The University of Arizona

One Hundred Years

1885 - 1985

A Proud Beginning
"The goals of the University of Arizona are to provide the opportunity for the acquisition of comprehensive education and usable skills, to serve as a resource for the expansion of knowledge through research; and to extend the opportunity to improve the quality of life by making available the services and resources of the University, its faculty and staff, to the students of the University and citizens of the State."
General Catalog  1983-84 1984-85

Tucson, Arizona

$4.00
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. Advisers, 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 a 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 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 Admissions and Records to determine the acceptability of credit from other institutions and its applicability toward a program of study at the University of Arizona.

The University of Arizona is an EEO/AA employer and does not discriminate on the basis of sex, age, race, religion, color, national origin, Vietnam Era Veterans' status, or handicapping conditions in its admissions, employment and educational programs or activities, and is required by Title IX of the Education Amendments of 1972 and the regulations adopted pursuant thereto in Title VII of the Civil Rights Act of 1964 and Section 504 of the Rehabilitation Act of 1973 not to discriminate in such manner. The requirement not to discriminate in education programs and activities extends to employment therein and admission thereto. Inquiries concerning the application of said regulations to this university may be referred to Dr. Celestino Fernandez, Assistant Vice President for Affirmative Action, Administration 503, phone (602) 621-3081; or to the Director of the Office of Civil Rights of the U.S. Department of Education.

In compliance with the Family Education Rights and Privacy Act of 1974, the University of Arizona guarantees that the parents of dependent children will have a right to information about their offspring without having to gain the student's consent.

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

The Dean of Admissions and Records
The University of Arizona
Tucson, Arizona 85721
(602) 621-3237

STATEMENT OF MAILING PRIVILEGE

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# ACADEMIC CALENDAR

## First Semester

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<tr>
<th>Event</th>
<th>1983-84</th>
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<tr>
<td>Last day for receipt of applications for admission and all supporting transcripts</td>
<td>July 18, M</td>
<td>July 23, M</td>
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<tr>
<td>Degrees awarded as of this date for students completing requirements at close of summer session</td>
<td>Aug. 11, Th</td>
<td>Aug. 16, Th</td>
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<tr>
<td>Residence halls open</td>
<td>Aug. 15-16, M-Tu</td>
<td>Aug. 20-21, M-Tu</td>
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<td>New-student orientation program</td>
<td>Aug. 17-19, W-F</td>
<td>Aug. 22-24, W-F</td>
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<tr>
<td>Registration</td>
<td>Aug. 22, M</td>
<td>Aug. 27, M</td>
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<tr>
<td>Classes begin</td>
<td>Aug. 29, M</td>
<td>Sept. 4, Tu</td>
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<tr>
<td>Labor Day—no classes</td>
<td>Sept. 5, M</td>
<td>Sept. 3, M</td>
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<td>Last day for dropping courses resulting in a deletion of course enrollment from record</td>
<td>Sept. 16, F</td>
<td>Sept. 21, F</td>
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<td>Midsemester scholarship records due in Office of the Registrar</td>
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<td>Oct. 9, Tu</td>
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<td>Last day for dropping courses</td>
<td>Oct. 28, F</td>
<td>Nov. 2, F</td>
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<td>Veterans’ Day—no classes</td>
<td>Nov. 11, F</td>
<td>Nov. 12, M</td>
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<td>Thanksgiving recess</td>
<td>Nov. 24-27, Th-Su</td>
<td>Nov. 22-25, Th-Su</td>
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<td>Applications for bachelor’s degree candidacy must be filed for degrees to be awarded at close of the following summer session</td>
<td>Dec. 1, Th</td>
<td>Dec. 3, M</td>
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<td>Class and laboratory sessions end</td>
<td>Dec. 7, W</td>
<td>Dec. 12, W</td>
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<tr>
<td>Semester examinations begin</td>
<td>Dec. 9, F</td>
<td>Dec. 14, F</td>
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<tr>
<td>Semester examinations end</td>
<td>Dec. 16, F</td>
<td>Dec. 21, F</td>
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<td>Degrees awarded as of this date for students completing requirements at close of first semester</td>
<td>Dec. 31, Sa</td>
<td>Dec. 31, M</td>
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Second Semester

Last day for receipt of applications for admission and all supporting transcripts
Registration
Classes begin
Last day of registration for credit
Last day for dropping courses resulting in deletion of course enrollment from record
Midsemester scholarship records due in Office of the Registrar
Applications for bachelor’s degree candidacy must be filed for degrees to be awarded at close of the following fall semester
La Fiesta de los Vaqueros—no classes
Founders’ day—100th Anniversary Convocation (1985)
Spring recess
Last day for dropping courses
Applications for bachelor’s degree candidacy must be filed for degrees to be awarded at close of the following spring semester
Class and laboratory sessions end
Semester examinations begin
Semester examinations end
Commencement
Centennial Year Commencement

Pre-Session

Summer Session

Registration for first term
First term
Registration for second term
Second term

ACADEMIC CALENDAR

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<td>Jan. 9-11, M-W</td>
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<td>Jan. 17, Th</td>
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<td>Jan. 24, Th</td>
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<td>Feb. 8, W</td>
<td>Feb. 13, W</td>
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<td>Feb. 24, F</td>
<td>Mar. 1, F</td>
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<td>Feb. 28, Th</td>
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<td>Mar. 10-18, Sa-Su</td>
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<td>Mar. 28, W</td>
<td>Apr. 3, W</td>
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<td>May 1, Tu</td>
<td>May 1, W</td>
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<td>May 12, Sa</td>
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<td>June 11-July 12</td>
<td>June 10-July 11</td>
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<td>July 13, F</td>
<td>July 12, F</td>
</tr>
<tr>
<td>July 16-Aug. 15</td>
<td>July 15-Aug. 14</td>
</tr>
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</table>
How to Use This Catalog

This general catalog is divided into four basic sections. A brief guide to each section follows.

GENERAL UNIVERSITY INFORMATION — This section contains all of the basic, noncurricular information pertinent to undergraduate education.

COLLEGES AND GENERAL DIVISIONS OF THE UNIVERSITY — The major academic divisions of the University are described in these chapters.

   The description for each college is divided into four parts:
   I. Brief description of the college.
   II. List of the degrees offered by the college.
   III. Specific college degree requirements. The specific major departmental requirements are listed in the Departments and Courses of Instruction section of this catalog, except for the departments in the Colleges of Architecture, Business and Public Administration, Engineering, Mines, and Pharmacy which provide that information in the college sections.
   IV. General college information giving such items as special research facilities and student organizations.

DEPARTMENTS AND COURSES OF INSTRUCTION — Two types of information will be found in this section:

   I. A description of the purpose of the department or committee, and a listing of the departmental curriculum requirements for the majors and, in some cases, the minors.
   II. A complete listing of the courses offered by the department or committee. (For a complete explanation of the information contained in the course listings, please see "Curricular Change," "Explanatory Notes," "Key to Symbols," and "University-Wide House-Numbered Courses" at the beginning of the department section.)

THE BOARD OF REGENTS, ADMINISTRATION, AND FACULTY — This section lists the complete Board of Regents, Administration, and Faculty of the University as of the academic year 1982-83.
### 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>a.ec.</td>
<td>agricultural economics</td>
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<tr>
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<td>a.m.e.</td>
<td>aerospace and mechanical engineering</td>
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<td>animal physiology</td>
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<td>addiction studies</td>
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<td>A.i.n.s.</td>
<td>American Indian studies</td>
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<td>animal sciences</td>
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<td>business and career education</td>
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<td>Bl.s.</td>
<td>Black studies</td>
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<tr>
<td>c.e.</td>
<td>civil engineering</td>
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<td>c.d.f.r.</td>
<td>child development and family relations</td>
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<td>chemical engineering</td>
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<td>computer science</td>
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<td>e.c.e.</td>
<td>electrical and computer engineering</td>
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<td>e.m.</td>
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<td>ed.f.a.</td>
<td>educational foundations and administration</td>
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<td>surg.</td>
<td>surgery</td>
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<td>sw.c.</td>
<td>southwest studies</td>
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<td>s.w.e.</td>
<td>soils, water and engineering</td>
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<td>tox.</td>
<td>toxicology</td>
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<td>u.pl.</td>
<td>urban planning</td>
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<td>v.sc.</td>
<td>veterinary science</td>
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<td>w.lc.</td>
<td>wildlife and fisheries science</td>
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<td>w.r.a.</td>
<td>water resources administration</td>
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<td>w.s.</td>
<td>women's studies</td>
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<td>ws.m.</td>
<td>watershed management</td>
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General University Information

Memberships And Accreditations

- ACCREDITATIONS — Accreditation Board for Engineering and Technology; American Assembly of Collegiate Schools of Business; American Association for Accreditation of Laboratory Animal Care; American Association of Museums; American Chemical Society; American Council on Education for Journalism; American Council on Pharmaceutical Education; American Dietetic Association; American Library Association; American Planning Association; American Psychological Association (graduate program in clinical psychology and graduate program for school psychologists); American Society of Landscape Architects; American Speech and Hearing Association; Association of American Law Schools and American Bar Association; Committee on Rehabilitation Education; Council on Rehabilitation Education (rehabilitation counselor education); Liaison Committee on Medical Education of the American Medical Association and the Association of American Medical Colleges; National Architectural Accrediting Board; National Association of Schools of Music; National Association of Schools of Public Affairs and Administration; National Council for Accreditation of Teacher Education; National League for Nursing; North Central Association of Colleges and Schools; Society of American Foresters.

MEMBERSHIPS — American Association for Higher Education; American Association for Laboratory Animal Science; American Association of Colleges for Teacher Education; American Association of Colleges of Nursing; American Association of Colleges of Pharmacy; American Association of Collegiate Registrars and Admissions Officers; American Association of University Women; American College Theatre Festival; American Council of Learned Societies; American Council on Education; American Home Economics Association; American Psychological Association; American Society for Engineering Education; American Society for Public Administration; American Statistical Association; Argonne Universities Association; Associated Western Universities; Association for Gerontology in Higher Education; Association for Public Policy and Management; Association for University Business and Economic Research; Association of Academic Health Centers; Association of American Colleges; Association of American Medical Colleges; Association of American State Geologists; Association of American Universities Presses; Association of Collegiate Schools of Architecture; Association of Collegiate Schools of Planning; Association of Research Libraries; Association of Systematics Collections; Association of Universities for Research in Astronomy; Association of University Summer Sessions; Border State Universities Consortium for Latin America; Broadcasters Educational Association; College Art Association of America; College Entrance Examination Board; Consortium of Western Universities and Colleges; Council for Advancement and Support of Education; Council of Graduate Schools in the United States; Council of United States Universities for Soil and Water Development in Arid and Subhumid Areas; EDUCOM, Interuniversity Communications Council; Eisenhower Consortium; Graduate Management Admissions Council; Institute of International Education; International Museum of Photography; Latin American Scholarship Program of American Universities; Mid-America College Art Association; Midwestern Association of Graduate Schools; National Association of Colleges and Teachers of Agriculture; National Association of College and University Attorneys; National Association of State Universities and Land Grant Colleges; National Consortium for Black Professional Development; National Public Radio; National University Extension Association; North American Association of Summer Sessions; Pacific Mountain Network; Public Broadcasting Service; Rocky Mountain Science Council; Society of Architectural Historians; Speech Communication Association; Travel Research Association; Universities Council on Water Resources; Universities Research Association; University Corporation for Atmospheric Research; University Film Association; University Resident Theatre Association; University Space Research Association; Western Association of Graduate Schools; Western College Association; Western Interstate Commission for Higher Education (WICHE); Western Interstate Council on Nursing.
History and Academic Organization

THE UNIVERSITY — A HISTORICAL SKETCH

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

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

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

In 1922 the College of Education was organized, and in 1925 offerings in law, originally established in 1915, were organized under the College of Law. The School of Business and Public Administration, established within the College of Letters, Arts, and Sciences in 1934, was reorganized as a separate college in 1944. In 1934 the Department of Home Economics was enlarged to a school within the College of Agriculture. In 1934 the College of Fine Arts, including the School of Music, and the Graduate College were established. In 1940 the Board of Regents reorganized the College of Mines and Engineering into two separate colleges. In 1947 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.

The forty-acre campus of the 1890s has grown to 319 acres and 131 buildings. Its purpose remains, in the language of the organic law, “to provide the inhabitants of this state with the means of acquiring a thorough knowledge of the various branches of literature, science, and the arts,” and, insofar as possible, to provide a technical education adapted to the development of the resources peculiar to Arizona. The university is maintained by funds appropriated by the state of Arizona and the United States government, and by fees and collections including private grants from many sources.
ACADEMIC DIVISIONS OF THE UNIVERSITY

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

COLLEGE OF AGRICULTURE. School of Home Economics (with divisions of Child Development and Family Relations; Clothing, Textiles and Interior Design; Home Economics Education/Consumer Studies); School of Renewable Natural Resources (with programs in Landscape Architecture, Natural Resource Recreation, Range Management, Watershed Management, Wildlife and Fisheries Science). Departments of: Agricultural Economics; Agricultural Education; Animal Sciences; Entomology; Nutrition and Food Science; Plant Pathology; Plant Sciences; Soils, Water and Engineering; Veterinary Science.

COLLEGE OF ARCHITECTURE

COLLEGE OF ARTS AND SCIENCES. School of Music. Departments of: Anthropology; Art; Astronomy; Atmospheric Sciences; Cellular and Developmental Biology; Chemistry; Classics; Computer Science; Drama; Ecology and Evolutionary Biology; English; French and Italian; General Biology; German; History; Journalism; Linguistics; Mathematics; Microbiology; Oriental Studies; Philosophy; Physics; Planetary Sciences; Political Science; Psychology; Radio-Television; Russian and Slavic Languages; Sociology; Spanish and Portuguese; Speech and Hearing Sciences; and Speech Communication.

COLLEGE OF BUSINESS AND PUBLIC ADMINISTRATION. Departments of: Accounting; Economics; Finance and Real Estate; Geography and Regional Development; Management; Management Information Systems; Marketing; Public Policy, Planning and Administration.

COLLEGE OF EARTH SCIENCES. Departments of: Geosciences; Hydrology and Water Resources.

COLLEGE OF EDUCATION. Graduate Library School; Center for the Study of Higher Education. Departments of: Business and Career Education; Counseling and Guidance; Educational Foundations and Administration; Educational Psychology; Elementary Education; Reading; Rehabilitation; Secondary Education; Special Education.

COLLEGE OF ENGINEERING. Departments of: Aerospace and Mechanical Engineering; Civil Engineering and Engineering Mechanics; Electrical and Computer Engineering; Nuclear and Energy Engineering; Systems and Industrial Engineering.

COLLEGE OF LAW

COLLEGE OF MEDICINE. Departments of: Anatomy; Anesthesiology; Family and Community Medicine; Internal Medicine; Molecular and Medical Microbiology; Neurology; Obstetrics-Gynecology; Ophthalmology; Pathology; Pediatrics; Pharmacology; Physiology; Psychiatry; Radiology; Surgery.

COLLEGE OF MINES. Departments of: Chemical Engineering; Metallurgical Engineering; Mining and Geological Engineering.

COLLEGE OF NURSING

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

GRADUATE COLLEGE. Committees on Animal Physiology; Arid Lands Resource Sciences; Genetics; Materials Engineering; Medieval Studies; Nutritional Sciences; Optical Sciences; Pharmacology and Toxicology; Plant Protection.

GENERAL DEPARTMENTS. Biochemistry; Physical Education; Statistics. School of Health-Related Professions; School of Military Science and Aerospace Studies.

GENERAL COMMITTEES. American Indian Studies; Applied Mathematics; Biomedical Engineering; Black Studies; Business Administration; Gerontology; History and Philosophy of Science; Humanities; Latin American Studies; Religious Studies; Remote Sensing; Toxicology; Women’s Studies.

CONTINUING EDUCATION. Daytime and Evening Classes on Campus; Community Services; Conferences and Short Courses; Correspondence Course Offerings; Elderhostel Programs; Opportunities for Women Programs; Specialized Clientele Programs; Special Interest Courses; Extension Courses and Degree Programs.

THE UNIVERSITY LIBRARIES
The following divisions are a part of or are affiliated with the University. Additional information regarding their organization and services may be obtained upon inquiry to the director concerned.

The **AGRICULTURAL EXPERIMENT STATION (1890)**, one of the divisions of the College of Agriculture, is responsible for the basic and applied research programs in the various departments and divisions within the College of Agriculture. It is administered by the Director of the Experiment Station. Modern facilities for laboratory and field research, as well as graduate and undergraduate teaching, are available on the University campus and at branch experiment stations and farms located at Marana, Mesa, Phoenix, Tempe, Tucson, Safford and Yuma. 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 **ANIMAL DISEASE DIAGNOSTIC SERVICE** was initiated by the Department of Veterinary Science in 1934 and has provided continuous service to the animal owners of Arizona since its establishment. Administered under the Agricultural Experiment Station, diagnostic services are provided upon referral from private veterinary practitioners for any resident of the state.

The **ARIZONA CENTER FOR EDUCATIONAL RESEARCH AND DEVELOPMENT (1971)** houses programs in early childhood education and in language and literacy, as well as the Offices of Psychoeducational Research and Educational Evaluation and Measurement. The Center operates through the College of Education and involves other University personnel as appropriate. Its activities are in the area of basic and applied research in education.

The **ARIZONA COOPERATIVE FISHERY UNIT (1964)** is engaged in graduate education, research, and extension. It is supported by the University of Arizona, the Arizona Game and Fish Department, and the U.S. Bureau of Sport Fisheries and Wildlife. The research program is directed chiefly toward learning how to meet the rapidly increasing demand for inland sport-fishing opportunities in the Southwest. The unit is housed in the School of Renewable Natural Resources.

The **ARIZONA COOPERATIVE NATIONAL PARK RESOURCES STUDY UNIT (1973)**, located in the School of Renewable Natural Resources, is engaged in research to support the natural science program of the National Park Service. In cooperation with the University of Arizona, the unit provides graduate research opportunities and instructional support in a broad array of natural resource problem areas.

The **ARIZONA COOPERATIVE WILDLIFE RESEARCH UNIT (1951)** is sponsored and supported jointly by the University of Arizona, the Arizona Game and Fish Department, the U.S. Fish and Wildlife Service, and the Wildlife Management Institute. Unusual opportunities for research on game-management problems exist because of the large diversity of habitats and of game species native to the state. The unit is housed in the School of Renewable Natural Resources.

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 anyone in the state. It also offers drug information and therapeutic consultations to health professionals. The center has a toll-free telephone number (listed on the inside cover of Arizona telephone directories) and can be reached 24 hours a day, seven days a week. Full-time clinical pharmacists staff the center and serve as poison and drug information specialists. Serving as consultants are a medical toxicologist and specialists in plant and animal poisons, drugs, and environmental and industrial poisons. The Arizona Poison and Drug Information Center provides for clinical training of pharmacy students in the areas of drug and poison information. The Arizona Poison and Drug Information Center is a component of the Arizona Poison Control System which was established by the Arizona State Legislature in 1980 and is based in the College of Pharmacy. 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 (1981) serves as a repository for a wide range of remote sensing imagery, image processing and computer mapping software, and equipment for analysis of the imagery and for data input to the software. The facilities of the Center, which is housed in the College of Agriculture, are available to faculty, students, and non-University cooperators. Technical assistance and training in the uses of the equipment and programs are available. The Center is involved in interdisciplinary projects related to the areas of remote sensing and computer mapping.

The ARIZONA STATE MUSEUM, founded as a territorial museum in 1893, is an educational, research, and service division of the University. Museum exhibits emphasize prehistoric and recent Indian cultures of Arizona and the Southwest. Special temporary exhibits on a variety of subjects are presented throughout the year. The Museum is open daily to the public. Closed major holidays.

The ARIZONA TRANSPORTATION AND TRAFFIC INSTITUTE (1959) is engaged in broad research aimed at developing advanced methods of analysis and obtaining answers to the transportation problems in Arizona. Topics considered include the planning, design, and operation of transportation facilities, including pavement design and highway materials, as well as maintenance of these systems. The institute acts as a technical information center, and its activities are closely tied to those of the Department of Civil Engineering and Engineering Mechanics.

The 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 from 8:00 a.m. to 5:30 p.m. daily except for Christmas Day.

The BUREAU OF EDUCATIONAL SERVICES (1959) is involved in in-service programs for educational personnel, educational surveys, curriculum development, psychological and evaluative services, and consultative activities with schools, school districts, and a variety of other educational agencies and enterprises. The Bureau operates within the College of Education.

The BUREAU OF APPLIED RESEARCH IN ANTHROPOLOGY (1952), a division of the Department of Anthropology, is a regional and international center for basic and applied research relating to culture change, urban and rural living, technological innovation, demography, and cross-cultural management.

The BUREAU OF GEOLOGY AND MINERAL TECHNOLOGY (1915) is a state agency affiliated with the College of Mines and is directly charged with developing, maintaining, and disseminating to the people of Arizona information relating to mining, metallurgy, and earth sciences generally. The Bureau's primary functions are those of a state geological survey and mines bureau and, therefore, include scientific investigation and public service activities comparable to those conducted by similar organizations in other states.

The close union of the Bureau with the teaching programs of the Colleges of Mines and Earth Sciences has been exceptionally productive in the development and dissemination of knowledge about the mineral resources and environmental characteristics of Arizona. The Bureau is a member of the Association of American State Geologists, the national affiliation of geological surveys of individual states.

The CENTER FOR CREATIVE PHOTOGRAPHY (1975), a division of the University Library, is a growing research library and archive containing material on all aspects of photography. The collection includes rare photographic books, periodicals, photographs, and manuscript collections, as well as the archives of major American photographers and a large collection representing over 1500 photographers. In addition, the Center sponsors a lecture series and frequent exhibitions and publishes a journal entitled The Archive. Photographs not on exhibition may be viewed by appointment.
The **Center for the Study of Higher Education** (1978) in the College of Education conducts research studies and provides related service activities to meet state and institutional needs, as well as those of national, international and regional governmental units and other organizations. It develops and disseminates information about higher education policy and operation and facilitates the research of faculty members and students. Special research and service projects are provided through University funds and outside support. The Center also provides graduate-level instruction leading to master’s and doctoral degrees.

The **Computer Center** provides facilities and services for the instructional, research, and administrative computing needs of the University community. Computer access can be obtained, at no charge, by all registered students.

The University’s network of shared computers consists of a Control Data Corporation CYBER 175 computer, two Digital Equipment Corporation DECSystem-10 computers, and three VAX-11/780 computers. These computers are interconnected to allow data transfer between systems. The Center provides terminals at various locations on campus as well as dial-up ports for access to these systems from individual laboratories and offices.

The Computer Center provides a variety of services to assist users in taking full advantage of the available computing resources. Such services include consulting on the use of the University’s shared computer systems, user acquisition of computing facilities and interface between user-owned equipment and the University’s systems; non-credit short courses, open to the public, on use of the University’s systems; computer facility planning and preparation; selection, acquisition, integration, installation, and training in the use of user-owned computer systems acquired through the Center; and the dissemination of information through publications, manuals, reference books and periodicals, program library documentation, and consulting services.

The **Cooperative Extension Service** (1914) brings information to interested people of Arizona. One of the three divisions of the College of Agriculture, it emphasizes agricultural production and natural resources, family and consumer sciences, youth development (4-H), and rural development. The Service is financed from federal, state, and county appropriations. It operates through the county extension agent, state and area specialist system with faculty trained in their specialty, and in the practical application of scientific information on farms, ranches and in rural and urban homes. Assistance is provided to target audiences in problem solving, information dissemination and educational programs.

The **Division of Economic and Business Research** (1949) is a research and service organization within the College of Business and Public Administration. Its broad objective is to conduct basic and applied research in business, economics, public policy, and planning. Continuing research programs are conducted in economic models, resources and environment, consumer impact, and public sector economics. In addition, an information service is operated which serves government, business and the general public by responding to requests for information and by publication of Arizona business statistics. The Division publication program includes the *Arizona Review*, *Arizona's Economy*, monographs, special studies, and a chart book.

The **Division of Media and Instructional Services** (1939) provides a wide range of instructional, production, research, and public broadcasting services to the University, community, and state. The division operates three maximum-power public broadcasting stations: KUAT-TV (Channel 6 and Translator Channel 71), KUAT-AM (1550kHz), and KUAT-FM (90.5 MHz and Translator Frequency 103.1 MHz). Professional production facilities are maintained in the Modern Languages Building, the Audiovisual Building, the Harvill Building, and the Arizona Health Sciences Center. Production capability includes color studio and mobile television, and 16mm motion picture equipment. The stations are affiliated with the Public Broadcasting Service (PBS) and National Public Radio (NPR). The Microcampus produces and distributes University courses to business and industry in the Tucson area through a two-channel Interactive Educational Television System (IETS) and throughout the nation by videotape.
The Instructional Research and Development area is committed to improving the quality of instruction at the University. Members of the staff consult with members of the faculty in course design and revision. The staff holds workshops for interested University personnel and provides an ongoing evaluation of teaching effectiveness.

The Graphics Center provides outstanding graphic and photography services to the University.

The Film Library and Equipment Services provide media and audiovisual materials to both the University and other educational institutions.

Many members of the division staff serve as faculty members.

The ENGINEERING EXPERIMENT STATION (1941) administers the funds of all sponsored grants and contracts of the faculty in the College of Engineering. Students are often supported by wages or work-study arrangements under individual projects. Using state-appropriated funds, the Station promotes, initiates, and conducts engineering research of potential benefit to the state of Arizona.

The ENVIRONMENTAL RESEARCH LABORATORY (1967) conducts research in controlled-environment agriculture (CEA) for intensive food production, in seawater crop irrigation, and in solar heating and cooling. ERL has designed CEA vegetable systems which produce crops in the desert sands of the United States and Middle East, and it has developed CEA for the intensive culture of marine shrimp. ERL is developing halophytic crops for livestock feeds and other uses — plants which are irrigated solely with seawater or other highly saline water. ERL consults on such special projects as the portrayal of agriculture of the future at the EPCOT Center at Walt Disney World in Florida. ERL has also developed a series of demonstration solar homes at Tucson International Airport, where the laboratory is located.

The GRACE H. FLANDRAU PLANETARIUM (1975), a part of the College of Arts and Sciences, was built as a result of a gift to the University by Grace H. Flandrau. It 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 also presents dramatic public programs on astronomy and planetary science that take one on cosmic journeys through time and space. The science halls and 16-inch telescope are open free to the public. Open daily except Mondays.

The HUMAN DEVELOPMENT LABORATORY (1979) is an interdisciplinary research and training center within the Division of Child Development and Family Relations in the School of Home Economics. The laboratory is charged with promoting and conducting applied research to enhance the welfare of families and individuals. The laboratory supports and conducts funded and unfunded research on issues relating to all stages of human life. The laboratory’s preschool program, an ongoing research project, develops and evaluates child development programs. Priority is given to research that is interdisciplinary, preventive, and issue-oriented. The facility is equipped for audio and video taping and sponsors colloquiums and a semiannual newsletter.

The INSTITUTE OF ATMOSPHERIC PHYSICS (1954) conducts research on the fundamental mechanisms that govern weather processes. Particular emphasis is given to investigations in aerosols, cloud and precipitation physics, atmospheric electricity, climatology, atmospheric dynamics, radiative exchange mechanisms, remote sensing, and atmospheric chemistry.

The INSTITUTE OF GOVERNMENT RESEARCH (1963) is a part of the Department of Political Science. The institute facilitates, supports, and coordinates research on political and governmental problems and on public policies relevant to Arizona and the Southwest, with special emphasis on natural resources (water and energy) and the environment. Also included are research projects in problems of American Indian policy and Latin America. The Institute publishes occasional monographs and reports dealing with these topics and maintains a political science reference and research library.
The INTERACTIVE EDUCATIONAL TELEVISION SYSTEM (1980) is an educational delivery system which affords students at remote locations the opportunity to participate in coursework simultaneously with classes being held on campus. MICROCAMPUSS (1972) is an education delivery system which uses video cassettes and live, interactive microwave transmission to make University of Arizona classes available to students throughout the U.S. Students in remote locations who want University credit must be admitted to the University and register for classes in absentia. Successful completion of a course results in a University credit transcript entry. In addition to regular courses, videotaped short courses provide up-to-date information on diverse subjects, but are not available for University credit. Developed in the College of Engineering, Microcampus has grown to include courses from many other colleges and is now part of the Division of Media and Instructional Services.

The LABORATORY OF TREE-RING RESEARCH (1937) is an outgrowth of the pioneering tree-ring studies initiated by Andrew Ellicott Douglass at the University of Arizona in 1906. A division of the College of Earth 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 and paleoclimatic 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 LUNAR AND PLANETARY LABORATORY (1960) is the research institute allied with the Planetary Sciences Department. Laboratory staff engage in research and graduate instruction in conjunction with the Planetary Sciences Department and frequently undertake projects in collaboration with other campus units as well, including the Departments of Astronomy, Geosciences, and Physics, and the Steward Observatory. Research programs at the Lunar and Planetary Laboratory are closely associated with the NASA space program and include numerous lunar and planetary missions. Several of the faculty of the department and the laboratory have been principal investigators or coinvestigators on space experiments, including Apollo, Mariner, Voyager, and Pioneer spacecraft. Major ground-based research facilities include the University of Arizona telescopes (150 cm, 100 cm, 70 cm aperture reflectors on Mt. Lemmon; 154 cm aperture reflector and 46/71 cm Schmidt camera near Mt. Bigelow; 53 cm reflector on Tumamoc Hill; 220 cm Cassegrain reflector on Kitt Peak; and the multiple-mirror telescope on Mt. Hopkins), a scanning electron microprobe, a neutron activation analysis laboratory, and the Space Imagery Center. In addition, the Laboratory conducts high-altitude observational programs for solar, planetary, and stellar infrared spectroscopy using NASA jet aircraft.

Research interests of the laboratory and department include experimental and theoretical geochemistry and cosmochemistry, lunar and planetary geology, spacecraft imaging of planetary surfaces, the physics of planetary interiors, cosmic rays, the solar wind, astrophysical plasmas, polarimetry, infrared Fourier spectroscopy, planetary atmospheres, infrared astronomy, and astrometry. The Laboratory is housed in the Gerard P. Kuiper Space Sciences Building.

The MINERALOGICAL MUSEUM (1919) emphasizes Arizona’s unique mineral heritage in a spectacular collection of minerals, fossils, and gems. The Museum, a part of the collections of the Department of Geosciences since its establishment, is open to students and the general public.
The Office of Arid Lands Studies (1964), administratively within the College of Agriculture, is active in international studies, information systems, Indian programs, remote sensing, publications and education. The 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 state, federal, and international government agencies. The Office administers the interdisciplinary Doctor of Philosophy degree with a major in arid lands resource sciences.

The Optical Sciences Center (1967) is a graduate center for research in applied and theoretical optical physics. Areas in which research is currently being conducted include atmospheric optics, coherent optics, holography, image processing, infrared techniques, integrated optics, laser physics, medical optics, modulation spectroscopy, optical design, optical fabrication and testing, optical properties of materials, quantum optics, remote sensing, solar energy, and thin film technology. In addition, interdisciplinary research programs involving the Departments of Astronomy, Civil Engineering and Engineering Mechanics, Electrical and Computer Engineering, Mathematics, Microbiology, Physics, Physiology, Planetary Sciences, Psychology, and Radiology are in progress.

Special facilities of the Optical Sciences Center include an electronics shop, faculty/student machine shop, instrument shop, massive-optics shop, photographic darkrooms, PDS microdensitometer, eclipse minicomputer, remote computer terminal, reading room, teaching laboratory, and thin film facility. These facilities may be used by graduate students in their research programs.

The Ruth E. Golding Clinical Pharmacokinetics Laboratory (1977) in the College of Pharmacy is primarily an analytical laboratory where new assays are developed to quantify drugs and their metabolites from biological fluids. These assays are used in conjunction with animal and clinical research projects to better define the disposition of and response to drugs. The results of these studies along with the monitoring of drug plasma concentrations in patients are used to optimize therapy by individualizing drug administration.

The Southwest Institute for Research on Women (SIROW) (1979) is a regional research and resource center within the Committee on Women's Studies. The Institute develops and conducts research on women in the Southwest (Arizona, Colorado, New Mexico, and Utah) or of interest to scholars in the region. SIROW publishes a newsletter and a working paper series, links researchers with community organizations and policy makers through a research clearinghouse, and provides professional development and training for people in education, research, business, and government.

The Steward Observatory (1916) was established by the generous gift from Lavinia Steward, in honor of her husband, George Steward. For many years, the Observatory's principal telescope was its 36-in. (91-cm) reflector, constructed with aid of the Steward bequest. At this time, the primary research telescopes of the Observatory include the Multiple Mirror Telescope (MMT), located on the Mt. Hopkins summit in the Santa Rita Mountains, the 90-in. (2.3-m) Ritchey-Chretien reflector at the Kitt Peak site, and the 61-in. (1.55-m) Cassegrain reflector found at the Mt. Bigelow station in the Santa Catalina Mountains. The MMT, operated jointly with the Smithsonian Astrophysical Observatory, represents an innovative and highly successful concept for construction of large optical telescopes; it may thus become the prototype for future large-aperture telescopes. The major telescopes are used with a wide variety of instrumentation and detectors and are supported by several smaller instruments used for teaching or special research projects.

The Steward Observatory offices and laboratories are located on the northeast part of the University campus adjacent to the original 36-in. dome which now houses a 21-in. instructional telescope. The main areas of research at the Observatory include extragalactic and galactic astronomy, with major specializations in the areas of quasars, degenerate stars, infrared sources, novae, and radio galaxies. Observational work is concentrated in the optical and infrared but includes work at radio, ultraviolet and x-ray wavelengths using other facilities. The Observatory is developing facilities for work at mm and sub-mm wavelengths in collaboration with the Max Planck Institute for Radio-astronomy in Bonn, West Germany. The research programs also include a wide range of theoretical studies in modern astrophysics.
Located across N. Cherry Ave. from Steward Observatory are the administrative offices and laboratories of the Kitt Peak National Observatory. The two observatories co-sponsor a weekly series of professional colloquia. Steward Observatory also maintains close working ties with the University’s Lunar and Planetary Laboratory, the Department of Planetary Sciences, the Committee on Optical Sciences, the Department of Physics and the Grace M. Flandrau Planetarium.

The UNIVERSITY ANALYTICAL CENTER was established in response to the increasing need for various segments of the academic community to have access to modern chemical analysis methodology. The Analytical Center provides the University with a centralized system consisting of analytical equipment and personnel trained in various areas of chemical analysis. This facility is available to all University disciplines requiring or desiring to use various analytical procedures in teaching or research activities. The Analytical Center serves the University community by providing analytical equipment, analytical advice, methods development, sample analysis, and the training of both technical and nontechnical personnel in various aspects of analytical measurements. In addition, the Analytical Center maintains an active program of both basic and applied analytical research. The research activities provide a means of continuously expanding the Analytical Center capabilities and ensuring that equipment and personnel are kept at “state-of-the-art” levels in various analytical areas.

The UNIVERSITY ENVIRONMENTAL COUNCIL (1976) serves to focus existing institutional resources for addressing contemporary environmental concerns. The Council acts in an advisory capacity to the University administration and individual colleges regarding environmental activities in teaching, research, and public service. With Council representation from each college, coordination among the various disciplines represented by the University is provided in a manner which allows the development of efficient and realistic programs directed at those environmental subjects involving many disciplines. The Council interacts with special college environmental programs, such as the College of Agriculture Council for Environmental Studies.

The UNIVERSITY OF ARIZONA PRESS (1959), the book-publishing arm of the University, specializes in “works of merit in the subject-matter fields identified with the institutions of higher learning in Arizona, and other significant nonfiction books of a regional nature about Arizona, the Southwest, and Mexico.” Most titles are at the college or adult level. The imprint is controlled by the University Publications Committee, which includes the Press director.

Manned by a professional publishing staff, the Press shoulders the accepted four basic responsibilities of a quality publisher: manuscript appraisal and selection; comprehensive editing and organizing; appropriate design and quality production; and effective marketing. The Press distributes in 85 foreign countries as well as throughout the United States. Works are in the English language, but rights for translations are negotiated by the Press with foreign publishers.

A number of books of the Press have received awards for scholarly excellence and quality of production.

Manuscripts will be considered by the Press from any authoritative writer — regardless of geographical location — if the works are in the publishing fields in which the Press operates in upholding University intention and emphasis. Approximately half the titles in print have come from University faculty or authors holding former University of Arizona affiliation, with the other half from outside authors whose works qualify.

Also appearing under the Press imprint is the historical quarterly Arizona and the West, whose separate editorial and subscription office is in the Main Library.

The WATER RESOURCES RESEARCH CENTER (1965), an interdisciplinary organization formed in response to the U.S. Congress’s Water Resources Act of 1964, is primarily devoted to assistance to water-related research activities at the three state universities. In addition, the Center conducts certain special research investigations within its organization. This work includes the harvesting of additional water from arid and semiarid watersheds; artificially recharging the groundwater aquifers; evaporation suppression; seepage control; urban hydrology; and operation and maintenance of the research facility on the Casa Grande Highway, and one undeveloped and three urbanized watersheds; all in or near Tucson. Lastly, the Center is responsible for the dissemination of results of water-related research in the state.
Admission to The University

GENERAL REGULATIONS

CHARACTER — All students at the University must be of good character, and new students are required to furnish satisfactory evidence thereof at or prior to admission. A certificate of graduation or of honorable dismissal from the school last attended may be furnished as evidence of good character, but the University may require additional evidence.

EQUAL OPPORTUNITY — The University of Arizona is committed to providing equal educational opportunity for all qualified students, welcoming all such without regard to sex, race, religion, color, national origin, age, Vietnam Era veterans’ status, or handicapping condition. Inquiries may be referred to Dr. Celestino Fernandez, Assistant Vice President for Affirmative Action, Administration Building, Room 503, (602) 621-3081.

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

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

HEALTH REGULATIONS — All new students and students absent from the University more than two semesters are urged to furnish the Student Health Service with results of a tuberculin skin test taken within six months prior to registration and a completed Admission Health Report Form. If the skin test is known to be positive, or found to be positive, a chest X-ray is recommended. Medical or nursing students should defer the chest X-ray until arrival at the University.

APPLICATION FOR ADMISSION — Inquiry regarding application for undergraduate admission should be directed to the Office of Admissions. Information about admission to the Graduate College, the College of Law, and the College of Medicine may be obtained from the admissions office of the respective college.

TIME FOR APPLICATION — Application for admission and all supporting transcripts must be submitted to the Admissions Office no later than one month before the first day of registration for the fall semester or the spring semester concerned. Foreign students (nonimmigrants) should note application deadline dates indicated in the section “Admission of Foreign Students.”

DOMICILE AFFIDAVIT — A student enrolling in the University of Arizona for the first time, or a student returning after an absence of one or more semesters, must file a Domicile Affidavit. This form is furnished to students with the admission or readmission application.

ENTRANCE TEST — All entering freshman students, including those who have completed college credit elsewhere, must have taken the American College Test (ACT) or the Scholastic Aptitude Test (SAT) of the College Board, and had their scores sent to the Admissions Office. Information regarding these tests may be obtained from high school counselors.
CANCELLATION OF ADMISSION OR REGISTRATION — The University reserves the right to cancel the admission or registration of an individual whose attendance at the University, in the opinion of the appropriate administrative officer and the president, would not be mutually beneficial to the student and to the institution.

READMISSION — Former students absent from the University for a regular semester or longer, regardless of reason, must make a formal application for readmission, applying to the Admissions Office at least one month prior to the opening of the semester or summer term for which they wish to re-enroll. Students who withdraw for medical reasons and who are medically encumbered must have their readmittance approved by the Student Health Service. Medical withdrawal procedures should be initiated through the Student Health Service.

NONRESIDENT APPLICATIONS

ADMISSION APPLICATION FEE — Applicants for admission from outside the state of Arizona will pay an application fee of $10 (this fee does not apply to applicants for admission to the Graduate College). The application fee is also required of undergraduate foreign students who reside within the United States but outside the state of Arizona. This should be paid in check or money order made payable to the University of Arizona, and must be submitted with the application for admission. Applications are not considered unless accompanied by this nonrefundable fee.

ADMISSION OF FOREIGN STUDENTS (Students who hold nonimmigrant visas) — Inquiries about undergraduate admission should be directed to the Foreign Student Admissions Office, Administration Building, Room 302. Foreign students are expected to have above average grades, must demonstrate proficiency in the English language, and must satisfy the financial guarantee requirement for each year of attendance.

All foreign applicants whose native language is other than English and who do not present American College Test (ACT) scores are required to take the Test of English as a Foreign Language (TOEFL). Results of the TOEFL are valid for two years. Applicants should request that TOEFL (Box 899-TR, Princeton, New Jersey 08541, USA) send their scores to the University of Arizona. The scores must be received before the application for admission can be considered.

Newly admitted foreign students must also take a locally administered English placement or achievement test upon arrival and must take such further study in English as the test results indicate is necessary.

For those lacking college-level English proficiency, the Center for English as a Second Language (CESL) on this campus offers full-time English language training. Enrollment in the intensive English language program is not a part of the academic program. The full semester sessions carry no college credit, but satisfactory completion of CESL study will meet the English proficiency requirement for admission. Request further information by writing to Foreign Student Admissions.

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

Foreign students on nonimmigrant visas are required by the University to have University of Arizona Student Accident and Sickness Insurance coverage. Information and costs of this coverage are sent to those foreign students who are accepted for admission. The cost of the insurance is included in the amount of the financial guarantee. Insurance coverage is required for each term of enrollment. Students are exempted from the University of Arizona insurance plan only when their government or sponsoring agency has submitted accident and sickness insurance plans acceptable to the University of Arizona.
Inquiries concerning the acceptance of transfer credit from foreign institutions completed by US and non-US citizens should be directed to the Foreign Student Admissions Office, which is responsible for the evaluation of foreign credit in transfer.

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

ADMISSION OF IMMIGRANT AND REFUGEE-STATUS STUDENTS

Application inquiries should be directed to the Undergraduate Admissions Office, Administration Building, Room 322.

Applicants whose native language is not English and who do not present American College Test (ACT) scores are required to take the Test of English as a Foreign Language (TOEFL), which is given at test centers worldwide under the direction of the Educational Testing Service. For test registration information, write: Test of English as a Foreign Language, Box 899, Princeton, New Jersey 08541.

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

ADMISSION OF DISABLED STUDENTS

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

Prospective students who are disabled are encouraged to write or call the Disabled Student Services Program, Department of Rehabilitation, Education Building, Room 104, 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

GOVERNMENT EDUCATIONAL PROGRAMS FOR VETERANS AND WAR ORPHANS — The University of Arizona is fully approved for the training of students under the several government educational programs for veterans and war orphans. Eligible students should apply directly to their nearest Veterans' Administration office for benefits to which they may be entitled under these laws.

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

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

EXEMPTION OF CERTAIN VETERANS FROM EFFECTS OF FAILING GRADES — By Arizona statute, in determining the admissibility to the University of a veteran, honorably discharged, who has served in the armed forces of the United States for a minimum of two years and who
was previously enrolled at a university or community college in Arizona, no failing grades received by such veteran at any Arizona university or community college prior to military service may be considered. This policy applies to the admission decision only. Failing grades awarded at the University of Arizona remain on the record, and the graduation average is based upon the grades received in all coursework attempted in residence.

The student admitted or readmitted to the University under this statute is subject to progression, retention, graduation, and other academic regulations and standards in this catalog.

ADMISSION TO FRESHMAN STANDING

SCHOLASTIC REQUIREMENTS — A first-time freshman applicant for admission may be admitted if he or she has satisfactorily completed the required secondary-school subject units and

1. Ranks in the upper 50% of the high school graduating class; or
2. Is an in-state applicant, obtains a minimum composite score of 21 on the American College Test or a minimum combined score of 930 on the Scholastic Aptitude Test of the College Board; or
3. Is an out-of-state applicant, obtains a minimum composite score of 23 on the American College Test or a minimum combined score of 1010 on the Scholastic Aptitude Test of the College Board.

Applicants who do not meet the above freshman admission standards may appeal in writing to be admitted on the basis of at least one of the following additional criteria:

1. Has attained a high school grade-point average minimum of 2.5000 overall on a 4.0000 scale;
2. Has shown an upward grade trend during his or her high school career or an upward grade trend in the senior year;
3. Obtains positive recommendations from his or her secondary school administrators and/or a positive recommendation from a university counselor based upon academic potential, work experience, leadership ability, or extra-curricular activities;
4. Attains an average score on the General Education Development test (GED) of at least 50;
5. Demonstrates an ability to complete freshman-level academic courses by attaining a minimum grade-point average of 2.0000 on a 4.0000 scale in academic courses in English, social science, mathematics, science, foreign languages, or the humanities, as shown by at least 9 credit hours in a community college and/or summer or evening sessions of the university.

GRADUATION FROM AN APPROVED SECONDARY SCHOOL — Applicants for admission must have graduated with satisfactory scholarship from an accredited secondary school.

ARIZONA HIGH SCHOOLS

The high schools of the state are classified in three divisions — North Central Association schools, Class I schools, and Class II schools — whose graduates are acceptable to the University of Arizona.

The following schools are members of the North Central Association of Colleges and Secondary Schools and meet the standards set by that association:

<table>
<thead>
<tr>
<th>North Central High Schools</th>
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</thead>
<tbody>
<tr>
<td>Agua Fria Union (Avondale)</td>
</tr>
<tr>
<td>Ajo</td>
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<tr>
<td>Alchesay (Whiteriver)</td>
</tr>
<tr>
<td>Alhambra (Phoenix)</td>
</tr>
<tr>
<td>Amphitheater (Tucson)</td>
</tr>
<tr>
<td>Antelope Union (Wellton)</td>
</tr>
<tr>
<td>McClintock (Tempe)</td>
</tr>
<tr>
<td>Mesa</td>
</tr>
<tr>
<td>Miami</td>
</tr>
<tr>
<td>Mingus Union (Cottonwood)</td>
</tr>
<tr>
<td>Mohave (Riviera)</td>
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<tr>
<td>Monument Valley (Kayenta)</td>
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</tbody>
</table>
The following schools are approved by the State Committee on Accreditation and meet the standards prescribed for Class I High Schools:

**Class I High Schools**

AZ State School for the Deaf & the Blind (Tucson)  Phoenix Day School for the Deaf  Pima  Red Mesa (Teec Nos Pos)  St. David  St. Mary's (Phoenix)  Salome  San Simon  Seligman  Seton Catholic (Chandler)  Suffolk Hills Catholic (Tucson)  Valley (Sanders)  Valley Union (Elfrida)

Ash Fork  Baboquivari (Sells)  Bourgade (Phoenix)  Bowie  Duncan  Fort Thomas  Fredonia (Phoenix)  Gerard Catholic (Phoenix)  Maricopa  Mayer  Patagonia Union

The following schools are nonpublic schools approved by the State Committee on Accreditation and meet the standards prescribed for Class II High Schools:

**Class II High Schools**


Graduates of Class II schools are acceptable to the University of Arizona into full freshman standing upon the personal recommendation of the principal of their high school and under the foregoing provisions governing admission.

**REQUIRED SECONDARY-SCHOOL SUBJECT UNITS**

Applicants for admission must have completed a 4-year secondary-school course or the equivalent with a minimum of sixteen units in acceptable subjects. The definition of a unit is that used by the North Central Association of Colleges and Secondary Schools. This is the amount of credit given for the successful completion of a course which meets 40 minutes daily, five days per week, for at least 36 weeks, or the equivalent amount of time (120 clock hours) within the school year.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>English (or English 3 and one foreign language 2)</td>
<td>4 (5)</td>
<td>(see Groups I and II below)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>2</td>
<td>(see Group III below)</td>
</tr>
<tr>
<td>American history &amp; social studies</td>
<td>2</td>
<td>(see Group IV below)</td>
</tr>
<tr>
<td>Laboratory science</td>
<td>1</td>
<td>(see Group V below)</td>
</tr>
<tr>
<td>Electives (or depending upon English option)</td>
<td>7 (6)</td>
<td>(see Groups I through VI below)</td>
</tr>
</tbody>
</table>

The mathematics requirement will be 3 units starting in the 1985-86 school year.
Classification of Acceptable Secondary School Subjects

Group I. English: only courses with major emphasis upon grammar, composition, and literary analysis.

Group II. Foreign language: a classical or modern foreign language. Less than one unit is not accepted. Two units or more are strongly recommended.

Group III. Mathematics: one unit of algebra must be presented. The second required unit may be either advanced algebra or plane geometry.

Group IV. Social Studies: history, civics, economics, sociology, geography, and government (including United States and Arizona constitution).

Group V. Laboratory science: courses in biology, chemistry, earth science, and physics, in which at least one regular laboratory period is scheduled each week.

Group VI. Art, agriculture, bookkeeping, general science, home economics, arithmetic, business arithmetic, general mathematics, journalism, industrial arts, music, drama, speech, secretarial training, and other subjects commonly offered for credit by secondary schools.

Provision for Admission of Secondary-School Graduates Who Have Not Completed the Required Subject Units

Applicants who are otherwise admissible and who lack no more than two units of the required program may be admitted with deficiencies. There may be no more than one unit of deficiency in any subject. Beginning fall, 1985, there may be no more than one unit of deficiency in either of the following groupings: I, II, and IV; or III and V.

Because a student admitted with deficiencies is not satisfactorily prepared for college, it is recommended that the deficient subject units be made up prior to college attendance. The deficiencies must be made up by the beginning of the sophomore year either by additional high school courses (for example, correspondence study with the high schools, community colleges or state universities), or by college courses. When the deficiencies have not been removed by the time the student first registers at the University, the first course taken in the subject matter area will be used to remove that deficiency. If the student completes the additional high school work required in the deficient area before the beginning of the sophomore year and before taking the first University course in that subject area, that high school work may be used to remove the deficiency upon petition to the registrar. Students who fail to remove deficiencies by the end of their sophomore year (48 units) will be denied admission to junior-level standing. Credit for college courses applied to deficiencies is not applicable to degree unit requirements. Such courses taken in meeting deficiencies, however, do apply to meeting minimum enrollment standards and may apply to meeting college subject matter requirements. Grades for such courses, if taken in residence at the University of Arizona, will be included in the graduation average. Courses used to remove high school entrance deficiencies may be taken under the pass-fail option; however, such courses may not be used to meet subject matter requirements.

Additional Subject Units Recommended

The required pattern of subjects is that which, on the basis of experience, can reasonably be expected to provide satisfactory preparation for college when these subjects have been completed with better-than-average grades. A well prepared high school student will have completed at least 4 units of English, 2 units of one foreign language, 4 units of college preparatory mathematics (to be selected from the areas of algebra, geometry, and trigonometry), 3 units of history and social studies, and 2 units of laboratory science. One mathematics and one English subject unit should be taken by the student during the senior year of high school.

The University and the Board of Regents are considering increasing the secondary school subject units required for admission to the University after 1985.
ADMISSION TO PARTICULAR COLLEGES AND SCHOOLS

ARCHITECTURE — Applicants are expected to present credit in mathematics and laboratory science as follows: 1 unit of elementary algebra, \( \frac{1}{2} \) unit of intermediate algebra, 1 unit of plane geometry, and 1 unit of physics with a lab. Students are strongly advised to include among their electives additional courses in mathematics such as trigonometry, advanced algebra, or solid geometry.

ARTS AND SCIENCES — Students are strongly urged to present one unit of plane geometry, \( \frac{1}{2} \) unit of intermediate algebra, and two units of a foreign language.

BUSINESS AND PUBLIC ADMINISTRATION — Applicants are strongly advised to offer entrance credit in mathematics as follows: one unit of elementary algebra, \( \frac{1}{2} \) unit of intermediate algebra, and \( \frac{1}{2} \) 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.

EARTH SCIENCES — Applicants are expected to present credits as indicated in the College of Earth Sciences section, under “Admission.”

EDUCATION — Applicants for admission to the College of Education must have completed 56 semester units of credit applicable to a baccalaureate degree with a cumulative grade-point average of 2.5000 or better. Candidates for admission must also have a grade-point average above that for probation (2.0000) for all work taken at the University of Arizona.

ENGINEERING — Applicants are required to present credit in mathematics as follows: one unit of elementary algebra, \( \frac{1}{2} \) unit of intermediate algebra, \( \frac{1}{2} \) unit of advanced algebra, one unit of plane geometry, \( \frac{1}{2} \) unit trigonometry. It is strongly recommended that one unit of physics and one unit of chemistry be presented.

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

MINES — Applicants are required to present credit in mathematics and laboratory science as follows: one unit of elementary algebra, \( \frac{1}{2} \) unit of intermediate algebra, \( \frac{1}{2} \) unit of advanced algebra, one unit of plane geometry, \( \frac{1}{2} \) unit trigonometry, and \( \frac{1}{2} \) unit of advanced algebra; one unit of physics; one unit of chemistry.

NURSING — Applicants are strongly advised to offer entrance credit in intermediate algebra in addition to credit in elementary algebra. Otherwise, they will be required to complete Math. 116 before enrolling for Math. 117e. Two years in the College of Arts and Sciences are prerequisite to entrance into the College of Nursing. For further information, see the College of Nursing section of this catalog.

PHARMACY — Applicants are expected to complete in high school one unit of elementary algebra, one unit of plane geometry, \( \frac{1}{2} \) unit of advanced algebra, \( \frac{1}{2} \) unit of trigonometry. Two years in the College of Arts and Sciences are prerequisite to entrance into the College of Pharmacy. For further information see the College of Pharmacy section of this catalog.
ADVANCED FRESHMAN PLACEMENT

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

The Advanced Placement Program recognizes that many students can complete college-level courses while they are still in secondary school. Participating colleges encourage and recognize this achievement. The Program provides course descriptions and professional consultants to help schools establish college-level courses for their stronger students. It sets, administers, and grades examinations in these courses. It sends the examination grades, together with supporting materials, to the students’ colleges, enabling the college to grant appropriate placement and credit. See section on Advanced Placement from High School under “Proficiency and Exemption Examinations, Credit by Examination” in chapter entitled Academic Guidelines.

Students should consult their high school counselors or write to the College Entrance Examination Board, Princeton, New Jersey, 08540 for more details.

TRANSFER STUDENTS

APPLICATION FOR ADMISSION — Students transferring from other colleges and universities are required to file with the Office of Admissions official transcripts of record sent directly from all previously attended schools. These should include or be accompanied by statements of honorable dismissal. Students may not disregard their records in other colleges and universities in order to apply for admission solely on the basis of their high school records. Any student who does so is subject to suspension from the University and, should requirements for a degree otherwise be met, subject to the withholding of the degree.

Credentials presented for admission may be rejected in whole or in part and examinations required in any or all of the subjects offered. Final admission will not be granted to students whose credentials from other institutions are not on file.

Students presenting transfer credit but accepted with less than 48 college units are required to have official transcripts of their high school records sent directly to the Admissions Office, in addition to submitting transcripts of college credit.

SCHOLARSHIP REQUIREMENT — Applicants for admission to advanced standing are required to present a minimum overall grade-point average on their previous college work of 2.0000 (C) on a 4.0000 scale. Students with fewer than 48 college or university semester units will be subject to the same subject matter requirements as regular admittees from high schools, and must show evidence of having fulfilled the required secondary school subject units. Such units must be completed in high school work or by equal or higher work at the college level in the same manner as designated for entering freshmen.

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

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

COLLEGE-LEVEL EXAMINATION PROGRAM — The University of Arizona grants credit for both the General Examinations and the Subject Examinations of the College-Level Examination Program of the College Entrance Examination Board.
TRANSFER OF CREDITS — The University of Arizona evaluates without prejudice applicants for admission from regionally accredited postsecondary institutions or postsecondary institutions which are candidates for accreditation on the individual merits of their academic achievements and individual capability to complete the courses and curriculum requirements. Credit ordinarily will transfer hour for hour, insofar as it applies to the requirements of the student’s curriculum pursued at the University of Arizona. Credit in courses in which the grade received was lower than C is not transferable. Grades earned in courses taken at other institutions are not included in calculation of the University of Arizona grade-point average.

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

CREDITS FROM COMMUNITY COLLEGES — Credits transferred from accredited community colleges will be accepted up to the maximum allowed by the University for the first two years in the corresponding University curriculum, provided these credits are in courses acceptable for transfer credit. (See “Maximum Units Allowed Per Semester” under Academic Guidelines.) While all courses offered for transfer will be accepted by the University subject to the above rule, the specific lower-division requirements of various curricula vary widely. In order to complete the baccalaureate program in the normal time span, the student should therefore consult the college section of this catalog that is appropriate for the student’s curriculum, as well as the head of the appropriate University department to determine specific requirements of the program into which the student plans to transfer.

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

ADMISSION TO THE GRADUATE COLLEGE — See the Graduate College section of this catalog and the Graduate Catalog.

THE TRAVELING SCHOLARS PROGRAM

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

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

CLASSIFICATION OF STUDENTS

Students of the University of Arizona are classified as regular, unclassified, or non-credit.

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

UNCLASSIFIED — An unclassified student is not a candidate for a degree.

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

PROCEDURES

NEW STUDENT ORIENTATION — Orientation for new students is held during the summer and again in the fall and spring. New students receive information about these programs after the students have been admitted to the University. Students are encouraged to attend the Summer Orientation and Preregistration Program if possible. Orientation activities include counseling, academic advising, and an introduction to campus facilities and services.

REGISTRATION — Students must register for each class in which they will participate. Pre-registration is conducted during the fall and spring for the following semester. Students who do not preregister are required to register in alphabetical groups on designated days at the beginning of each semester. The period of late registration for credit closes one week from the opening of classes. See the calendar for the academic year in the front of this catalog.

PENALTY FOR LATE REGISTRATION — Students who fail to pay all fees during the designated walk-through registration period are charged a late registration fee.

IDENTIFICATION CARD — As part of the registration process each new student at the University of Arizona will be issued a photo identification card. This card, along with the current fee receipt, establishes the student's identity as a University of Arizona student and authorizes access to certain University facilities. This card must be obtained during the prescribed time at the beginning of each semester or a late processing fee of $10 will be charged.

CLEARANCE OF ACCOUNTS — No student whose record indicates indebtedness to the University shall be permitted to register.

SPECIAL TESTING — Students may be required to take special tests as recommended by their college dean or the Dean of Students.
REGISTRATION ADJUSTMENTS

CHANGE OF SCHEDULE — Changes in an original registration by adding or dropping courses must be initiated by the student by filing a change-of-schedule form with the University Cashier. A fee of $2.00 is charged unless the change is made for the convenience of the department.

After the last day of registration for credit, as stated in the Academic Calendar, a student may not add a course without special permission from the instructor of the course and the student’s college dean.

Course withdrawals filed by the end of the fourth week of classes result in cancellation of registration in the course. Course withdrawals filed from the end of the fourth week of classes until the end of the tenth week of classes are subject to rules set forth in the section, “Withdrawal Grade,” under Academic Guidelines in this catalog.

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

Each semester students will receive written confirmation from the Office of the Registrar 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 and correct his or her registration. An instructor has no alternative but to assign a failing grade (“F”) to a student who has not participated in the course but whose name appears on the final grade report list.

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

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

CHANGE OF COLLEGE — Students wishing to change colleges should consult the dean’s office of the college to which they wish to transfer. Change from one college to another may be made by filing a change-of-college form in the Admissions Office at least 30 days prior to the next registration. The change of college is effective at the beginning of the semester or term in which the student registers in the new college.

CHANGE OF MAJOR — A student may change his or her major by filing a change-of-major form in the Admissions Office.

PETITIONS — Students desiring to submit petitions to the faculty may obtain petition forms in the office of the Registrar or college dean. Information may be obtained from the degree certification section of the Registrar’s Office or the office of the college dean concerned.

LIMITATION OF REGISTRATION — Whenever lack of facilities in courses makes it necessary to limit the number of students admitted, preference will be given to students for whom these courses are required. Among these, priority is given in order to graduating seniors and students having superior records in prerequisite courses.
CANCELLATION OF COURSES — The University reserves the right to cancel any course not elected by an adequate number of students.

STUDENT RETENTION

An average of twenty percent of entering freshmen fail to register the first semester of the following year. In subsequent semesters, a portion of these students return while others drop out permanently or temporarily. Approximately one third of the entering freshmen graduate in four years and sixty percent eventually receive degrees from a four-year college or university.

RELEASE OF INFORMATION

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

**SCHOLARSHIP REQUIREMENTS**

**MINIMUM GRADE-POINT AVERAGE REQUIRED** — One of the requirements for students to be eligible to continue in the institution is that they earn minimum cumulative averages as follows:

<table>
<thead>
<tr>
<th>Total units completed in residence and accepted in transfer</th>
<th>Minimum grade-point average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fewer than 25 units</td>
<td>1.7500</td>
</tr>
<tr>
<td>From 25 through 55 units</td>
<td>1.9000</td>
</tr>
<tr>
<td>56 or more units</td>
<td>2.0000</td>
</tr>
</tbody>
</table>

Graduate students (any student registered in the Graduate College), work carried for graduate credit only ................................................................. 2.6500

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

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

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

**DEFINITION OF UNIT OF CREDIT** — Utilizing the definition that an hour of work is the equivalent of fifty minutes of class time (often called a contact hour) or sixty 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 fifteen contact hours of recitation, lecture, discussion, seminar, or colloquium, as well as a minimum of thirty hours of student homework are required for each unit of credit.
2. Workshops require at least fifteen 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 thirty contact hours and at least fifteen hours of homework for each unit of credit.
4. Laboratory courses must maintain a minimum of 45 contact hours per unit of credit.
5. Field trips are to be counted hour-for-hour as laboratory meetings.
6. Each unit of internship or practicum must require a minimum of 45 hours of work.

Since it would be virtually impossible for a student to satisfactorily complete 45 hours of work in less than one week, the policy regarding the duration of courses maintains that a course must cover at least a one-week period for every unit of credit given. As during the summer session, however, six 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.
MIDSEMESTER SCHOLARSHIP REPORT — A report of students (except in the College of Law) doing failing or below-average work is issued during the seventh week of classes each semester. Students listed on this scholarship report are warned that their work in the courses reported is deficient and their extracurricular activities may be restricted by their deans until the end of the semester.

ACADEMIC PROBATION AND DISQUALIFICATION

FAILURE TO EARN REQUIRED GRADE-POINT AVERAGE — Failure to meet grade-point average requirements listed above subjects the student to academic probation or disqualification. (Please see also the statement regarding "Probation or Disqualification by Special Action" which appears later in this section.)

PROBATION — Students on probation are subject to such restrictions with respect to courses and extracurricular activities as may be imposed by the dean of the college concerned. Students are removed from probation upon earning the minimum cumulative average required by the table listed under "Minimum Grade-Point Average Required" above, or by action of the dean of their college.

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

The student recommended for disqualification from a particular college may seek immediate admission to another college in the University. Permission for admission to another college must be obtained in writing from the dean of the college into which the student plans to transfer. The letter of permission should be presented to the Office of the Dean of Admissions and Records. Ordinarily permission will be granted only if the student plans to pursue a modified program in a curriculum of the new college and has demonstrated ability warranting such action. Those who have been given college disqualification are strongly urged to seek thorough academic and vocational counseling and guidance. Failure to secure approval to transfer to another college in the University is tantamount to disqualification from the University as a whole, and the rules governing this type of disqualification then will apply.

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

FIRST UNIVERSITY DISQUALIFICATION — A student may be academically disqualified from the University only after having been on probation for one semester or two summer terms, or by special action of the Advisory Council as described below under "Probation or Disqualification by Special Action."

A student disqualified from the University as a whole is ineligible to register the following semester. A student disqualified at the close of the first semester may enter the summer session, but a student disqualified at the close of the second semester is not eligible to enter the summer session or the first semester of the following academic year. Students under First University Disqualification are discouraged from taking credit course work elsewhere and should treat their period of disqualification as a time to reassess their goals while in a nonacademic environment.

SECOND UNIVERSITY DISQUALIFICATION — A student with two disqualifications 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 serious intellectual effort. The student must furnish the Dean of Admissions and Records with a letter from the dean of the college from which he or she was last disqualified stating that the dean approves the re-registration. If the student
wishes to enroll in a college of the University other than the one from which he or she was last disqualified, approval must be obtained from both the dean of the college from which the student was disqualified and the dean of the college he or she desires to enter.

**PROBATION OR DISQUALIFICATION BY SPECIAL ACTION** — Upon recommendation of the dean of the college and the approval of the Advisory Council, a student may be placed on scholastic probation or may be disqualified at any time for neglect of academic work. Such disqualification may be either temporary or permanent.

**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 audit enrollment and correspondence enrollment.

**ACADEMIC RENEWAL**

Under certain circumstances an undergraduate student may petition the Registrar for academic renewal. If the petition qualifies under this policy, the student shall be granted relief. After appropriate counseling, the student may have a maximum of four consecutive semesters of course work disregarded in all calculations regarding academic standing, grade-point average, and eligibility for graduation. If summer work is to be included in the work to be disregarded, a five-week summer term shall count as one-half semester.

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

1. At the time the petition is filed, a minimum of five years shall have elapsed since the most recent course work to be disregarded was completed.

2. In the interval between the completion of the most recent course work to be disregarded and the filing of the petition, the student shall have completed a minimum of thirty units of course work at the university with a minimum grade-point average of 2.5000 on all work completed at the university in that interval.

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

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

Academic renewal may be effected only once during a student’s academic career.

**ENROLLMENT POLICIES**

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

<table>
<thead>
<tr>
<th>College or School</th>
<th>Units</th>
<th>College or School</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>18</td>
<td>Graduate</td>
<td>16</td>
</tr>
<tr>
<td>Architecture</td>
<td>18</td>
<td>Health-Related Professions</td>
<td>18</td>
</tr>
<tr>
<td>Arts and Sciences</td>
<td>18</td>
<td>Home Economics</td>
<td>18</td>
</tr>
<tr>
<td>Business and Public Administration</td>
<td>18</td>
<td>Law</td>
<td>17</td>
</tr>
<tr>
<td>Earth Sciences</td>
<td>19</td>
<td>Mines</td>
<td>19</td>
</tr>
<tr>
<td>Education</td>
<td>19</td>
<td>Nursing</td>
<td>18</td>
</tr>
<tr>
<td>Engineering</td>
<td>19</td>
<td>Pharmacy</td>
<td>18</td>
</tr>
</tbody>
</table>
CLASS STANDING — Class standing in the various colleges and schools, based upon the number of units completed, is given in the table below. A student's class standing does not necessarily relate to the number of semesters or units required to complete degree requirements. Class standing is determined by the college in Medicine and Pharmacy.

<table>
<thead>
<tr>
<th>College or School</th>
<th>Freshman</th>
<th>Sophomore</th>
<th>Junior</th>
<th>Senior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>1 - 25</td>
<td>26 - 57</td>
<td>58 - 90</td>
<td>91+</td>
</tr>
<tr>
<td>Architecture</td>
<td>1 - 29</td>
<td>30 - 60</td>
<td>61 - 94</td>
<td>95+</td>
</tr>
<tr>
<td>Arts and Sciences</td>
<td>1 - 24</td>
<td>25 - 55</td>
<td>56 - 86</td>
<td>87+</td>
</tr>
<tr>
<td>Earth Sciences</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</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></td>
<td>58 - 97</td>
<td>98+</td>
</tr>
<tr>
<td>Home Economics</td>
<td>1 - 25</td>
<td>26 - 57</td>
<td>58 - 90</td>
<td>91+</td>
</tr>
<tr>
<td>Mines</td>
<td>1 - 27</td>
<td>28 - 62</td>
<td>63 - 97</td>
<td>98+</td>
</tr>
<tr>
<td>Nursing</td>
<td>1st year</td>
<td>2nd year</td>
<td>3rd year</td>
<td>101+</td>
</tr>
<tr>
<td>Law</td>
<td>1 - 21</td>
<td>22 - 49</td>
<td>50+</td>
<td></td>
</tr>
</tbody>
</table>

FULL-TIME STUDENT STATUS — Full-time status for an undergraduate student varies with the college and study program, but ordinarily requires a load of at least 12 units per semester. Full-time status for graduate students is more widely variable, depending upon assistantship or associateship duties and the composition of the individual student's program. Students in doubt about their standing should check with the dean of the college.

GRADING SYSTEM

The grading system used by the University of Arizona follows:

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

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

INCOMPLETE GRADE — The grade of I may be awarded only at the end of a semester, when all but a minor portion of the course work has been satisfactorily completed. The grade of I is not to be awarded when the student is expected to repeat the course; in such a case, the grade of E must be assigned. Incomplete grades do not enter into the calculation of the grade-point average for one year from the date of award. If the incomplete is not removed by the instructor within one year, the I grade will revert to a failing grade. For undergraduate courses, the one-year limit may be extended for cause approved by the instructor with the concurrence of the dean of the college in which the student is registered. For courses taken for graduate credit, such approval may be granted only by the Graduate Council.
The grade of K may be awarded by the instructor for 900-level courses when the course continues for longer than one semester. Time limit for completion of such work for full credit for the master’s degree is six years; for the doctoral degree, ten years. K grades remain on the student’s permanent record until removed with a final grade but do not enter into calculation of the grade-point average.

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

**WITHDRAWAL GRADE** — Prior to the end of the fourth week of classes, official withdrawal from a course cancels the registration for the course. Between the end of the fourth week and the end of the tenth week of classes, the grade of W is awarded to students who are passing at the time of official withdrawal. After the tenth week of classes the grade of W can be awarded only with the approval of the student’s academic dean. 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 the section on “Formal Withdrawal.”)

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

Honors courses numbered 299Ha and 299Hb (Readings), and those numbered 399Hb, 399Hc (Independent Study) may receive either regular letter grades or P/F grades instead of following the special grading policy for individual-studies courses.

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

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

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

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

**REPEATING A COURSE** — Undergraduate students may repeat courses, with the exception of Engl. 100, in which they have not earned credit as many times as necessary to establish credit. They may repeat only once any courses in which they previously earned grades of C, D, or P, and may not repeat courses in which they have earned grades of A or B, except as specifically provided by departments on a course-by-course basis. All grades for repeated courses will be included in computing the grade average. Credit will be allowed only once, however, for successful completion of a course, unless the course is designated “repeatable for credit” by the department. For the policy regarding Engl. 100, see “University Requirements in Composition” elsewhere in this section.
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 2.0000 or better. They must also have the approval of their advisers to register for a course under the pass-fail option.

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

Undergraduate students may register under the pass-fail option for not more than two courses per semester up to a maximum of twelve courses. Further, they must carry a minimum of twelve units for 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 elective only, and may not be used to fulfill major, minor, or other specified curriculum requirements.

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

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

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

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

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

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

UNIVERSITY REQUIREMENTS IN COMPOSITION

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

I. FRESHMAN COMPOSITION

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

Placement in freshman composition takes into account the student’s performance on two examinations: (1) A written placement essay administered at the time a student first registers for a course in freshman composition; (2) The English section of the American College Test or the Test of Standard Written English score on the Scholastic Aptitude Test. Both of these examinations require fees. Students with superior ratings based on the above examinations
examinations require fees. Students with superior ratings based on the above examinations enroll initially in Engl. 103; students whose scores indicate inadequate preparation initially enroll in Engl. 100 and pass this course before they enroll in Engl. 101. A student who fails Engl. 100 twice may not take the course again; instead the student must pass the essay placement examination with a score high enough to justify placement in Engl. 101.

II. THE UPPER-DIVISION WRITING-PROFICIENCY EXAMINATION

After earning at least 45 credit hours toward a degree and before completion of the semester during which 75 hours of degree credit are earned, each student must take the Upper-Division Writing-Proficiency Examination. This examination is administered by the Department of English. Results of examinations are reported to students and to students' major departments.

Students must have completed the freshman-composition requirement before taking the examination. A fee is required.

III. WRITING-EMPHASIS CLASSES

Every undergraduate degree program includes at least one required writing-emphasis class. Writing-emphasis classes are regular classes in an academic discipline, but at least half a grade awarded is determined by written work appropriate to the academic discipline. Prerequisite to a writing-emphasis class is satisfactory performance on the Upper-Division Writing-Proficiency Examination or, in the case of students whose performance on the examination is unsatisfactory, permission of the student's major department.

PHYSICAL EDUCATION

The University-wide requirement for successful completion of two units of physical education activity course work has been eliminated as of fall term of 1983. Students may elect physical education courses according to their personal interest and as appropriate to their departmental and college programs.

EXAMINATIONS

MID-SEMESTER EXAMINATIONS — It is expected that all mid-semester examinations will occur during a regularly scheduled class period of the course. For those multiple-section courses, in which it is impossible to offer mid-semester examinations during the regular class period, the following requirements for offering the examination at an alternate time must be met: (1) the course shall be identified in the schedule of classes as requiring combined hourly examinations at a time different from the regular class period; (2) the times at which combined hourly examinations will be given shall be listed in the schedule of classes; (3) the controlling academic dean shall approve such action in advance; and (4) students whose schedules conflict with the time scheduled for the combined examination shall be provided an alternate time for taking the examination.

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

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

I. The Advanced Placement program administered by the College Entrance Examination Board;

II. The College-Level Examination Program (also administered by the College Entrance Examination Board);

III. Departmental exemption or proficiency examinations;

IV. Special Examination for Credit or Grade.

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

### I. Advanced Placement from High School

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

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

The following is a list of the Advanced Placement examinations offered and their course equivalents at the University:

<table>
<thead>
<tr>
<th>Name of Advanced Placement Exam</th>
<th>Univ. of Arizona Course Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>American History</td>
<td>Hist. 130a-130b</td>
</tr>
<tr>
<td>Art</td>
<td>Art 117, 118, 119</td>
</tr>
<tr>
<td>History of Art</td>
<td>To be determined</td>
</tr>
<tr>
<td>Studio Art</td>
<td>Intro. biology, 4-8 units of credit</td>
</tr>
<tr>
<td>Biology</td>
<td>Chem. 103a-103b, 104a-104b</td>
</tr>
<tr>
<td>Chemistry</td>
<td>Engl., three units of lower-division credit</td>
</tr>
<tr>
<td>English</td>
<td>Hist. 101a-101b</td>
</tr>
<tr>
<td>European History</td>
<td>Fren. 201a-201b, 305a-305b</td>
</tr>
<tr>
<td>French Language</td>
<td>Fren. 201a-201b, 250a-250b</td>
</tr>
<tr>
<td>French Literature</td>
<td>Ger. 101a-101b, 201a-201b, 315a-315b</td>
</tr>
<tr>
<td>German</td>
<td>To be determined</td>
</tr>
<tr>
<td>Latin Virgil, Latin Lyric</td>
<td>Math. 123 or 125a</td>
</tr>
<tr>
<td>Math-Calculus AB</td>
<td>Math. 125a-125b</td>
</tr>
<tr>
<td>Math-Calculus BC</td>
<td>Music 107 or 130a-130b</td>
</tr>
<tr>
<td>Music Literature</td>
<td>Music 100, 120a-120b</td>
</tr>
<tr>
<td>Music Theory</td>
<td>Phys. 102a-102b</td>
</tr>
<tr>
<td>Physics B</td>
<td>Phys. 110, 116</td>
</tr>
<tr>
<td>Physics C</td>
<td>Span. 201a-201b, 305</td>
</tr>
<tr>
<td>Spanish Language</td>
<td>Span. 201a, 201b, 306, 399</td>
</tr>
<tr>
<td>Spanish Literature</td>
<td></td>
</tr>
</tbody>
</table>
No grades are recorded for courses credited through the Advanced Placement program.

University policy encourages prospective students to avail themselves of any Advanced Placement programs suitable to their college goals, since successful achievement in them will substantially increase students' freedom in designing their university programs of study.

II. College-Level Examination Program (CLEP)

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

Additionally, these examinations are seen increasingly as of value to students formally engaged in degree programs, as a means of satisfying certain course or area requirements, or for earning extra course credits, without having to enroll formally in the courses. Students should consult their academic advisers or the offices of their college deans for information as to how their examination credits can be most effectively applied.

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

The University of Arizona accepts for college credit both the General and the Subject examinations of the CLEP, providing satisfactory scores are attained. Scores of 500 or better on the General examinations (610 or better in English Composition) will entitle the student, upon registration at the University, to six units of credit in each of the five General examinations: 1) English Composition; 2) Humanities; 3) Mathematics; 4) Natural Sciences; 5) Social Sciences-History.

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

<table>
<thead>
<tr>
<th>Test</th>
<th>Units of Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Afro-American History (3)</td>
<td></td>
</tr>
<tr>
<td>American Government (3)</td>
<td></td>
</tr>
<tr>
<td>American History I (Early Colonization to 1877) (3)</td>
<td></td>
</tr>
<tr>
<td>American History II (1865 to Present) (3)</td>
<td></td>
</tr>
<tr>
<td>American Literature (6)</td>
<td></td>
</tr>
<tr>
<td>Analysis and Interpretation of Literature (6)</td>
<td></td>
</tr>
<tr>
<td>General Biology (8)</td>
<td></td>
</tr>
<tr>
<td>Calculus w/ Elementary Functions (10)</td>
<td></td>
</tr>
<tr>
<td>College Algebra (3)</td>
<td></td>
</tr>
<tr>
<td>College Algebra — Trigonometry (5)</td>
<td></td>
</tr>
<tr>
<td>Computers and Data Processing (3)</td>
<td></td>
</tr>
<tr>
<td>Educational Psychology (3)</td>
<td></td>
</tr>
<tr>
<td>Elementary Computer Programming — FORTRAN IV (3)</td>
<td></td>
</tr>
<tr>
<td>College Composition (6)</td>
<td></td>
</tr>
<tr>
<td>English Literature (6)</td>
<td></td>
</tr>
<tr>
<td>Foreign Language</td>
<td></td>
</tr>
<tr>
<td>College French I, II (8)</td>
<td></td>
</tr>
<tr>
<td>College German I, II (16)</td>
<td></td>
</tr>
<tr>
<td>College Spanish I, II (8)</td>
<td></td>
</tr>
<tr>
<td>Freshman English (6)</td>
<td></td>
</tr>
<tr>
<td>General Chemistry (7)</td>
<td></td>
</tr>
<tr>
<td>General Psychology (6)</td>
<td></td>
</tr>
<tr>
<td>Human Growth &amp; Dev. (3)</td>
<td></td>
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<tr>
<td>Introduction to Business Mgmt. (3)</td>
<td></td>
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<tr>
<td>Introductory Accounting (6)</td>
<td></td>
</tr>
<tr>
<td>Introduction to Business Law (3)</td>
<td></td>
</tr>
<tr>
<td>Introductory Macroeconomics (3)</td>
<td></td>
</tr>
<tr>
<td>Introductory Microeconomics (3)</td>
<td></td>
</tr>
<tr>
<td>Introductory Micro- &amp; Macroeconomics (6)</td>
<td></td>
</tr>
<tr>
<td>Introductory Marketing (3)</td>
<td></td>
</tr>
<tr>
<td>Introductory Sociology (3)</td>
<td></td>
</tr>
<tr>
<td>Microbiology (5)</td>
<td></td>
</tr>
<tr>
<td>Money and Banking (3)</td>
<td></td>
</tr>
<tr>
<td>Statistics (3)</td>
<td></td>
</tr>
<tr>
<td>Trigonometry (3)</td>
<td></td>
</tr>
<tr>
<td>Western Civilization I (Ancient Near East to 1648) (3)</td>
<td></td>
</tr>
<tr>
<td>Western Civilization II (1648 to Present)</td>
<td></td>
</tr>
</tbody>
</table>

Other examinations will be added as they become available.

Note: A maximum of six semester hours will be allowed for completion of the Subject Examination in College Composition, the Subject Examination in Freshman English, or the General Examination in English Composition. Whether this credit will satisfy the University Freshman English requirement is determined by the Director of Composition following interview and writing performance. Credit granted for the CLEP College Composition test or the Freshman English test, or the English Composition test that is not accepted as satisfying all or part of the
University Freshman English requirement will be counted as general elective credit. 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, duplicate credit will not be awarded in subjects at the same level. In addition, resident students will not be awarded credit through CLEP for courses equivalent to, or at a lower level than, other courses they have already established in formal course work.

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

III. Exemption or Proficiency Examinations

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

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

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

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

Foreign students will be allowed credit by transfer in their native language only for those courses taken during the years equivalent to the United States college years.

The completion of the course levels set in this paragraph satisfies the requirement: Or.S. 404b (Arabic); Or.S. 400b (Modern Chinese); Fren. 201b, 302b; Ger. 201b; Clas. 202b (Greek); Or.S. 403b (Hebrew); Or.S. 401 (Hindi-Urdu); Ital. 201b, 302b; Or.S. 402b (Japanese); Clas. 201b (Latin); Or.S. 405b (Persian); Port. 201b, 202b; Russ. 201a or 201b; Span. 201b, 202b, or 373.

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

The results of each proficiency or exemption examination, if successful, are reported in writing by the department directly to the Office of the Registrar, with a copy of the report sent to the student, and are indicated on the student’s permanent record.

GENERAL REGULATIONS:

1. Proficiency or exemption exams 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 to be arranged by the student directly with the department concerned, and are to be administered at the University of Arizona.
IV. Special Examination for Credit or Grade

Any student currently enrolled or previously withdrawn in good standing at the University of Arizona may earn credit toward an undergraduate degree through the use of special examinations. The responsibility for preparing for these examinations rests entirely with the student; faculty members are under no obligation to assist with such preparation.

Undergraduate courses currently offered by the University and designated in the catalog "CDT" may be taken for credit by examination. Courses designated "GRD" may be taken for grade by examination or credit by examination. Other courses generally have been excluded from this option; at department discretion, however, any course may be made available for grade by examination or credit by examination.

OPTIONS:

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

2. Special Examination for Grade: All grades, whether passing or failing, are permanently recorded and used in computing the cumulative grade average.

LIMITATIONS:

1. The credit so earned may not duplicate units already presented for admission to the University, either collegiate or subcollegiate.

2. The credit may not be in a course which is equivalent to, or more elementary than, another course in which the student is enrolled or for which the student has already received credit. The head of the examining department has the responsibility of determining the application of this limitation in each student's case.

3. No credit may be earned by this type of examination for beginning or intermediate language courses in the native language of the applicant.

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

PROCEDURES FOR SPECIAL EXAMINATION:

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 adviser.

3. The examining instructor and the head of the examining department must determine the eligibility of the applicant and sign the application.

4. The application is returned to the Registrar, and the $21-per-unit fee is paid to the University Cashier. No department may schedule a special examination until notified by the Cashier that the fee has been paid.

5. The examination is scheduled by the faculty member responsible, normally during the same semester in which the application is made.

6. The grade (CR or letter grade) is reported to the Registrar. The examination, together with the student's graded examination paper and any appropriate evaluations of oral performance or projects, is then filed with the department for at least one year.

7. The student may change the type of special examination for those courses designated "GRD" in the catalog any time before the scheduled hour of the examination by filing a new application. No additional fee will be charged.

GRADUATE CREDIT FOR SENIORS

A senior within fifteen 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 ten days thereafter. The number of units of graduate credit for which a student may petition is limited to the difference between the sixteen-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 3.0000 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 sixteen units.

**ABSENCES**

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

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

**DISHONEST SCHOLASTIC WORK**

The Code of Academic Integrity places full responsibility on the student for the content and integrity of all academic work submitted as homework, examinations, etc. Alleged violations of the code are usually adjudicated at a Faculty Hearing within the reporting professor's department. The maximum penalty at this hearing is a failing grade in the course. More serious cases or student appeals of a Faculty Hearing are referred to the University Committee on Academic Integrity. The committee is composed of faculty and student members representing all colleges of the University. Additional information or a copy of the complete code may be obtained from the office of the Dean of Students.

**LEAVING THE UNIVERSITY**

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

**DISMISSAL FROM COURSES OR 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. Such action is posted on the student's academic record. Students suspended from the University are denied student privileges during the period of suspension, and may not register for correspondence work except with permission of the dean of the college in which they have previously registered. They may not enroll for Continuing Education courses, nor establish credit by examination during the period of suspension.

**MEDICAL WITHDRAWAL** — Medical withdrawal is initiated from the Student Health Service.
Adequate medical documentation must be supplied by the student. Students who withdraw from the University for medical reasons and who are medically encumbered must have their readmittances approved by the Student Health Service.

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

**TRANSCRIPTS** — Official transcripts are issued to other institutions, offices or agencies designated by the student. When the student is required by the institution or agency to present an official transcript personally, one will be issued to him with the notation “issued to student.” (See “Transcript Fee” in Expenses and Fees section.)
## Graduation Requirements

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

<table>
<thead>
<tr>
<th>Degree</th>
<th>Units Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor of Architecture</td>
<td>167</td>
</tr>
<tr>
<td>Bachelor of Arts</td>
<td>125</td>
</tr>
<tr>
<td>in Art</td>
<td>125</td>
</tr>
<tr>
<td>in Drama</td>
<td>125</td>
</tr>
<tr>
<td>in Education</td>
<td>125</td>
</tr>
<tr>
<td>in Music</td>
<td>125</td>
</tr>
<tr>
<td>in Radio-Television</td>
<td>125</td>
</tr>
<tr>
<td>in Speech Communication</td>
<td>125</td>
</tr>
<tr>
<td>Bachelor of Fine Arts (except major in Art Education, 127 units)</td>
<td>125</td>
</tr>
<tr>
<td>Bachelor of Landscape Architecture</td>
<td>160</td>
</tr>
<tr>
<td>Bachelor of Music:</td>
<td></td>
</tr>
<tr>
<td>Major in Performance (Keyboard)</td>
<td>126</td>
</tr>
<tr>
<td>Major in Performance (String Instrument)</td>
<td>126</td>
</tr>
<tr>
<td>Major in Performance (Voice)</td>
<td>130</td>
</tr>
<tr>
<td>Major in Performance (Wind Instrument &amp; Percussion)</td>
<td>125</td>
</tr>
<tr>
<td>Major in Jazz Studies</td>
<td>127</td>
</tr>
<tr>
<td>Major in Music Education (Choral)</td>
<td>125</td>
</tr>
<tr>
<td>Major in Music Education (Instrumental)</td>
<td>133</td>
</tr>
<tr>
<td>Major in Theory &amp; Composition</td>
<td>132</td>
</tr>
<tr>
<td>Bachelor of Science</td>
<td>125</td>
</tr>
<tr>
<td>in Aerospace Engineering</td>
<td>130</td>
</tr>
<tr>
<td>in Agricultural Engineering</td>
<td>131</td>
</tr>
<tr>
<td>in Agriculture</td>
<td>131</td>
</tr>
<tr>
<td>in Business Administration</td>
<td>125</td>
</tr>
<tr>
<td>in Chemical Engineering</td>
<td>137</td>
</tr>
<tr>
<td>in Civil Engineering</td>
<td>134</td>
</tr>
<tr>
<td>in Computer Engineering</td>
<td>133</td>
</tr>
<tr>
<td>in Education</td>
<td>125</td>
</tr>
<tr>
<td>in Electrical Engineering</td>
<td>130</td>
</tr>
<tr>
<td>in Energy Engineering</td>
<td>132</td>
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<tr>
<td>in Engineering Mathematics</td>
<td>132</td>
</tr>
<tr>
<td>in Engineering Physics</td>
<td>128</td>
</tr>
<tr>
<td>in Geological Engineering</td>
<td>138</td>
</tr>
<tr>
<td>in Geosciences</td>
<td>134</td>
</tr>
<tr>
<td>in Health Sciences:</td>
<td></td>
</tr>
<tr>
<td>Major in Health Education</td>
<td>128</td>
</tr>
<tr>
<td>Major in Medical Technology</td>
<td>142</td>
</tr>
<tr>
<td>Major in Occupational Safety and Health</td>
<td>137</td>
</tr>
<tr>
<td>in Home Economics</td>
<td>130</td>
</tr>
<tr>
<td>in Hydrology</td>
<td>135</td>
</tr>
<tr>
<td>in Industrial Engineering</td>
<td>129</td>
</tr>
<tr>
<td>in Mechanical Engineering</td>
<td>127</td>
</tr>
<tr>
<td>in Metallurgical Engineering</td>
<td>133</td>
</tr>
<tr>
<td>in Mining Engineering</td>
<td>137</td>
</tr>
<tr>
<td>in Nuclear Engineering</td>
<td>133</td>
</tr>
<tr>
<td>in Nursing</td>
<td>141</td>
</tr>
<tr>
<td>in Pharmacy</td>
<td>166</td>
</tr>
</tbody>
</table>
No student will be permitted to graduate with fewer than 120 units.

CHOICE OF CATALOG UNDER WHICH STUDENTS MAY BE GRADUATED — Candidates for bachelor's degrees may elect to fulfill degree requirements as outlined in any one catalog in effect during their dates of registration for university credit at the University of Arizona, with the following exception: Students who withdraw from the University for more than two consecutive semesters must meet degree requirements as outlined in the catalog in effect at the date of their reenrollment for university credit or any subsequent catalog in effect during their dates of registration for university credit. Students admitted to the University directly from an Arizona community college may, provided not more than two consecutive semesters have elapsed since their attendance at the community college, elect to fulfill degree requirements as outlined in any one catalog in effect during their dates of attendance at the Arizona community college, or any subsequent catalog in effect during their dates of registration for university credit. This provision does not apply to the grade average requirements for graduation, which are governed solely by those in effect during the student's dates of attendance for university credit at the University of Arizona.

Students should decide as early as possible which catalog is to be used in meeting degree requirements, and follow carefully the curriculum outlined therein.

GRADUATION AVERAGE — A graduation average of 2.0000 for all university-credit course work undertaken and for any work satisfied by the Special Examination for Grade is required for the bachelor's degree. Note: The graduation grade average is based only on credit earned in residence at the University of Arizona.

MAJOR AVERAGE — The Colleges of Architecture, Arts and Sciences, Business and Public Administration, Earth Sciences, Education, Engineering, Mines, Nursing, and Pharmacy as well as the School of Health-Related Professions and certain departments require an average of 2.0000 or better for all university credit work undertaken in the major field and for any work satisfied by the Special Examination for Grade if in the major.

UNIVERSITY CREDIT REQUIREMENT — A minimum of thirty units of University credit from the University of Arizona is required for the bachelor’s degree. It is further required that eighteen of the final thirty 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. Additionally, there are specific limitations on the amount of applicability of the credit earned while registered as a continuing education student. Students should consult the Division of Continuing Education entry in the General Divisions of the University section of this catalog for that information. Correspondence credit and/or credit by examination is not University credit.

UPPER-DIVISION UNIT REQUIREMENT — All students graduating in spring 1985 and thereafter will be required to have a minimum of 30 upper-division units (300, 400, or 500 level courses) for graduation. It is recommended that these units be included among the final units taken toward the degree (see section on University Credit Requirement).

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

APPLICATION FOR BACHELOR'S DEGREE CANDIDACY — The University awards degrees three times annually: in May, in August (at the close of the summer session), and on Dec. 31 (at the close of the fall semester). Candidates for bachelor's degrees are required to file at the degree certification section of the Registrar's office an application for degree candidacy according to the following schedule:
GRADUATION REQUIREMENTS

Date of Degree — Application to be filed no later than —

May ............................................................ May 1 of the year preceding graduation
August ...................................................... Dec. 1 of the year preceding graduation
December .............................................. Mar. 1 of the year of graduation

A fee of $10 (nonrefundable) is required to be paid when the application is filed. A fee of $2 will be charged for late filing.

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

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

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

CONTINUING EDUCATION STUDENTS — Before a continuing education student can become a candidate for a degree, he or she must submit to the Admissions Office transcripts from all colleges and universities previously attended and must be regularly admitted to one of the University's colleges.

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

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

CLEARANCE OF ACCOUNTS — Degree candidates are required to clear any indebtedness to the University before completion of degree requirements will be officially certified or the diploma released.
Expenses and Fees

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

The University cannot extend credit. Therefore, all students must have sufficient funds upon entering to defray their immediate expenses. An estimate of the amount required for the first month in residence, covering board for one month, room for one semester on the campus, registration, tuition, incidental fees, books, supplies, etc., is $1500.00 for residents of Arizona. For nonresidents, the estimated amount is $2850.00.

EXPENSES AND FEES — PER SEMESTER

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<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Registration fee</td>
<td></td>
<td>$377.50</td>
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<tr>
<td>Seven or more units</td>
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<td>$42.00</td>
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<tr>
<td>One through six units</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonresident tuition*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Twelve or more units</td>
<td></td>
<td>$1,332.50</td>
</tr>
<tr>
<td>Seven units</td>
<td></td>
<td>$777.50</td>
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<tr>
<td>Eight units</td>
<td></td>
<td>$888.50</td>
</tr>
<tr>
<td>Nine units</td>
<td></td>
<td>$999.50</td>
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<tr>
<td>Ten units</td>
<td></td>
<td>$1110.50</td>
</tr>
<tr>
<td>Eleven units</td>
<td></td>
<td>$1221.50</td>
</tr>
<tr>
<td>One through six units</td>
<td></td>
<td>waived</td>
</tr>
</tbody>
</table>

*In addition to the registration fee required of all students.

PAYMENT OF FEES — All fees are payable through preregistration or on registration day as the final step in the registration procedure. The University accepts checks for the amount due at the time of registration — do not send checks in advance — but cannot advance cash on checks. The University cannot accept installment payments, and all fees for the semester must be paid in full at the time of registration. The registration of a student whose check is returned by the bank unpaid is considered incomplete, and a $10.00 late fee will be assessed.

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

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

NONCREDIT FEE — Fees for "no-credit" or "audit" units are the same as regular credit units, including the nonresident tuition, if applicable.

LATE REGISTRATION FEE — A student who fails to complete payment of all fees during the two-day registration period will be assessed a late fee of $10.00. The late fee is not refundable.
CLASSIFICATION OF PERSONS FOR TUITION PURPOSES

The Arizona Board of Regents is required by law to establish for the universities under its jurisdiction and control uniform guidelines and criteria for the classification of students for payment of tuition. Attention is invited to relevant provisions of the constitution, statutes, and laws of Arizona, including Sections 3 and 6, Article 7 of the Constitution (which provisions have been held by the Supreme Court of Arizona to govern domicile for all purposes), Sections 15-1625, 15-1626, and 15-1801 through 15-1805 Arizona Revised Statutes, as amended.

A. A person who does not qualify to enroll as an in-state student and who is taking seven or more units must pay a nonresident tuition, in addition to other established fees and charges that are required for all students. The following provisions govern the assessment of tuition. UNDERGRADUATE STUDENTS: An out-of-state undergraduate student enrolling for twelve or more units on campus must pay an out-of-state tuition fee of $1,332.50 per semester in addition to a registration fee of $377.50; a person enrolling for seven through 11 units must pay an out-of-state tuition of $111.07 per unit of work carried in addition to a registration fee of $377.50 per semester. Students taking six or fewer units pay a registration fee of $42.00 per unit; out-of-state tuition is waived for students enrolling for no more than six units. GRADUATE STUDENTS: An out-of-state graduate student enrolling for twelve or more units on campus must pay an out-of-state tuition fee of $1,332.50 per semester in addition to a registration fee of $377.50; a person enrolling for seven through 11 units must pay an out-of-state tuition of $111.07 per unit of work carried in addition to a registration fee of $377.50 per semester. Students taking six or fewer units pay a registration fee of $42.00 per unit; out-of-state tuition is waived for students enrolling for no more than six units.

B. A person may not be classified as an in-state student for purposes of registration and payment of fees and expenses at the University until the student has been domiciled in this state for one year next preceding the last day of registration for credit published by the University, except for students domiciled in this state whose parent's domicile is in this state and who may be claimed by that parent as a dependent for tax purposes.

C. Mere presence of a person in the state of Arizona for one year does not necessarily establish a domicile for classifying that person as an in-state resident. No person shall be deemed to have gained or lost a domicile by reason of his 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: Information and Guidelines for Determining Tuition Status, which is incorporated by reference in this catalog, and the attention of all persons concerned with classification for tuition purposes is directed to this publication available in the office of the domicile classification officer in Room 210A, Administration Building. (These materials include: (a) definitions related to domicile, (b) guidelines, rules, and regulations applied to determine domicile, and (c) information on procedures for appeal.)

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

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

E. Classification officers of the University shall be designated to determine domicile. If there is any question as to domicile, the matter should be brought to the attention of the classification officers and passed upon prior to registration and payment of fees. The same classification officers can, during the registration period published by the University or at other times, pass upon the domicile of a person.
F. The President of the University shall appoint one or more appeals committees to hear the cases of individuals who believe that the decision regarding their domicile is not consistent with the laws of the state of Arizona or the guidelines promulgated by the Arizona Board of Regents. An appeal shall be filed in the office of the domicile classification officer. It shall be written, signed by the student, and accompanied by a sworn written statement of all facts relative to the matter. Notice of appeal shall be filed at any time within 35 days from the last day of registration published by the University. The person appealing shall have the right to appear and testify before the committee and to be represented by an adviser.

SUMMARY OF MINIMUM ANNUAL EXPENSE FOR FULL-TIME CAMPUS STUDENTS, 1983-84*

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

LEGAL RESIDENTS OF ARIZONA:

Registration fee* .................................................. $ 755.00
($377.50 per semester)
Residence halls, minimum rate** .................................. 555.00
Meals in university cafeteria ...................................... 1,525.00
Books and supplies .................................................. 200.00

Total minimum annual expense .................................... 3,035.00

NONRESIDENTS OF ARIZONA:

Nonresident registration fee* ...................................... $ 755.00
($377.50 per semester)
Nonresident tuition fee*** ......................................... 2,665.00
($1,332.50 per semester)
Residence halls, minimum rate** .................................. 555.00
Meals in university cafeteria ...................................... 1,525.00
Books and supplies .................................................. 200.00

Total minimum annual expense .................................... 5,700.00

All students should add to this list incidental personal expenses as needed and a room reservation deposit of $50.00. Students taking military science should add a deposit of $25.00.

All fees are payable through preregistration or on registration day as the final step in the registration procedure. Do not send checks in advance. Residence-hall rent should be paid by the semester, at the beginning of the semester.

*The registration fee for seven or more units includes services and facilities of student activities, Student Union, Health Service, Parking, Alumni Association and Artist Series. Students taking fewer than seven units pay $42.00 per unit per semester. The fee includes Health Service and Parking.

**Residence hall rates range from $555.00 to $1,153.00 per student per year and are subject to increase for the 1983-84 and 1984-85 academic years.

***For seven through 11 units of course work, the nonresident tuition per semester is: $777.50 for 7 units; $888.50 for 8 units; $999.50 for 9 units; $1,110.50 for 10 units; $1,221.50 for 11 units. The nonresident tuition is waived for students taking fewer than 7 units.

RESIDENCE HALL RESERVATION — Accompanying the Registrar’s notification of admission is a request for residence hall application and information. This should be filled out immediately and mailed to the Department of Student Housing. The Housing office will forward residence hall information and an application and contract. The student should complete the application and contract and return them with the $50.00 deposit to the Department of Student Housing. Do not send cash. The University cannot be responsible for any cash deposits sent through the
mail. Make checks payable to the University of Arizona. Room deposits should not be submitted until notice of admission is received from the Registrar. The room deposit, in addition to being a guarantee against cancellation of housing application, applies against damage or loss to University property. It does not apply on the rent. It is refunded when a student leaves the residence hall, if all charges for loss or damage have been paid.

Notification of residence hall assignments for the fall is mailed to applicants in the early part of June. Although residence hall accommodations are made available first to legal residents of Arizona, many rooms are available each year to out-of-state students.

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

Deposits on rooms will not be refunded for cancellations after July 1 preceding the fall semester, nor after January 5 for the second semester, except in case the University is unable to provide accommodations.

RESIDENCE HALL FEES — The University prefers that rent be paid by the semester in advance; however, payments as set forth in the terms and conditions of the residence-hall contract are permissible.

STUDENT HOUSING RATES

<table>
<thead>
<tr>
<th></th>
<th>Entire Academic Year</th>
<th>Fall Semester Payment</th>
<th>Spring Semester Payment</th>
<th>Spring Semester ONLY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RESIDENCE HALLS:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coconino, Manzanita, Mohave, Maricopa, Apache, Graham, Greenlee, Kaibab-Huachuca, Santa Cruz, Yavapai, Arizona, Sonora</td>
<td>$836.00</td>
<td>$477.00</td>
<td>$359.00</td>
<td>$418.00</td>
</tr>
<tr>
<td>Coronado, International House, Comstock</td>
<td>$884.00</td>
<td>$504.00</td>
<td>$380.00</td>
<td>$442.00</td>
</tr>
<tr>
<td>Gila, Yuma, Hopi, Papago, South</td>
<td>$579.00</td>
<td>$330.00</td>
<td>$249.00</td>
<td>$290.00</td>
</tr>
<tr>
<td>Pima</td>
<td>$529.00</td>
<td>$302.00</td>
<td>$227.00</td>
<td>$265.00</td>
</tr>
<tr>
<td>Cochise, Sierra</td>
<td>$631.00</td>
<td>$360.00</td>
<td>$271.00</td>
<td>$316.00</td>
</tr>
<tr>
<td>Navajo, Pinal</td>
<td>$695.00</td>
<td>$396.00</td>
<td>$299.00</td>
<td>$348.00</td>
</tr>
<tr>
<td>Babcock (std. single occupancy)</td>
<td>$1,078.00</td>
<td>$614.00</td>
<td>$464.00</td>
<td>$539.00</td>
</tr>
<tr>
<td>Babcock (std. double occupancy)</td>
<td>$1,018.00</td>
<td>$580.00</td>
<td>$438.00</td>
<td>$509.00</td>
</tr>
</tbody>
</table>

**II. SUMMER RATES:**

Five-Week Summer Session
Manzanita, Mohave, Apache, Santa Cruz | $129.00 each session
Comstock, International House | $142.00 each session
Babcock (std. double occupancy) | $170.00 (minimum)

Conference Groups:
Daily Rates
Double | $8.00
Single | $13.00
Weekly Rates (Over Four Weeks)
Double | $54.00
Single | $85.00
III. FAMILY HOUSING RATES:

Family Housing Project (Per Month) — Includes Activities:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency Unfurnished</td>
<td>$176.00</td>
</tr>
<tr>
<td>Efficiency Furnished</td>
<td>$204.00</td>
</tr>
<tr>
<td>One-Bedroom Unfurnished</td>
<td>$242.00</td>
</tr>
<tr>
<td>One-Bedroom Furnished</td>
<td>$264.00</td>
</tr>
<tr>
<td>Two-Bedroom Unfurnished</td>
<td>$288.00</td>
</tr>
<tr>
<td>Two-Bedroom Furnished</td>
<td>$320.00</td>
</tr>
</tbody>
</table>

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

**Effective July 1, 1982**

**BOARD** — The University cafeterias, located in the Student Union Memorial Building and the Park Student Center, are operated on a self-sustaining basis for the convenience of students. The cost of food for the average student is approximately $150 a month. Students and members of the University staff may purchase meal tickets, or may pay in cash at the time the meal is served. No credit, however, will be extended. The University charges for board only a sufficient amount to cover its cost and reserves the right to increase the cost to meet any increase in the prices of foodstuffs and service.

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

**MILITARY UNIFORMS AND EQUIPMENT** — The Departments of Army and Air Force of the United States government supply uniforms without cost to students taking military training. Each student in military science or aerospace studies must deposit $25 to cover damage to or loss of uniform or equipment. This deposit, less any charge for damage or loss, is refunded at the close of the year or upon withdrawal from the course. To obtain refund, property must be turned in to the Military Property Custodian within seven days after withdrawal from or completion of the course, and the refund order obtained from the Military Property Custodian must be cashed before the following June 30 or be forfeited. Property must be turned in or its total money value be paid to the University.

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

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

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

Students registered for Chemical Engineering 304 pay a field trip fee of $150 to cover transportation and lodging.

**CHANGE OF SCHEDULE** — For any change in schedule other than withdrawal with a failing grade of E, a fee of $2 will be charged. This fee is effective immediately upon completion of registration.

**CREDIT-BY-EXAMINATION FEE** — A fee of $21 per unit is charged for all special examinations for credit.
EXPENSES AND FEES

COLLEGE-LEVEL EXAMINATION FEE — The fees for examinations administered under the College Level Examination Program (CLEP) are $25 each for the Subject examinations and $25 for each General examination; plus a $3 administration fee.

FOREIGN LANGUAGE EXAMINATION FEE — A fee of $10 is charged to take any one foreign language examination. Examinations in French, German, Russian, and Spanish are administered nationally by the Educational Testing Service. The fee is paid to ETS at the time of registration. For other foreign language examinations, the fee is paid to the University Cashier at the time of registration.

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

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

STUDENT-TEACHING FEE — The student-teaching experience is scheduled generally during the fall or spring semester. It will not be available, except in rare instances, during the summer session. For those exceptional circumstances when student teaching is provided during the summer session, the student will be assessed an additional fee of $150 to cover costs of supervision. In any event, approval for student teaching during the summer session must be obtained early in the fall semester of the preceding year.

LIBRARY IDENTIFICATION CARD REPLACEMENT FEE — Library borrower identification cards, if lost or stolen, must be reported to the librarian’s office. They can be replaced at a fee of $1.

TRANSCRIPT FEE — Each student is entitled, upon request, to one transcript without cost. For each additional transcript $1 is charged. The fee for instantaneous service is $3. Transcripts will not be issued for students whose records indicate indebtedness to the University.

PHOTO I.D. REPLACEMENT FEE — I.D. photo cards, if lost or stolen, must be reported to the Registrar. They can be replaced at a fee of $10.

FEE RECEIPT REPLACEMENT FEE — If student’s fee receipt is lost or stolen, a duplicate may be obtained by payment of a $10 fee.

GRADUATION EXPENSES

DEGREE CANDIDACY — Every candidate for a degree is required to pay a fee of $10 (nonrefundable) at the time of filing application for degree candidacy. A fee of $2 will be charged, in addition, for late filing for bachelor’s-degree candidacy (see Graduation Requirements section). Each senior is provided with an official check of remaining degree requirements, following filing of the application for degree candidacy, under the curriculum designated in such an application. A fee of $5 will be charged for any additional degree check necessitated by a student’s subsequently changing catalog or curriculum. A fee of $1 will be charged for duplicate copies furnished.

PROCESSING THESIS — A fee of $10, to cover the cost of binding two copies of the thesis or dissertation for the Library, is required of each graduate student at the time of submitting the thesis or dissertation.

DISSERTATION MICROFILM FEE — $25.
CAP AND GOWN FEE — Degree candidates participating in the commencement exercises are required to wear the prescribed academic costume, which may be obtained through the University Bookstore at fees varying from $12 to $35.

REFUNDS OF TUITION AND FEES

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

TUITION, REGISTRATION, MUSIC AND SPECIAL COLLEGE FEES — See Schedule below.

<table>
<thead>
<tr>
<th></th>
<th>Schedule of Refunds*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5 days</td>
<td>6-10 days</td>
</tr>
<tr>
<td>100% less $10</td>
<td>80%</td>
</tr>
</tbody>
</table>

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

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

The University of Arizona through the Office of Scholarships and Financial Aids maintains a comprehensive program of financial assistance for its students. This office offers all of the federal student aid programs as well as a large and varied selection of scholarship assistance.

The Office of Scholarships and Financial Aids is currently located in Room 203 of the Administration Building. Financial aid counseling is available to students throughout the year. A brochure of scholarships and financial aids describing the financial assistance available to students at the University of Arizona is published by the office and may be obtained by requesting a copy from that office.

Students must file a University of Arizona SAFE application in order to be considered for scholarships and/or financial aid administered by this office. SAFE applications for the next academic year are available in early January and thereafter at this office and should be filed early, preferably before March for the following academic year. Students must file separate applications for the Pell Grant and the Guaranteed Student Loan.

SCHOLARSHIPS

The scholarship program of the University of Arizona may be generally divided into: (1) General University Scholarships, which are available to all undergraduates at the University; (2) General College Scholarships, which are available to all students in particular colleges; and (3) specific scholarships in departments and major fields.

General University and General College Scholarships are strongly oriented toward lower-division students, while the specific departmental and major field scholarships are generally available only to upper-division candidates. Specifications for scholarships are contained in the Catalog of Scholarships and Financial Aids which is available in offices of all university deans and high school counselors as well as in this office. It should be noted that about 96% of the nearly 7500 scholarships available require financial need on the part of the applicant.

FEDERAL STUDENT AID PROGRAMS

The University of Arizona offers its students the advantages of all federal programs of student financial aid. The available programs are:

NATIONAL DIRECT STUDENT LOANS (NDSL) — Loans are available yearly to all qualified students. The amount of the loan award is determined by the student's need. Interest at a low rate (currently 5%) begins six months after the borrower is no longer at least a half-time student. Repayment to the University is made in monthly installments. Deferral while engaged in educational pursuits is available.

GUARANTEED STUDENT LOANS — The Guaranteed Student Loan program enables undergraduate and graduate students to meet educational expenses by borrowing from eligible lenders (banks, credit unions, savings and loan associations) at a low interest rate (currently 9%). Graduate and professional students are expected to fill their evaluated need first with GSL before they will be considered for other aid. Applications are available from this office or through local banks. Payments normally begin 6 months after the borrower leaves school; generally 5 to 10 years are allowed for repayment of the loan.

SUPPLEMENTAL EDUCATIONAL OPPORTUNITY GRANTS (SEOG) — This is a federal program of nonrepayable aid to deserving students who demonstrate financial need.
COLLEGE WORK-STUDY — This is a program for students who demonstrate financial need and who require employment to help defray educational expenses. Awards are made to deserving students who meet these criteria. They may work part time while attending classes full time, or a maximum of forty hours weekly when classes are not in session and after approval by this office. After being declared eligible, students are interviewed and then placed in jobs through the University. Interviews are conducted in the Office of Scholarships and Financial Aids.

NURSING STUDENT LOANS (NSL) — Repayable loans are available to students enrolled in the College of Nursing. Interest at a low rate (currently 6%) commences nine months after the borrower is no longer an officially enrolled student in nursing. Repayment to the University is made in monthly installments. The amount of the loan award is determined by the student's need. Federal legislation affecting this program is currently under review. Please contact the Office of Scholarships and Financial Aids for current information.

PHARMACY (HEALTH PROFESSIONS) STUDENT LOANS — Repayable loans are available to students enrolled in the last three professional years of pharmacy education. Other students are eligible for National Direct Student Loans and Supplementary Educational Opportunity Grants. Interest at a low rate (currently 9%) commences nine months after the borrower ceases to be a full-time student, and repayment to the University is made in monthly installments. The amount of the loan award is determined by the student's need.

HEALTH PROFESSIONS STUDENT LOAN PROGRAM IN MEDICINE — Loans are available to full-time enrollees pursuing a program leading to the degree of Doctor of Medicine. The amount of the loan award is determined by the student's need.

PELL GRANTS: Formerly Basic Educational Opportunity Grants (BEOG) — This program is legislated to assist undergraduate students who demonstrate financial need. All undergraduate students are eligible to apply.

Note: Students are cautioned that the federally funded student aid programs are constantly changing. The eligibility criteria and other factors as set forth in this catalog, therefore, may change before a new catalog is published. For the most up-to-date information, request the current Scholarships and Financial Aids brochure from this office.

GENERAL UNIVERSITY LOAN FUNDS

The Office of Scholarships and Financial Aids maintains a comprehensive loan program in addition to the federal programs. This program is designed to offer short-term emergency loans to students; however, several long-term loan programs are also available for students in specific academic areas. Applications are available for these loans at the Office of Scholarships and Financial Aids and descriptions of each fund are included in the Catalog of Scholarships and Financial Aids.
Provisions for Superior Students

UNIVERSITY-WIDE HONORS PROGRAM

Under the supervision of the University Honors Coordinating Board, the Honors Program has been developed to provide special opportunities and encouragement to superior undergraduate students. Graduating high school seniors who have distinguished themselves in their high school studies are eligible to apply for participation in the program beginning in their freshman years. In addition, other outstanding students may be invited to participate in the program at any point during their undergraduate years. Although academic achievement is an important criterion in the selection of Honors students, it is in no instance the sole factor determining acceptance into the program. Careful consideration is also given to a prospective participant's leadership ability, emotional maturity, initiative, enthusiasm, open-mindedness, intellectual curiosity, creativity, and potential for self-direction.

Special opportunities for Honors students are formally provided through special classes, independent-study projects, small-group discussions, topic-centered colloquia, faculty-student dialogues, extended library privileges, and outstanding student and project awards. In addition, Honors students may petition to carry units in excess of the normal maximum load and, with the instructor's permission, may take courses regularly open to more advanced students. Informal opportunities include "peer-help" activities, tutorial work, and other service-oriented projects.

Responsibility for the University-wide Honors Program is shared between academic departments and the Honors Program. In general, the departments assume responsibility for the majority of Honors experiences available which are primarily academic and specific to the disciplines of the respective departments. The Honors Program seeks to complement those offerings by assuming major responsibility for academic opportunities which are interdisciplinary in focus, and for those noncredit learning opportunities which have a service dimension.

Prior to registering for any course designated as an "H" section, students should check with the University-wide Honors Program to see if admission to the program is a prerequisite for the course. The following courses require such admission before registration in the course: Honors 280H, 295H, 380H; Ed.F.A. 495Ha, 495Hd; Ed.P. 495Hb, etc.; Engl. 495Ha, 495Hb (must be taken twice); as well as the following courses available in most undergraduate departments — 299Ha, 299Hb, 396H, 399Ha, 399Hb, 399Hc.

In general, the Honors Program permits qualified students to extend the boundaries of their academic programs beyond the scope of the standard degree requirements. Moreover, it provides for greater opportunity to interact with faculty than is otherwise the case. Fundamental to the program is the commitment that Honors work should enhance the development of the "whole" person — that individual who is sensitive, clear-thinking, humane, knowledgeable, responsible, just, and self-reliant.

Further information regarding Honors Program offerings may be obtained by contacting departmental Honors advisers or the Honors Center staff.

HONORS, AWARDS, AND PRIZES

UNIVERSITY SCHOLARSHIP HONORS are conferred annually to encourage sound scholarship. They are awarded to every undergraduate student attaining the required proficiency during one complete academic year. To be eligible for University scholarship honors, students — other than those in the College of Law — must have completed a minimum of thirty units of work during the two semesters of the regular academic year with a grade average for those two semesters that
placed the student in the top 10% of the undergraduates enrolled in his or her college. A student in the College of Law must have completed a minimum of 24 units. A student enrolled in a cooperative education program must have completed a minimum of thirty units of work during the consecutive two semesters of the regular academic years in which he or she was enrolled for full-time study, must have earned a grade average for those two semesters placing the student in the top 10% of the undergraduates enrolled in his or her college, and must have completed the intervening period of industrial cooperative education in a satisfactory manner.

CLASS SCHOLARSHIP AWARDS — The University has established an award for each class to be given to the students who earn the highest grade average for the year. To be eligible, a student must have completed a minimum of thirty graded units of work during the two semesters of the regular academic year. Engraved silver bowls are awarded.

GRADUATION WITH DISTINCTION in three categories is awarded for superior scholarship in work leading to the bachelor’s degree and the juris doctor degree. This honor, based upon the graduation grade average, is awarded upon graduation and is imprinted on the diploma of the recipient.

For bachelors’ degrees, With Highest Distinction is awarded to candidates whose grade average is 3.9000 or higher; With High Distinction, to candidates whose average is 3.8999 to 3.7000; With Distinction, to candidates whose average is 3.6999 to 3.5000. In computing these averages only work in residence is considered. To be eligible for distinction at graduation, bachelor’s degree candidates must have completed at least sixty units in undergraduate residence at the University of Arizona, with number grades in a minimum of 45 units.

For juris doctor degrees, With Highest Distinction is awarded to candidates whose grade average is 3.5000 or higher; With High Distinction, to candidates whose average is 3.4999 to 3.2500; With Distinction, 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 forty units of such work.

AWARDS AND PRIZES are given in recognition of outstanding achievement. In some cases, financial need is also a consideration. All communications with respect to scholarship awards and prizes should be addressed to the Director, Office of Scholarships and Awards. For further information please consult the Catalog of Scholarships and Financial Aids.
Student Services

FRIDAY INFORMATION PROGRAMS

Each semester the University designates certain Fridays on which any high school or community college student, and others interested, may visit the campus without appointment, receive a tour, and attend information sessions given by the various colleges and by Scholarships and Financial Aids. It is helpful if groups planning to attend notify the Office of Student Recruitment.

The Friday programs in the fall semester are usually held during November and December; spring semester programs usually fall just before and just after spring break. Program dates may be obtained from high school and community college counseling offices or from the Office of Student Recruitment.

COUNSELING AND ADVISING

The University offers varied guidance services for students. The faculty, the faculty advisors, the heads of departments, and the deans of the colleges keep regular office hours for consultation. The Health Service provides health counsel; the Student Counseling Service provides psychological counsel; the Placement Service office compiles records for possible employment; and the Registrar’s office directs admissions, keeps cumulative files of student achievements, and issues the schedule of classes which students should read in order that they may plan their courses and obtain necessary information about the University.

DEANS OF THE COLLEGES — Information regarding the selection of a proper academic program, including both required and elective courses, is obtained in the office of the dean of the college in which the student is enrolled.

DEAN OF STUDENTS — The student’s life outside the classroom demands attention and concern as part of the learning experience. The office, through its staff and related service areas, provides support by offering advisement in housing, financial affairs, personal problems, activities, clubs, and student conduct. Continual encouragement is given to new programs that meet students’ needs. Emphasis is placed on better ways to communicate with students, parents, and the public regarding educational programs currently in progress. The creation of a “helping relationship” is the cornerstone on which service to the total campus community is based, and each member of the staff is dedicated to this concept. The Dean of Students Office is located on the second floor of Old Main.

The Office of Student Recruitment coordinates recruitment and outreach activities. As part of the Office of the Dean of Students, it is also involved with retention. The recruitment office is responsible for participating in the Arizona College Days and high school visitation programs, coordinating community college visitations, and planning and administering the Friday Information Programs, the John and Helen Murphey On-Campus Day for Outstanding High School Juniors, counselor workshops, and a number of off-campus programs. The office also works closely with the Office of Scholarships and Financial Aids in administering the President’s Award for Excellence and sponsors the Arizona Ambassadors, an organization for student recruitment and for promotion. The recruitment office is located on the second floor of Old Main.

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

**AMERICAN INDIAN STUDENT ADVISER** — This official assists American Indian students in their transition from the home environment into the University community by counseling at both the academic and personal-adjustment level and by soliciting wider campus involvement in the programs and affairs of the American Indian student. Located in the Office of the Dean of Students, Old Main.

The **STUDENT COUNSELING SERVICE**, a division of the Office of Student Relations, offers free of charge to all University students psychological counseling on educational, personal, or career problems. Service is offered in identifying the choice of vocational or educational programs and in dealing with emotional disturbances or factors hindering the student's ability to benefit fully from his or her University experience. The Service normally works by scheduled appointments but students can be seen immediately through a walk-in service.

The Academic Learning Skills Center, within the Counseling Service, offers classes and supervised laboratory practice in improving rate and comprehension of reading materials, and in developing efficient study habits. Individual study counsel is also provided. The classes, of approximately eight-week duration, start near the beginning and middle of each semester.

The Testing Office, within the Student Counseling Service, is the campus agency that administers the residual American College Test, the Law School Admission Test, National Teachers' Examination, Medical College Admission Test, Test of English as a Foreign Language, Graduate Management Admissions Test, Miller Analogies Test, Graduate Record Examinations, the College-Level Examination Program, as well as admission exams in optometry, pharmacy, and veterinary medicine. Interest and personality test inventories are also available for students who come for counseling.

Resource books are maintained on occupations and opportunities for continuing education following study at the University. Students are invited to use these materials without appointment, whether or not they desire counseling.

The Student Counseling Service also administers the University-wide Honors Program.

The **MENTAL HEALTH SECTION** of the Student Health Service is a voluntary, confidential, counseling service open to all students who are eligible for care at the Student Health Service. The Mental Health Section offers short-term individual, couple, and group therapy, as well as workshops in health and mental health-related areas.

The **OFFICE OF MINORITY STUDENT AFFAIRS** — Administratively within the office of the Executive Vice President, its purpose is to recruit minority students to the University and to retain those students who enroll. Through the many different programs, which include the Student Encouragement Program (SEP), New Start, and the Writing Skills Improvement Program (WSIP), this office assists students with tutoring, peer counseling, financial aid, job placement and other services. A summer program and various orientation activities are available to new students. The office is located in Old Main 134; SEP and New Start are housed in Old Main 101 and WSIP at 1630 East Speedway.

**DISABLED STUDENTS SERVICES PROGRAM** — Through its support services, this program seeks to expand opportunities for disabled students to participate fully in the educational process and broader campus life. Individualized services promote independence and responsibility. Also, ongoing programs provide the campus and the community with opportunities for increased understanding of disabling conditions.

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

SPEECH AND HEARING CLINIC — The Department of Speech and Hearing Sciences maintains a speech and hearing center where University students may receive remedial training. Diagnostic and referral assistance for any Arizona citizen is offered.

The STUDENT HEALTH SERVICE helps students maintain their physical and mental health, and is a campus resource for counseling on health problems.

Every entering student is requested to submit a completed Admission Health Report Form. In addition, it is recommended that all students provide proof of freedom from pulmonary tuberculosis by submitting the results of a tuberculin skin test. The Student Health Service provides the tuberculin skin tests on a voluntary basis to students for a nominal charge.

Regularly enrolled students become eligible for care at the beginning of the semester for which registration fees have been paid. Continuing dissertation students, thesis students, and special students become eligible on payment of the Optional Eligibility Fee and submission of the Admission Health Report Form.

Services — The Student Health Service offers an essentially prepaid medical plan of limited, defined benefits. During regular school sessions, general medical care is provided. The Health Service is unable to provide all its services during academic holidays, vacation periods, summer sessions, and semester breaks.

In general, the services available at the Health Center approximate those of the family physician. Chronic and preexisting illnesses, as well as problems requiring complex therapeutic and rehabilitative care, may require outside consultation and referral to the local medical community. In such cases, where services exceed the benefits of the prepaid program, the cost must be assumed by the student. Occasionally, an illness involving hazard to self or others may require temporary withdrawal from the University.

Special clinics available at the Health Service include orthopedics, gynecology, dermatology, allergy, and immunization. A Mental Health Section staff provides crisis intervention and short-term therapy for troubled students. Nominal charges are made for laboratory tests, X-ray services, and prescriptions filled at the Health Service pharmacy.

Ambulance service is not provided. Vehicular accident victims receive necessary first care, and are then referred to outside hospitals or physicians for further treatment. Cost of such outside care must be borne by the student. Dental and ophthalmologic services are not provided at the Student Health Center.

Health Education — The Student Health Service places strong emphasis on health education and prevention. Health educators and staff are available for individual counseling and group presentations. Special programs on self-care are offered in the Self-Care Center located adjacent to the reception area in the Student Health Center.

Insurance — The Student Accident and Sickness Insurance Plan is available to those students who meet eligibility requirements for Student Health Service care. Participation is recommended for those students who do not have insurance that will help defray those medical costs not covered by the Health Service’s prepaid plan.

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

PLACEMENT SERVICES

The University of Arizona maintains a Placement Services Office to facilitate contact between employers and job hunters, and to provide prospective employers with the records of individuals enrolled in the Placement Services Office. The Office is divided into four divisions: (1) Part-time and Vacation, (2) Education, (3) Commercial, and (4) Alumni/Career Development.
The Division of Part-Time Placement for Students (TOPPS) lists part-time jobs of up to 30 hours per week in the business community and on-campus. TOPPS also offers special job programs.

The Education Placement Division assists degree candidates and also those individuals working on administrative credentials. Enrollment is open to any alumnus or transfer student who has completed at least fifteen units of academic work at the University of Arizona. Students should begin to establish placement files at the beginning of their senior years on campus. Educational files containing letters of recommendation will be maintained for a ten-year period and then destroyed if none of the following occurs: (a) receipt of a request that the file be sent to a potential employer, (b) placement of new letters of recommendation in the file, or (c) updating of the file with current information as to positions, education, etc.

The Commercial Placement Division works with nearly 300 companies and governmental agencies, which send representatives to the University each year to interview graduating seniors and graduate students. Placement files of those registered with this service are maintained for one year after graduation and then destroyed.

The Alumni Placement/Career Development Division provides alumni with information regarding current employment opportunities, benefits, and locations with various companies and agencies. Materials may be obtained in the R. L. Nugent Building.

**STUDENT UNION POST OFFICE**

Only students living in campus halls will be assigned a Student Union Post Office box upon request after being assigned to a dorm. These boxes are free to the students living in halls as a service of the University. Until such time as a post office box has been assigned, students with reservations in one of the campus residence halls may have their mail addressed to General Delivery, Student Union Post Office, Tucson, Arizona 85720. This does not include, however, newspapers, magazines, and circulars. New students should refrain from having these sent until their correct post office box number can be placed on them.

Returning residence hall students who had Student Union Post Office boxes in the spring semester will have them automatically reserved for the next year only by paying their residence hall deposit before July 1.

Any student who has not been given residence hall assignment before coming to the University, and whose local address is uncertain should have his or her mail directed to General Delivery, Main Post Office, Tucson, Arizona 85701, until a definite residence is determined. Immediately after the student has established his definite residence, he should send change of address cards to all individuals and organizations from which he may expect to receive mail. These cards are available at the Student Union Post Office. There are a limited number of boxes available to rent to full-time students who live off campus. These must be applied for in person at the Student Union Post Office.

**THE UNIVERSITY LIBRARIES**

The University Library system contains more than 3,000,000 items, including books, periodicals, microforms, maps, government publications, manuscripts, and media. Basic holdings cover all fields of instruction, and there are especially strong collections in anthropology, geology, Spanish and Latin American language and literature, American agriculture, Southwestern Americana, Arizona, history of science, science fiction, and eighteenth- and nineteenth-century British and American literature. Through the Library the University is a member of the Association of Research Libraries and the Center for Research Libraries. Supplementary materials for graduate students writing theses and dissertations and for faculty and staff doing advanced research are available on interlibrary loan.

The University Library system consists of the Main Library, Science-Engineering Library, Music Collection, the Center for Creative Photography, and the Library Science Collection. Two large but separate library facilities are the College of Law Library and the Health Sciences Center Library at the 'Arizona Health Sciences Center. In addition, several other departmental
libraries, such as the Arizona State Museum Library, the Institute of Government Research Library, the Division of Economics and Business Research Library, the Steward Observatory Library, the Herbarium, and the Lunar and Planetary Sciences Library, have been established to serve special research needs.

MAIN LIBRARY — Central Reference Department and main card catalog; Interlibrary Loan; Media Collection; Map Collection; Current Periodicals, Newspapers and Microforms Reading Room; Special Collections Department; Government Documents Department; Acquisitions Department; Catalog Department; Serials Department; and Library Offices.

SCIENCE-ENGINEERING LIBRARY — All materials on science and technology, and the Oriental Studies Collection.

MUSIC COLLECTION (Music Building) — Scores, sheet music, recordings, and facilities for listening. Books about music are in the Main Library.

LIBRARY SCIENCE COLLECTION (Graduate Library School) — Materials about libraries and all aspects of library science.

CENTER FOR CREATIVE PHOTOGRAPHY — Books, periodicals, photographs, photographers' manuscript archives, and rotating exhibits covering all aspects of photography as an art form.

Additional Library Resources

THE LAW LIBRARY — This library now contains over 110,000 volumes, including the reported cases of all the jurisdictions in the United States and substantially all the English reported cases; American and English statutory law; decisions of federal administrative agencies; complete sets of leading legal periodicals; a carefully selected collection of legal encyclopedias, digests, treatises, and textbooks; and a developing collection of civil law with emphasis on Latin America.

THE HEALTH SCIENCES CENTER LIBRARY — This specialized library, which serves the University Hospital as well as the Colleges of Medicine, Nursing and Pharmacy, contains over 75,000 cataloged volumes and receives approximately 3,000 serial titles. The collection includes books, journals, and nonprint materials in the health sciences.
Housing Facilities, Student Conduct and Campus Life

The University recognizes the importance of residence life as a part of the total educational program. Thus, to the extent possible, University housing is made available to students so they may experience the companionship, cultural environment, and social opportunities which enrich university life.

One of the valued aspects of university life is the opportunity to meet students of varied cultures and interests. By the mutual exchange of views, students learn from one another, gain a fresh outlook and new ideas, and enlarge their experience in human relationships. This phase of university life is shared most fully by hall residents. Lifelong friendships are formed among residence companions, and students gain worthwhile experience in community living. Each residence hall elects its own student officers and plans programs of social and recreational activities.

Head residents and resident assistants in each hall are skilled in helping new students adjust to campus life and in providing mature guidance when needed.

MEN’S RESIDENCE HALLS — Located on the south side of the campus, the twelve men’s residence halls are Apache-Santa Cruz, Cochise, Graham, Greenlee, Hopi Lodge, Kaibab-Huachuca, Navajo, Papago Lodge, Pinal, Sierra, South, and Yavapai.

WOMEN’S RESIDENCE HALLS — Three of the eight residence halls for women—Arizona, Coronado, and Sonora—are on the south side of the campus. The women’s halls on the north side of the campus, set among olive and palm trees, are Coconino, Gila, Maricopa, and Yuma. Pima (a cooperative hall for women) is near the Colleges of Medicine, Nursing, and Pharmacy.

COEDUCATIONAL HOUSING — Manzanita-Mohave is reserved for sophomore, junior, and senior students. Comstock House is reserved for graduate students and the International House for foreign and American students. Although men and women live in separate wings, common areas are shared by all students. The Babcock Inn is reserved for junior, senior, graduate students and special undergraduate groups. Each room in Babcock has an outside entrance.

DISABLED STUDENT HOUSING — The following halls are accessible for wheel chairs and have other special equipment for disabled students: Coconino, Yuma, Papago, and Yavapai.

COOPERATIVE RESIDENCE HALL — Pima Hall is operated by woman students and is the only hall in which meals are served. In order to reduce the cost of overhead, students living in this hall do all cleaning and cooking. The working schedule requires of each student nine to twelve hours of service weekly in the hall and is so arranged that it does not conflict with class hours. The hall is supervised by the head resident. The cost of board fluctuates with the price of food and usually approximates $250 per semester. Rent averages approximately $260 per semester. The hall accommodates forty students and is limited to daughters of residents of Arizona.

SINGLE GRADUATE STUDENTS — Several residential areas are available for graduate students. These facilities are modern and fully air-conditioned. A request for graduate-student housing form is included in the admissions packet. Additional information may be obtained by writing to the Department of Student Housing.

RESIDENCE HALL FACILITIES — Rooms in residence halls are completely furnished, including pillows. Students are requested not to bring additional furniture with them but do need to provide their own blankets, sheets, pillowcases, and bedspread. Window curtains are not provided except in Arizona, Sonora, Coronado, Manzanita, Mohave, and Maricopa Halls. Students care for their own rooms; custodial service, however, is supplied through other portions of the halls.
Some of the residence halls have sleeping porches. If the health of a student is such that he or she must sleep in a room, or if a physical handicap necessitates a single room, the student may be required to rent a single room if available in the hall.

RESIDENCE HALL CONTRACT — All students assigned to residence halls are required to sign a housing contract pledging to remain in the residence hall for the academic year. Exceptions to occupancy requirements are provided in the terms and conditions of the contract.

OCCUPANCY OF ROOMS — Residence hall rent should be paid by the semester in advance. The rental does not cover occupancy in the fall prior to the day preceding Orientation Week or during the Christmas recess. All halls are kept open for students during spring recess. The occupancy of rooms at any time other than while the University is in session shall be only by permission of the Department of Student Housing. All halls will be closed during the Christmas recess with the exceptions of International House, Babcock Inn and Comstock House.

It should be understood that when students give up their rooms during vacation periods for which they are not paying, the University may feel free to use these rooms for the housing of other groups.

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 disciplinary removal from the hall.

Students who pledge a fraternity or sorority recognized by the University may transfer to its chapter house for residence not later than September 1 of the fall semester or not later than February 1 of the spring semester.

No change of residence hall may be made until approved by the Department of Student Housing.

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.

The University is not responsible for loss of students' personal property.

CHANGE OF ADDRESS — It is the student's responsibility to keep the University informed at all times of his or her current Tucson address. Change-of-address forms are available in the Registrar's Office.

TEMPORARY HOUSING — Temporary housing is available through "Gimme Shelter," ASUA Switchboard, Student Union.

HOUSING OFF THE CAMPUS — Listings of off-campus housing are available in the Associated Students office (above the Bookstore) through the ASUA Tenants' Association. Numerous such listings are also given in Tucson's daily newspapers.

HOUSING FOR MARRIED STUDENTS AND SINGLE-PARENT FAMILIES

Family Housing — This complex of 420 apartments is located in northeast Tucson about 12-15 minutes from the University. Applications may be submitted after a person has been officially admitted to the University. Additional information and application forms may be obtained from The Family Housing Office, 3401 N. Columbus, Tucson, Arizona 85712.

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

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

STUDENT CONDUCT

GENERAL RESPONSIBILITY — When a student accepts admission to the University of Arizona, the University assumes that the student thereby agrees to conduct himself or herself in accordance with its 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 proves to be an undesirable member of the student body. Evidence of unsatisfactory citizenship may be an overt violation of a specific standard, or social behavior that is not acceptable.

Students are expected to dress appropriately for appearance in the classrooms and on the campus.

For a detailed statement of University regulations refer to the code of conduct available in the Office of the Dean of Students.

USE OF NARCOTIC DRUGS — The use by a student, or the sale, possession, or giving as a gift by him or her of narcotic drugs, sedatives, stimulants, psychotherapeutic drugs, psychedelic agents of any variety, prescription drugs other than such as may be prescribed by a physician for the student’s individual use, or of any of the foregoing in violation of federal or state law, is incompatible with and inimical to the social, health, and safety standards and educative purposes of the University, and shall be cause for disciplinary measures, including suspension or expulsion, regardless of action or inaction by civil authorities with respect to violations of the law above mentioned.

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

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 Code of Conduct.

AUTOMOBILES, MOTORCYCLES, BICYCLES

REGISTRATION — Students operating an automobile, motorcycle or bicycle on the campus, whether their own or otherwise, must register these vehicles with the University Campus Police Department. Operating stickers will be issued and must be displayed appropriately on the vehicle at all times. Students should be prepared to supply the make, year, and license number for any motor vehicle that they expect to operate on campus at the time of the original registration.
Parking stickers may be obtained in the Campus Police Department Monday through Friday, 7:30 a.m. — 4:00 p.m. All students must present their paid fees receipts before stickers will be issued.

Those students expecting to operate bicycles on the campus should be prepared to supply the manufacturer's name, description, and any available serial numbers or license numbers.

Students who own or drive any of these vehicles on the campus are expected to familiarize themselves with, and to abide by, any pertinent parking and traffic regulations.

**PENALTIES** — Nonregistration or improper registration of student vehicles, illegal or improper parking, speeding and reckless driving are all subject to penalty. Failure to comply with parking and traffic regulations may result in a student forfeiting the privilege of driving or parking on campus.

**LIMITED PARKING** — The University provides limited parking space for automobiles owned by resident students. Because of congested traffic in Tucson and lack of adequate parking space on and around the campus, students are not encouraged to bring their automobiles to the University.

**STATE OF ARIZONA REGISTRATION** — Arizona law requires that every motor vehicle owned by an out-of-state student and operated within this state, which does not carry Arizona license plates, must be registered with the Motor Vehicle Division, whose Tucson office is at 1102 S. Euclid. No fee is charged for such registration when the vehicle is not used for business purposes and the owner qualifies as a nonresident.

**ELIGIBILITY FOR EXTRACURRICULAR ACTIVITIES**

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

Any student, undergraduate or graduate, who is currently enrolled in the University may participate in these activities. However, where specified in these activities, a student may be required to meet additional qualifications and criteria for membership or participation. All elected or appointed officers of these activities, to be eligible to hold these leadership positions, must at the time of their election or appointment be in good academic standing and currently enrolled in the University for a minimum of seven units. When a student continues in office from one semester to the next, the student must have successfully completed a minimum of seven units the previous semester.

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

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

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

Scholarships awarded to properly qualified students who participate in athletics are administered solely by the Committee on Scholarships and Awards under standards applying to all such awards. All funds for the support of the athletic program, regardless of source, are accounted for by the University Comptroller and are included in the annual audits.
ASSOCIATED STUDENTS

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

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

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

Just a few activities receiving financial support from the Associated Students through the Student Relations Budget Committee and the ASUA Senate are: the Traditions Committee, the debate team, moot court team, the Army and Air Force ROTC Drill Teams, Camp Wildcat, Switchboard, Liaison for Neighborhood Knowledge, the Black Student Union, Movimiento Estudiantil Chicano de Aztlan, the Amerind-Club, and various foreign-student organizations. Examples of sports clubs receiving financial support include rodeo, soccer, rugby, lacrosse, and bowling.

Student government acts as a liaison and communications vehicle with students, faculty, administration, regents, and legislature through the following programs and services: Projects Council, Polls and Surveys, Speakers Board, Special Events, Spring Fling, Concerts, Voter Action, Public Relations, Campus Athletic Board, Escort Service, Discount Card Program, Tutoring Service, Lecture Notes, Legal Aid, Student Health Advisory Committee, Switch Board, Teacher/Course Evaluation, Tenants Association, Whistle-Stop, Women’s Center.

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

The student activities office is responsible for planning and management of several special events and coordination of honors on campus: Parents' Day, A-Day, Airport Meet, and the Intercollegiate Rodeo. The Associated Students operate the ASUA Bookstores, located on campus, in Park Center, and in the Arizona Health Sciences Center.

FRATERNITIES AND SORORITIES

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

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

HONORARY AND PROFESSIONAL SOCIETIES, OTHER ORGANIZATIONS

SCHOLASTIC HONORARY SOCIETIES

Alpha Chi Sigma — Chemistry
Alpha Zeta — Agriculture, Men
Omicron Nu — Home Economics
Phi Beta Kappa — Arts and Sciences
Phi Eta Sigma — Freshman Men
Phi Kappa Phi — All Colleges
Pi Omega Pi — Business Education
Pi Sigma Alpha — Political Science
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 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
Association of Student Planners — Urban Planning
Audio Engineers Society
BPA Student Council
Black Engineering Science Students Today
Coordinated Council of Nursing Students
Fashions Dimensions Club
Featherless Bipedes (Philosophy)
Food Science Club
Higher Education Students Organization
History Graduate Association
Kappa Beta Pi — Law, Women’s Association
Kappa Epsilon — Pharmacy
Kappa Phi — All Colleges
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
National Lawyer’s Guild
Personnel Club
Phi Alpha Theta
Phi Beta Lambda
Phi Chi Theta — BPA, Women
Phi Delta Chi — Pharmacy
Phi Delta Phi — Law, Men
Pi Alpha Alpha
Plant Pathology Club
Public Administration Students Association
Recreation Club
Sigma Alpha Iota — 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
Society of Woman Engineers
Soils Club
Student Chapter of the Wildlife Society
Undergraduate Geology Club
University of Arizona Dietetics Club
University of Arizona Student Nurse’s Association

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

Angel Flight — Air Force Women
Alpha Phi Omega — Service
Blue Key — Senior Men
Bobcats — Senior Men
Chain Gang — Junior Men
Chimes — Junior Women
Mortar Board — Senior Women and Men
Order of Omega — Greek Men and Women
Phrateres — Tucson Women
Preludes — Freshman Women
Primus — Freshman Men
Sophos — Sophomore Men
Spires — Sophomore Women
Wranglers — Independent Women

RELIGIOUS ACTIVITIES

Organizations on the campus which are designed to foster the spiritual, intellectual, and social interest of various religious faiths or denominations are: American Baptist Student Movement, Advance for Christ, Baha'i Youth Organization, Baptist Student Union, B'nai B'rith Hillel Foundation, R. S. Beal Memorial Student Center (Sound Foundation), Campus Crusade for Christ, Christian Science Organization, Episcopal Campus Fellowship, Humanist Association, InterVarsity, L. D. S. Student Association, Little Chapel of All Nations, Lutheran Campus Parish (ALC-LCA-Missouri), Muslim Student Association, The Navigators, Newman Catholic Student Association, Quaker University Organization, United Campus Christian Fellowship, United Liberal Religious Youth (Unitarian), University Nazarene Fellowship, Wesley Foundation (Methodist).

The University Religious Council, representative of the various organizations, coordinates campus religious activities, works toward understanding and tolerance among religious groups, and fosters interest in religion among students.

The interdenominational Little Chapel of All Nations is located near the campus, and students are welcome at all the churches of the city. Upon entering the university, students are urged to contact their own denominational groups on the campus. For additional information regarding various religious organizations active on campus, contact the Coordinator of University Religious Affairs, located in the Office of the Dean of Students.

SPECIAL CULTURAL OPPORTUNITIES

UNIVERSITY ARTIST SERIES — The University of Arizona Artist Series has become the pace-setter for diversified programs in music, dance and theatre with outstanding national and international artists and companies. The programs provide a unique opportunity for the entire student body to experience more deeply the fine arts, and supplement regular instruction for students working more directly with music, dance, and drama.

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

THE UNIVERSITY OF ARIZONA MUSEUM OF ART — The University of Arizona is exceptionally fortunate in that it possesses several outstanding art collections. Housed in our modern building are the masterpieces of the Samuel H. Kress Collection, which include the surviving panels of the Retablo of Ciudad Rodrigo by Fernando Gallego and one of the finest university collections of Renaissance sixteenth- and seventeenth-century art in the United States. Contemporary international painting and sculpture are well represented in the Edward Joseph Gallagher III Memorial Collection; sixty-one sketches and models by Jacques Lipchitz which comprise one of the largest collections of his work in the world; the C. Leonard Pfeiffer Collection includes American paintings from the 1930s and was the first collection of art donated to the University. An active exhibition and educational program is available throughout the year. The Museum of Art is open to the public daily from nine to five and on Sunday from noon to five. There is no admission fee.
HOUSING FACILITIES, STUDENT CONDUCT AND CAMPUS LIFE

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

THE UNIVERSITY OF ARIZONA POETRY CENTER — A gift of Ruth Stephan, the Center contains a continually growing collection of poetry in a house near the campus where students and faculty may read and where groups may gather informally for poetry readings and discussion. The collection includes poetry of all ages and various nations, with emphasis on American and British poets. It also includes books about poetry and poets. The Center regularly sponsors readings by nationally known poets throughout the year.

THE LECOMTE DU NOUY MEMORIAL ROOM — This room is the gift of Madame du Nouy, preserving the manuscripts and first editions of the works of Pierre Lecomte du Nouy and of other important figures in the history of scientific development. Located in the Special Collections Department of the University Library, the collections are available for the use of graduate students and faculty members.

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

DRAMA SERIES — Each season the Drama Department sponsors a major series of five or six productions and the Lyceum Series. Tickets are available to all students and faculty for the major series and the lyceum series at a nominal cost.

MUSIC SERIES — The School of Music offers a wide range of special programs throughout the year, many of them free to the public. Sunday afternoon concerts by University orchestras, bands, and choirs are held in the University Auditorium, while faculty and student solo and chamber recitals as well as smaller ensemble concerts are held in Crowder Hall. Selected concerts by guest artists and opera productions by the School of Music’s Opera Theatre are offered at a nominal cost to all students and faculty.

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

INTERNATIONAL ARTS SOCIETY — A cinema club, Society membership is open to the faculty, staff, and student body of the University. A program of outstanding American and foreign films is presented throughout the academic year.

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

THE SUNDAY EVENING FORUM — Each Sunday from mid-October through April, one of the largest community program series in the nation presents nationally known speakers, top travelogues and other entertainment at 7:30 p.m. in the Main Auditorium. Programs are open to the public. The Forum office is located at 2700 E. Speedway.

PIANISTS’ FOUNDATION OF AMERICA SERIES — Several concerts by artist-pianists presented in Crowder Hall of the School of Music.
The University of Arizona Alumni Association

The University of Arizona Alumni Association was organized June 2, 1897. It is incorporated under the law of the state of Arizona and operates in accordance with the Articles of Incorporation and By-Laws adopted by the membership in open meeting at Homecoming, October 27, 1956, and amended October 20, 1981.

MEMBERSHIP — All former students are considered to be active members of the Alumni Association and receive all of the publications and services afforded by the Association.

In past years the Alumni Association has sold Life Memberships. More than 45,000 of those memberships remain in effect.

In 1982 the Alumni Association initiated the sale of memberships in its Alumni Endowment Club. An Endowed Membership costs $1,000 for an individual and $1,500 for husband and wife. The principal of the Endowment will remain intact and only the interest monies will be used toward essential Alumni Association programs. Purchase of an Endowed Membership is not required in order for the former student to receive the services afforded by the Alumni Association.

OBJECTIVES — The objectives of the Alumni Association generally are to promote the interest and welfare of the state of Arizona and the cause of education. More specifically they are "to promote the objectives of the University of Arizona, Tucson, Arizona, through the establishment and maintenance of contact between the University, its graduates and its students — present, former, prospective, and otherwise." The Association operates as a liaison between the University and former students. It is the former student's immediate and direct contact with his or her alma mater. Its basic motivating principle is service, both to the former student and the University. Because of the large number of alumni in the Phoenix area, an office is maintained in Phoenix to help coordinate the activities of the Phoenix Alumni Club.

ACTIVITIES — The Alumni Association is guided by a Board of Directors. Seats on the board are filled through a general election held each summer. The activities of the Association are managed by a full-time Director of Alumni responsible to the Board of Directors. The Director of Alumni maintains the Central Alumni Office on campus. The Alumni Office, headquarters for all alumni activities, houses computerized record files of more than 278,000 graduates and former students.

All students and alumni are invited to visit the Alumni Office in the Slonaker Alumni Building. Their opinions, suggestions and needs will receive full attention.

A major responsibility of the Central Alumni Office is the assistance and guidance of the more than 100 regional alumni clubs throughout the United States and in foreign countries. The central office encourages and assists in the formation of these regional clubs. It gives direction and guidance to them in the formulation of their programs of activities. Campus speakers, films, and preparation and handling of mail announcements are but a part of the assistance provided by the central office. The clubs are a key factor in Association activities, for it is through them that the alumni have a real and personal tie with their University. Students and former students may obtain information about the regional club in their area from the Director of Alumni.

The Alumni Office also publishes the Arizona Alumnus, the official publication of the Alumni Association. Published four times a year, it is sent to all former students. This publication represents the most immediate contact for alumni with the University programs and progress, with news of former classmates, and with all alumni activities.
The University of Arizona Foundation

Every institution of higher learning, whether supported by public or by private funds, needs a group of friends who have a special interest in its welfare. The need is great and the opportunities are many for contributions of private funds to improve and develop educational and research programs outside the limited scope of state funds and tuition income.

In Arizona and elsewhere many people, aware of these needs, are assisting the University of Arizona. In order to unite these efforts, the University of Arizona Foundation was established in 1958 as a private, nonprofit corporation intimately associated with the University. The Foundation is governed by a board of directors. Membership in the Foundation is dependent upon becoming a member of The Presidents Club.

The Presidents Club came into being in 1967 to recognize the generosity of especially dedicated donors and to provide the framework for substantial and continuing support. Membership in the Presidents Club is by invitation only, and nominees may become eligible with a gift of $10,000 or more or in a variety of other ways involving deferred gifts, including bequests.

The principal objectives of the Foundation and the Presidents Club are:
1. To acquaint its members and the public with programs, plans, and needs of the University, and
2. To attract gifts and bequests to the Foundation which may be directed into the University’s activities as advantageously as possible.

Monthly luncheons are held where members of the University faculty and administration discuss topics of concern and interest to the University and to Foundation members. Awards and grants to support University research and educational programs are also announced each month.

The Foundation assists prospective donors and testators in planning trust and will arrangements for the Foundation. The Foundation invests, manages and controls the gifts in accordance with the terms of the trust instruments and deeds of gift. This united effort of friends of the University is helping to meet the changing requirements of education and to enrich higher education for the ultimate benefit of the people of Arizona.

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James B. Lyle ......................... Vice President
Warren S. Rustand .................... Secretary
Mrs. Samuel H. Woods ................ Treasurer
Richard F. Imwalle ................. Executive Director

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Ex-Officio Members
Cedric W. Dempsey
Allan Beigel
Kent Rollins
Colleges
Undergraduate Degrees

MAJOR FIELDS FOR BACHELOR'S DEGREES

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

accounting
aerospace engineering
agricultural communications
agricultural economics
agricultural education
agricultural engineering
agri-mechanics and irrigation
agronomy
animal health science
animal sciences
anthropology
architecture
art education
art history
astronomy
atmospheric sciences
biochemistry
business economics
business education
cellular and developmental biology
chemical engineering
chemistry
child development and family relations
civil engineering
classics
clothing and textiles
computer engineering
consumer service in food
consumer studies and home management
creative writing
criminal justice administration
dance
drama education
drama production
dramatic theory
eyear childhood education
earth science*
ecology and evolutionary biology
economics
 electrical engineering
elementary education
energy engineering
engineering mathematics
engineering physics
English
entomology

extended English*
finance
food science
food service management
French
general agriculture
general biology
general business administration
general fine arts studies
general home economics
general studies
geography
geological engineering
geosciences
German
Greek
health education
health services administration
history
home economics and journalism
home economics education
home economics extension
education
horticulture
human nutrition and dietetics
human services administration
hydrology
industrial engineering
interior design
Italian
jazz studies
journalism
landscape architecture
language arts—social studies*
Latin
Latin American studies
linguistics
management information systems
marketing
mathematics
mechanical engineering
medical technology
merchandising and fashion promotion
metallurgical engineering
Mexican American studies
microbiology
mining engineering
music
music education
natural resource recreation
nuclear engineering
nursing
nutritional sciences
occupational safety and health
operations management
Oriental studies
performance
personnel management
pharmacy
philosophy
physical education*
physics
plant pathology
plant sciences
political science
Portuguese
psychology
public management
public recreation administration
radio-television
range management
real estate
regional development
rehabilitation
religious studies
Romance languages
Russian
secondary education
social studies*
sociology
soil and water science
Spanish
speech and hearing sciences
speech communication
studio art
systems engineering
theory and composition
watershed management
wildlife and fisheries
science

*Teaching majors only.
College of Agriculture

The College of Agriculture provides professional education for a wide range of career opportunities in agriculture, natural resources, and home economics. The various curricula offer professional preparation for careers in agribusiness, private industry, public agency management, conservation or environmental organizations, farming or ranching, research, extension, communications or educational programs. A broad knowledge base in professional aspects of agriculture, natural resources, or home economics is combined with foundation courses in the natural and social sciences, the humanities and communication skills to develop a well-rounded educational preparation.

College responsibilities include resident instruction, the Agricultural Experiment Station, and the Cooperative Extension Service. There are nine departments in the College of Agriculture: Agricultural Economics; Agricultural Education; Animal Sciences; Entomology; Nutrition and Food Science; Plant Pathology; Plant Sciences; Soils, Water, and Engineering; and Veterinary Science. The School of Renewable Natural Resources is organized into four divisions — Forest-Watershed Resources; Landscape Resources; Range Resources; and Wildlife, Fisheries and Recreation Resources. The School of Home Economics is organized into three divisions — Child Development and Family Relations; Clothing, Textiles and Interior Design; and Home Economics Education/Consumer Studies.

DEGREES

The college offers the Bachelor of Science in Agriculture, the Bachelor of Landscape Architecture (B.L.A.), the Bachelor of Science in Home Economics, and the Bachelor of Science in Renewable Natural Resources. All students are assigned a faculty adviser who provides guidance and counseling during their undergraduate preparation.

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

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

UNDERGRADUATE MAJORS

Agricultural Communications
Agricultural Economics
Agricultural Education
Agri-Mechanics and Irrigation
Agronomy
Animal Health Science
Animal Sciences
Child Development & Family Relations
Clothing and Textiles
Consumer Service in Food*
Consumer Studies & Home Management
Early Childhood Education
Entomology
Food Science
Food Service Management
General Agriculture

General Home Economics
Home Economics and Journalism
Home Economics Education
Home Economics Extension Education
Horticulture
Human Nutrition and Dietetics*
Interior Design
Landscape Architecture
Merchandising & Fashion Promotion
Natural Resource Recreation
Nutritional Sciences
Plant Pathology
Plant Sciences
Range Management
Soils and Water Science
Watershed Management
Wildlife and Fisheries Science

*These majors are currently under review. For information contact the Department of Nutrition and Food Science.
For a major in *general agriculture*, contact the Associate Dean and Director of Resident Instruction.

If interested in the *preveterinary program*, contact the Department of Veterinary Science.

The following options are designed to qualify students in specialized professional areas within a major. For *turfgrass management* see listings under Plant Sciences; Entomology; Plant Pathology; Soils, Water and Engineering; and Agriculture. For *international agriculture*, contact Associate Dean and Director of Resident Instruction.

**GENERAL CURRICULA**

All undergraduate students in the College of Agriculture will select one of the following five curricula depending on their career objectives. All undergraduate students in the School of Renewable Natural Resources will follow the natural resources curriculum with the exception of landscape architecture students, who will follow the requirements for the Bachelor of Landscape Architecture degree. Undergraduate students in the School of Home Economics will follow the home economics curriculum.

I. **AGRICULTURE** — This curriculum offers broad preparation in the field of agriculture with the major emphasis on technical aspects of agriculture.

II. **AGRICULTURAL SCIENCE** — This curriculum is for students who desire more intensive training in the basic sciences as well as those who wish to prepare for graduate study.

III. **AGRICULTURAL BUSINESS** — This curriculum is for students who require a substantial knowledge of some phase of technical agriculture but wish to prepare themselves for ultimate careers in middle- or upper-level management of agricultural enterprises and related industries.

IV. **NATURAL RESOURCES** — These curricula are for students interested in the management of renewable natural resources for water, wood, forage, recreation, wildlife, fisheries, soil and aesthetic values. Students should consult the listing for the School of Renewable Natural Resources.

V. **HOME ECONOMICS** — This curriculum is for students interested in preparation for professional positions in one of the many and varied areas in home economics. It also provides an excellent general education for personal and family living and prepares students to be informed, effective and competent citizens. Students should consult the listing for the School of Home Economics.

**MINIMUM REQUIREMENTS FOR UNDERGRADUATE DEGREES IN AGRICULTURE**

<table>
<thead>
<tr>
<th>Group</th>
<th>Ag.</th>
<th>Ag.Sci.</th>
<th>Ag.Bus.*</th>
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<tbody>
<tr>
<td>I. GENERAL COURSES</td>
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<tr>
<td>Fr.Comp.</td>
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<td>6</td>
<td>6</td>
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<tr>
<td>Communications</td>
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<td></td>
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</tr>
<tr>
<td>a. Sp.C. 102</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>b. Elec. (oral or written Engl.)**</td>
<td>3</td>
<td>3</td>
<td>3</td>
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<tr>
<td>Phys. Ed.</td>
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<tr>
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<td>(14)</td>
<td>(14)</td>
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<tr>
<td>II. AGRICULTURE***</td>
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<tr>
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<tr>
<td>Electives†</td>
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<tr>
<td>(Group Total)</td>
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<td>(31)</td>
<td>(25)</td>
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<tr>
<td>III. BIOLOGICAL &amp; PHYSICAL SCI</td>
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<td>4</td>
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<tr>
<td>Chem.</td>
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<td>16</td>
<td>4</td>
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<tr>
<td>Phys., Atmo., Geos.</td>
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<td>8</td>
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<tr>
<td>Math. or Stat.‡</td>
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<td>11</td>
<td>12</td>
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<tr>
<td>Electives†</td>
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<td>3</td>
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<tr>
<td>(Group Total)</td>
<td>(28)</td>
<td>(52)</td>
<td>(23)</td>
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IV. SOCIAL SCI. & HUM.

<table>
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<tr>
<td>Electives</td>
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<tr>
<td>(Group Total)</td>
<td>12</td>
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</tbody>
</table>

V. ELECTIVES — Electives vary. At least nine units must be taken outside the College of Agriculture.

TOTAL REQUIRED FOR GRADUATION: 130

**In the business curriculum, the student must complete Mgmt. 275 and one of the following: Mgmt. 373 or 375 or A.Ec. 439; and Math. 119 and 123 (Acc. 300a or 310 may be substituted for Math. 123). The business core includes Acct. 200, 210; Econ. 201b, 300, 330; Fin. 311 or A.Ec. 450; Mgmt. 305 or A.Ec. 215; Mgmt. 320; M.I.S. 111; Mktg. 361 or A.Ec. 213; an additional course in one of the departments listed in the business core. Students in the business curriculum will have an adviser in their chosen majors as well as an adviser in the Department of Agricultural Economics. A.e.c. majors must follow the same requirements as the agri-business curriculum with the exceptions described under the department.

**Elective units are to be selected from a college-approved list.

***The Group II requirements for the major in general agriculture are six units each in the areas of animal sci., plant sci., soil sci., and ag. soc. sci., with the remaining group units as agricultural electives. A minimum of twelve upper-division units must be completed in agriculture courses.

†A.Ec. course is to be selected from A.Ec. 217, 231, 242, or Econ. 201b.

††Six units of electives must be from one or more areas outside the major.

‡The math. or stat. requirements must be fulfilled by Mgmt. 275; any math. department course except 101a-10b, 105a-105b, 116, 122, 150, 396a, 402, or 405. Math. 402 and 405 may be used as Group III electives; 101a-101b, 105a-105b, 116 and 150 may be listed in Group V.

*Electives in the biological and physical sciences are to be selected from the following: astr., atmo., cell., chem., ecol., ento., g.bio., geos., hydr., math., micr., phys., or plp. The following courses may be selected and counted as Group III electives: Pl. S. 100, 228, V.Sc. 250, AnS. 213, N.F.S. 406a-406b.

#The required social science/humanities units are to be selected from at least two of the following: anth., art., child development and family relations, clas., dram., econ., ed., Eng., ethnic studies, foreign lang., geography, hist., Hum. 250a-250b-250c, jour., mus., Or.s., phil., pol., psyc., reli., soc., sp.c., and w.s.

GENERAL INFORMATION

The College of Agriculture participates in several international programs. Recent activities include research and educational programs in Brazil, Iran, Niger, Ecuador, Saudi Arabia, the Philippines, Mexico, Turkey, and Israel. Interaction with ACTION-Peace Corps, the Agency for International Development, and the U.S. State Department provides unique opportunities for student and faculty evaluation of world resource problems.

The college includes the following resource facilities: Agricultural Communications, Agricultural Statistics, Center for Quantitative Studies, Center for Remote Sensing, Council for Environmental Studies, and the Office of Arid Lands Studies.

Students have the use of research facilities on the University campus and in the Tucson area, i.e., the Dairy Research Center, Poultry Research Center, Casa Grande Highway Farm, and the facilities of a number of cooperating agencies. Facilities away from the campus available for student visitation and research include the Citrus Branch Station; Central Arizona Research and Extension Center, Maricopa; Marana Farm; Safford Branch Station; Yuma Branch Station; Page Ranch near Oracle; Mt. Lemmon Experimental Watershed; and the Santa Rita Experimental Range.

Scholastic societies in the college include Alpha Tau Alpha, Alpha Zeta, Gamma Sigma Delta, and Omicron Nu.

The college participates in the University-wide Honors Program. Students in the College of Agriculture are encouraged to join clubs within the college. Student representatives serve on the Student Advisory Council, a unifying agency for student clubs, groups and organizations. Students serve on many all-college committees as well.

Fellowships, Scholarships, and Awards — A number of financial awards are available to students in the College of Agriculture. See Scholarships and Financial Aids Catalog.

Dean’s Honor List — This honor is reserved for students who carry no fewer than fifteen units of work in a semester and attain a grade-point average of 3.5000 or better.

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. The college also participates in the University’s cooperative education program.
SCHOOL OF HOME ECONOMICS

Home Economics 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, managerial, health, and ethical aspects of family relations, child development, clothing, and housing.

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

The School is organized into three divisions — Child Development and Family Relations; Clothing, Textiles, and Interior Design; and Home Economics Education/Consumer Studies.

The School offers the degree of Bachelor of Science in Home Economics with majors in child development and family relations (emphasizing child studies, family studies, or a combination of the two); early childhood education; clothing and textiles; interior design (design track or merchandising track); merchandising and fashion promotion; home economics education; home economics extension education; consumer studies and home management; general home economics; and home economics and journalism. The majors in consumer service in food, human nutrition and dietetics, and food service management are currently under review. For information regarding study in these areas, consult the Department of Nutrition and Food Science.

130 units are required for graduation.

HONOR IN SCHOLARSHIP AND PARTICIPATION — Each year the faculty of the School chooses the outstanding senior home economics student. The name of the student so honored is engraved on the permanent Home Economics Plaque.

HONORS PROGRAM — The School of Home Economics participates in the University-wide Honors Program.

Home Economics Organizations

THE UNIVERSITY OF ARIZONA STUDENT SECTION OF THE AMERICAN HOME ECONOMICS ASSOCIATION is open to all home economics students. It is the organization for college-age individuals affiliated with their professional organization.

THE UNIVERSITY OF ARIZONA STUDENT CHAPTER OF THE AMERICAN SOCIETY OF INTERIOR DESIGNERS — Any interior design major, with a 3.0000 or better grade average, may be a member of the society upon acceptance by the national organization.

DIRECTOR'S COUNCIL is a student committee which acts as a liaison between the home economics faculty and the student body. It is composed of representatives from the freshman and sophomore classes; each of the three divisions; graduate students; presidents of AHEA, ON, ASID, ICAHR, and Fashion Dimensions Club.

THE FASHION DIMENSIONS CLUB is open to anyone interested in fashion and merchandising.

ICAH — Individuals Concerned for the Advancement of Human Relations — is a service organization which emphasizes volunteer activities and service projects in child development and growth.

OMICRON NU — A chapter of the national honor society. Junior, senior, and graduate students with high scholastic records are eligible for consideration of election to membership.
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 divisions — Forest-Watershed Resources; Landscape Resources; Range Resources; and Wildlife, Fisheries and Recreation Resources.

The School offers the degrees of Bachelor of Science in Renewable Natural Resources with majors in watershed management, range management, natural resource recreation, and wildlife and fisheries science and the Bachelor of Landscape Architecture with a major in landscape architecture.

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

MINIMUM UNIT REQUIREMENTS FOR UNDERGRADUATE DEGREES IN RENEWABLE NATURAL RESOURCES AND LANDSCAPE ARCHITECTURE

Group | B.S. in R.N.R. | B.L.A.
--- | --- | ---
I. GENERAL COURSES | | |
Freshman Comp. | 6 | 6
Phys. Ed. | 2 | 2
Sp.C. 102 | 3 | 3
Comm. Elec. (oral or writ. Engl.) | 3 | 3
Econ. 201a | 3 | 3
II. MAJOR AND COLLEGE | | |
Major Subject | 16 | 55
S.W.E. 200 | 3 | 3
Electives* | 3 | 16
III. BIOL. & PHYS. SCI. | | |
G.Bio., Cell., Ecol. | 4 | 4
Chem. | 8 | 8
Math. or Stat. ** | 3 | 8
Phys. Atmo., Geos. (incl. Phys. 102a) | 4 | 7
Electives† | 6 | 3
IV. SOCIAL SCI. & HUM. # | | |
| 12 | 15
V. ELECTIVES — At least 9 units must be taken outside the College of Agric. | | |
TOTAL REQUIRED FOR GRADUATION | 130 | 160

*Must be from any division in R.N.R. or H.Ec. or from any department in the College of Agriculture.

**The math. or stat. requirements can be fulfilled by Mgmt. 275; any math. department course except 101a-101b, 105a-105b, 116, 122, 150, 396a, 402, or 405. Math. 402 and 405 may be used as Group II electives; 101a-101b, 105a-105b, 116 and 150 may be listed in Group V.

†Electives in the biological and physical sciences are to be selected from the following: astr., cell., chem., c.sc., ecol., ento., g.bio., geos., hydr., math., micr., phys., pl.p., or s.i.e. The following courses may be selected and counted as Group III electives: Pl.S. 100, 228, V.Sc. 250, An.S. 213, N.F.S. 406a-406b.

#The required social science/humanities units are to be selected from at least two of the following: anth., art, cdfr, clas., dram., econ., educ., Eng., ethnic studies, foreign lang., geog., hist., Hum. 259a-259b-259c, jour., ling., mgmt., mus., Or.s., phil., pol., psych., pppa., rel., soc., u.pl., and w.s.
Honors Information

The School encourages outstanding students to participate in the University-wide honors program.

Each year the faculty of the School honors the outstanding graduating senior in each division. The awards are supported by the Natural Resources Students Scholarship Fund.

Professional Student Organizations

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

Active student Chapters of the Society of American Foresters, the Society for Range Management, the Wildlife Society, the American Fisheries Society, and the American Society of Landscape Architects are available to students in the School.
Architecture is the art and science of building. As a meeting place of the arts and sciences, it is innately interdisciplinary and has continuing vitality as a field of study or a life career. Students of architecture investigate both the broad relationships between human and natural forces and the relationships between materials and technologies required to realize architecture as built form. The college program is organized with the design studio as the element of focus.

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

**DEGREES**

The College of Architecture offers a five-year program leading to the professional degree of Bachelor of Architecture. The program is divided into four areas of emphasis: design, technology, practice and management, and history and theory. The first year is the preprofessional phase. The professional phase is composed of two parts: the core design area (consisting of the second, third, and fourth years), and the fifth year, which includes areas of study derived from the emphases listed above. These areas include building design, community design, design development, economics and politics in architecture, historic preservation, housing design, building technologies, energy-conscious design, and design in arid regions. Offerings may be limited by faculty availability.

The college also offers a program of study leading to the degree of Master of Architecture. Two years of full-time study are normally recommended; however, students with a five-year Bachelor of Architecture degree from an accredited school of architecture may be able to complete the degree in less time. See the Graduate Catalog for additional information.

**REQUIREMENTS**

**Admissions**

**PREPROFESSIONAL PHASE (FIRST YEAR)** — See University admission requirements in Admissions section of this catalog. The special nature of architectural education necessitates the extension of the general requirements for admission to the University. Admission to full standing in the College of Architecture requires all entering first year students to present sixteen units of acceptable high school credit as follows:

<table>
<thead>
<tr>
<th>Subject</th>
<th>High School Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>4 (or 5)</td>
</tr>
<tr>
<td>(or English, 3 units, and one foreign language, 2 units)</td>
<td></td>
</tr>
<tr>
<td>Elementary Algebra</td>
<td>1</td>
</tr>
<tr>
<td>Intermediate Algebra</td>
<td>½</td>
</tr>
<tr>
<td>Plane Geometry</td>
<td>1</td>
</tr>
<tr>
<td>American History and Social Studies</td>
<td>2</td>
</tr>
<tr>
<td>Physics (with Lab)</td>
<td>1</td>
</tr>
<tr>
<td>Electives (depending on English option)</td>
<td>6½ (or 5½)</td>
</tr>
</tbody>
</table>
Applicants are advised to include among their electives additional courses in mathematics, such as trigonometry and advanced algebra. Applicants with strong backgrounds in mathematics are encouraged to consider taking the University examinations for exemption and/or credit for all or part of the College of Architecture mathematics requirement. Applicants entering with an ACT score of 28 or higher in mathematics will not be required to take additional mathematics in the College of Architecture and may use the required mathematics units for additional open elective opportunities.

Students who have made a decision to pursue a professional education in architecture are strongly advised to seek admission to the College of Architecture at their first opportunity in order to minimize the time required to complete the professional degree.

Students deficient in one or more of the high school courses listed above will be permitted to enter the College of Architecture. Applicants with a deficiency in physics should take Physics 102a or 106. Applicants with a deficiency in intermediate algebra should take Math. 116. All entrance deficiencies must be removed prior to admission to the professional phase of the program.

Students in the preprofessional phase may not enroll in required professional phase courses except upon petition to the Student Affairs Committee. Preprofessional students may, however, enroll in architecture elective courses.

**PROFESSIONAL PHASE (SECOND-FIFTH YEARS)** — There is a second selection process before the student can be admitted to the professional phase of the program. In order to enter this phase, the student must have completed the preprofessional course of study, have earned a cumulative grade-point average of 2.0000 (C) or better, and have removed any high-school deficiencies.

Since enrollment in architecture courses is limited, completion of the preprofessional courses with a 2.0000 average does not assure a student of admission to the professional phase. The number of applicants admitted to the professional phase is limited by the resources of the college.

Selections for professional phase admission are made in summer for the fall term. College resources do not allow mid-year admission into the professional phase at second year level.

**Minimum course requirements in the professional phase include the following areas:**

- **Architectural design and graphic communication** — 201, 202, 301, 302, 401, 402, 451, 452 (six units each), 222a-222b (three units each) — 54 units.
- **Architectural practice and management** — 270, 429, 439, 459 (three units each) — 12 units.
- **Architectural technology** — 228a-228b, 235, 236, 335, 336, 338a-338b (3 units each) — 24 units.
- **Architectural history and theory** — 324a-324b, 424a-424b (3 units each); 444, 474 (2 units each) — 16 units.

**General education elective requirements** — fine arts (3), social sciences and humanities (6), science and technology (6), business, management and government (6), architecture (6), open (9) — 36 units.

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

Applicants who are applying for transfer of architecture units earned in a NAAB-accredited program must forward portfolios of their work to the College of Architecture at the time their applications for admission are forwarded to the Admissions Office. The portfolios will be considered along with the official transcripts in the admission decision. If the applicant is
admitted to advanced standing, the portfolio and transcripts will also be reviewed by a college committee which will make recommendations regarding placement in the program and specific courses.

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 phase and should consider enrolling at mid year, in January, if they wish to be considered for admission to the preprofessional 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 in summer for the fall term. College resources do not allow mid-year admission into the professional phase at second year level.

APPLICATION DEADLINES — Students seeking admission to the preprofessional phase for the fall semester should file an application with the University of Arizona Admissions office by May 15. Students seeking advanced placement or admission to the professional phase must apply by May 15 and must also correspond directly with the College for additional deadlines, information and applications.

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

Advancement

For advancement in any particular course sequence in the professional phase, individual course prerequisites must have been satisfied, and a cumulative grade-point average of 2.0000 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.

Required Curriculum
Preprofessional Phase
(Recommended Sequence)

FIRST YEAR

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engl. 101 or 103</td>
<td>3</td>
</tr>
<tr>
<td>Hist. 101a or 104a</td>
<td>3</td>
</tr>
<tr>
<td>Math. 117e</td>
<td>3</td>
</tr>
<tr>
<td>Arch. 118f</td>
<td>2</td>
</tr>
<tr>
<td>Arch. 112f</td>
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<tr>
<td>Elective††</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
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<table>
<thead>
<tr>
<th>Subject</th>
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</thead>
<tbody>
<tr>
<td>Engl. 102</td>
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</tr>
<tr>
<td>Hist. 101b or 104b</td>
<td>3</td>
</tr>
<tr>
<td>Math. 118</td>
<td>2</td>
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<tr>
<td>Arch. 114</td>
<td>3</td>
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<td>Elective or Physics 106**</td>
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<tr>
<td>Elective††</td>
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</tr>
<tr>
<td>Total</td>
<td>17</td>
</tr>
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</table>

Required Curriculum
Professional Phase
(Recommended Sequence)

SECOND YEAR

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arch. 201</td>
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</tr>
<tr>
<td>Arch. 222a</td>
<td>3</td>
</tr>
<tr>
<td>Arch. 228a*</td>
<td>3</td>
</tr>
<tr>
<td>Arch. 235*</td>
<td>3</td>
</tr>
<tr>
<td>Elective††</td>
<td>3</td>
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<tr>
<td>Total</td>
<td>18</td>
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<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>Arch. 202</td>
<td>6</td>
</tr>
<tr>
<td>Arch. 222b</td>
<td>3</td>
</tr>
<tr>
<td>Arch. 228b*</td>
<td>3</td>
</tr>
<tr>
<td>Arch. 236*</td>
<td>3</td>
</tr>
<tr>
<td>Elective††</td>
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</tr>
<tr>
<td>Total</td>
<td>18</td>
</tr>
</tbody>
</table>
### Third Year

<table>
<thead>
<tr>
<th>Subject</th>
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<th>Subject</th>
<th>Units</th>
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<tr>
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<td>Arch. 302</td>
<td>6</td>
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<tr>
<td>Arch. 324a*</td>
<td>3</td>
<td>Arch. 324b*</td>
<td>3</td>
</tr>
<tr>
<td>Arch. 336*</td>
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<td>Arch. 335*</td>
<td>3</td>
</tr>
<tr>
<td>Arch. 338a</td>
<td>3</td>
<td>Arch. 338b</td>
<td>3</td>
</tr>
<tr>
<td>Elective††</td>
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<td>Elective††</td>
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### Fourth Year

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<th>Units</th>
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<tbody>
<tr>
<td>Arch. 401</td>
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<td>Arch. 402</td>
<td>6</td>
</tr>
<tr>
<td>Arch. 424a*</td>
<td>3</td>
<td>Arch. 424b*</td>
<td>3</td>
</tr>
<tr>
<td>Arch. 429*</td>
<td>3</td>
<td>Arch. 439</td>
<td>3</td>
</tr>
<tr>
<td>Elective††</td>
<td>3</td>
<td>Arch. 444</td>
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<tr>
<td><strong>Total</strong></td>
<td>15</td>
<td><strong>Total</strong></td>
<td>17</td>
</tr>
</tbody>
</table>

### Fifth Year

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arch. 451</td>
<td>6</td>
<td>Arch. 452</td>
<td>6</td>
</tr>
<tr>
<td>Arch. 459</td>
<td>3</td>
<td>Elective††</td>
<td>3</td>
</tr>
<tr>
<td>Arch. 474</td>
<td>2</td>
<td>Elective††</td>
<td>3</td>
</tr>
<tr>
<td>Elective††</td>
<td>3</td>
<td>Elective††</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>14</td>
<td><strong>Total</strong></td>
<td>15</td>
</tr>
</tbody>
</table>

*Course may be taken in another year but must be completed prior to entrance into the fifth year.

**Physics taken to fulfill a high school deficiency may not be used as elective credit. Students without high school or college physics must complete physics in the first year and should take Math. 117e and Math. 118 first semester.

†Arch. 112 and 118 may be taken either semester.

††Arch. 270 must be taken in lieu of one elective prior to the fourth year. Electives are to be selected from five general areas of knowledge. Consult elective group list available in the College of Architecture.

### Resources and Activities

**Facilities** — The activities of the college are housed in the Architecture Building, which was constructed in 1966 and expanded in 1970. It is a three-story facility that houses the majority of the design studios, classrooms and seminar rooms, a large and completely equipped audiovisual lecture hall, model shop, photographic darkroom, faculty offices, exhibition areas, archives and the college library. The library has an extensive collection of books and magazines about architecture and all related environmental design fields. An important and active part of this resource is the outstanding 35mm slide collection covering the historical and contemporary architecture of the world. In 1978, a second expansion provided studio and exhibition space as well as an experimental facility for ongoing solar-energy research.

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

**PLACEMENT SERVICES** — Fifth-year students and former students are eligible to register with the University Placement Service, which is in communication with organizations seeking graduates. College of Architecture graduating students are urged to register with the Placement Service no later than the beginning of their last semester of studies to avail themselves of the benefit of this service. Further information may be obtained by contacting the Director of the Placement Service or visiting the office on campus.

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

**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 3.5 or better for a semester while carrying no fewer than fifteen units of work.

**STUDENT GUIDANCE** — Each entering student is assigned a faculty adviser who is available for guidance and counseling throughout the academic year. The faculty advisers maintain regular office hours and students are encouraged to review their progress and problems with their advisers.
College of Arts and Sciences

The College of Arts and Sciences of the University of Arizona was created in 1982 by a merger of the former College of Fine Arts and College of Liberal Arts. At the time of printing of this catalog, degree programs as administered by the former colleges remained unchanged. Students electing to satisfy graduation requirements under this catalog (see “Choice of Catalog” in the Graduation Requirements section of this catalog) should consult an adviser in the deans’ office to learn whether any changes in curricula have been made that would affect their degree programs.

ACADEMIC DIVISIONS

The College of Arts and Sciences offers degree programs through its four divisions. Degree programs in the fine arts are offered through the Faculty of Fine Arts, which comprises the following academic units:

FACULTY OF FINE ARTS: Art, Drama, School of Music, Radio-Television, Speech Communication, and Speech and Hearing Sciences. The Faculty of Fine Arts also cooperates with the Department of Physical Education to offer a major in dance.

Degree programs in the liberal arts and sciences are offered through the Faculties of Humanities, Science, and Social and Behavioral Sciences, which comprise the following academic units:

FACULTY OF HUMANITIES: Classics, English, French and Italian, German, Religious Studies, Russian, and Spanish and Portuguese.


DEGREE PROGRAMS IN THE FINE ARTS

The following degree programs are offered through the Faculty of Fine Arts:

Bachelor of Fine Arts (B.F.A.) with majors in:
  Studio Art, Art Education, Dance, Drama Production, Drama Education, General Fine Arts Studies

Bachelor of Music (B.M.) with majors in:
  Performance, Music Education, Theory and Composition, Jazz Studies

Bachelor of Arts (B.A.) in:
  Art (with a major in art history), Drama (with a major in dramatic theory), Music, Radio-Television, Speech Communication

Bachelor of Science (B.S.) in:
  Speech and Hearing Sciences
Master of Fine Arts (M.F.A.) with majors in:
  Art, Drama
Master of Arts (M.A.) with majors in:
  Art History, Art Education, Drama, Speech Communication
Master of Music (M.M.) with majors in:
  Musicology, Music Theory, Composition, Music Education, Performance (in the areas of keyboard, voice, strings, winds and percussion)
Master of Science (M.S.) with a major in:
  Speech and Hearing Sciences
Doctor of Musical Arts (A.Mus.D.) with majors in:
  Composition, Conducting, Music Education, Performance
Doctor of Philosophy (Ph.D) with majors in:
  Music Theory, Speech Communication, Speech and Hearing Sciences

The various curricula as described below and in the departmental section of this catalog will be helpful to students in selecting a course of study. For students who wish to prepare for both professional activity and postgraduate study, a double major within a professional degree (B.F.A. or B.M.) or the combination of a professional degree within the Bachelor of Arts degree is recommended as a five-year program. The adjustment of curricula to meet this plan may be worked out with the adviser during the freshman year.

ENTRANCE REQUIREMENTS

See the Admission section of this catalog. Any special departmental entrance requirements will be listed under the departmental headings later in this catalog.

REGISTRATION

Selection of a Major or Field of Study: A student entering a degree program offered through the Faculty of Fine Arts must select a major area of study at the beginning of the first semester in college.

Approval of Schedules: All schedules of courses must be approved by the student’s assigned adviser. To secure an adviser or to change advisers, the student should contact the departmental advising coordinator, the department head or the Fine Arts dean’s office.

Maximum Academic Load: The normal maximum semester load is eighteen units. Written permission to exceed this limit must be granted by the dean prior to registration. Freshmen and students on probation may not exceed the eighteen-unit limit. All courses, including non-credit courses, taken simultaneously, whether courses for University credit, correspondence courses, or courses taken at another campus (college level) are counted in determining the maximum academic load.

GRADUATION REQUIREMENTS

In addition to the Group Units required for all degrees as outlined below, the candidate for a degree must complete a major (see specific departmental requirements listed in the departmental section of this catalog) and, in the cases of the Bachelor of Arts and the Bachelor of Science degrees, a twenty-unit minor.
**Group Unit Requirements**

**BACHELOR OF FINE ARTS**  
(Majors in Studio Art, Art Education, Dance, Drama Production and Drama Education)  
& **BACHELOR OF MUSIC**  
(Majors in Performance, Music Education, Theory and Composition, and Jazz Studies)

<table>
<thead>
<tr>
<th>GROUP</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. FRESHMAN COMPOSITION</strong></td>
<td>6-9</td>
</tr>
</tbody>
</table>
| Completion of one of the following sequences:  
  A. Engl. 100, 101, and 102.  
  B. Engl. 101 and 102.  
  C. Engl. 103 and 102. | |
| **II. HUMANITIES OPTION** | 6-8 |
| Completion of one of the following sequences:  
  A. Hum. 250a-250b-250c (any two).  
  B. No fewer than two 3-unit survey courses from the following:  
    1. Art hist., dance hist., drama hist., music hist. or speech hist.  
    2. Literature (or survey literature in a foreign language).  
    3. Philosophy (except logic and world religions).  
  C. Either Hum. 250a or 250b or 250c and one 3-unit course from 1, 2, or 3 above. | |
| **III. SCIENCE/MATHEMATICS** | 8-10 |
| Completion of one of the following sequences:  
  A. Laboratory sciences selected from astr., atmo., chem., ecol., ento., g.bio., geos., hydr.,  
    phys. or pty.s. (8 units).  
  B. Mathematics selected from 116, 117e, 118, 119, 123, 125a-125b, 160 (9 units).  
  C. Combination of "A" and "B" above (10 units). | |

Note: Art education, drama education and music education majors must complete at least one course in both laboratory science and mathematics for a minimum of seven units.

<table>
<thead>
<tr>
<th>GROUP</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. FRESHMAN COMPOSITION</strong></td>
<td>6-9</td>
</tr>
</tbody>
</table>
| Completion of one of the following sequences:  
  A. Engl. 100, 101, and 102.  
  B. Engl. 101 and 102.  
  C. Engl. 103 and 102. | |
| **II. HUMANITIES OPTION** | 8-10 |
| Completion of one of the following sequences:  
  A. Hum. 250a-250b-250c (any two).  
  B. One 3-unit survey course from each of the following:  
    1. Art hist., dance hist., drama hist., music hist. or speech hist.  
    2. Literature (or literature survey in a foreign language).  
    3. Philosophy (except logic and world religions).  
  C. Six units in one field and 3 units in another from 1, 2 and 3 above.  
  D. Combination of Hum. 250a or 250b or 250c and at least 6 units from 1, 2, or 3 above. | |
| **III. FOREIGN LANGUAGE** | 16 |
| The requirement in foreign language is either proficiency in one foreign language at the fourth semester level or completion of 4 semesters. Advanced placement for credit in language courses for students continuing a foreign language taken in high school will be based upon the results of a placement examination given by the language department concerned. |
IV. SCIENCE/MATHEMATICS

Students must take a minimum of 4 units in laboratory sciences from the following departments: astr., atmo., chem., ecol., g.bio., geos., hydr., phys., or pty.s., and 3 units of math. selected from Math. 105a or 105b or 116 or any math. course above Math. 116.

V. SOCIAL SCIENCE

Courses to be selected from: anth., econ., geog., hist., phil., pol., psyc., soc., A.In.s., Bl.s., Or.s., reli., w.s.

BACHELOR OF SCIENCE
(Major in Speech and Hearing Sciences)

GROUP UNITS
I. FRESHMAN COMPOSITION ..................................................... 6-9
Completion of one of the following sequences:
A. Engl. 100, 101, and 102.
B. Engl. 101 and 102.
C. Engl. 103 and 102.

II. HUMANITIES OPTION ..................................................... 8-10
Completion of one of the following sequences:
A. Hum. 250a-250b-250c (any two).
B. One 3-unit survey course from each of the following:
   1. Art hist., dance hist., drama hist., music hist. or speech hist.
   2. Literature (or literature survey in a foreign language).
   3. Philosophy (except logic and world religions).
C. Six units in one field and 3 units in another from 1, 2, and 3 above.
D. Combination of Hum. 250a or 250b or 250c and at least 6 units from 1, 2, or 3 above.

III. FOREIGN LANGUAGE OR LINGUISTICS .................................. 6-8
Eight units in one foreign language or 6 units of linguistics.

IV. SCIENCE/MATHEMATICS .................................................. 22-24
Completion of plan A or plan B**:
A. G.Bio. 159a-159b, Math. 117e, 118, and 160**, and eight units of general lab. sci.
B. Sp.H. 461, Math. 160, and other courses selected in consultation with an adviser to achieve the required number of units. Sp.H. 260 and 280 may be used in fulfillment of this group requirement.

V. SOCIAL SCIENCE .......................................................... 12
Completion of plan A or plan B**:
A. Psyc. 100a-100b and six additional units from anth., econ., geog., hist., phil., pol., psyc., or soc. (Students who have a psyc. minor or split minor including psyc. may fulfill the social science requirement using courses other than Psyc. 100a-100b, which may be applied to the minor.)
B. Six units in psyc. and additional units from anth., soc., or psyc.

*Plan B is for students in the American Indian professional training program.
**Intro. stat. courses may be used for math. 160, except ed.p. 340.

BACHELOR OF FINE ARTS
(Major in General Fine Arts Studies)

GROUP UNITS
I. FRESHMAN COMPOSITION .................................................. 9-12
Completion of one of the following sequences:
A. Engl. 100, 101, and 102.
B. Engl. 101 and 102.
C. Engl. 103 and 102.

In addition to the above basic English requirement, the candidate for this degree must also complete one additional course in English to be selected from the following: 207, 209, 210 or 308.

II. LITERATURE/FOREIGN LANGUAGE/JOURNALISM .......................... 12
Completion of 12 units from 2 of the following:
A. Literature or survey literature in a foreign language.
B. Foreign Language (8 units minimum).
C. Journalism.
III. SCIENCE/MATHEMATICS
Completion of one of the following sequences:
A. Laboratory sciences selected from astr., atm., chem., ecol., ento., g.bio., geos., hydr., phys., or pty.s. (8 units).
B. Mathematics selected from Math. 116, 117e, 113, 119, 123, 125a-125b, 160 (9 units).
C. Combination of "A" and "B" above (10 units).

IV. SOCIAL SCIENCE
Courses to be selected from: anth., econ., geog., hist., phil., pol., psyc., soc., A.in.s., Bl.s., Or.s., reli., w.s.

V. INTRODUCTORY FINE ARTS
Dual courses as designated must be selected from 4 of the following fields: Art 101a or 101b and 117 or 118, Ph.Ed. 259a or 259b and 3 units of dnc. activity courses, Dram. 105 and 149 and 140a or 140b, Mus. 107 or 108 and 3 units of performance courses, R.T.V. 103 and 111 or 213, Sp.C. 136 and 181.

VI. FINE ARTS EMPHASIS COURSE WORK
The candidate for this degree also must complete a minimum of 24 additional units of course work in one of the departments mentioned (see section V above), and twelve additional units of course work in each of two other departments. (Creative writing, with the approval of the advisor, may be used as one of the 12-unit departments.) At least eighteen units must be upper-division courses. At least 24 units in the requirement mentioned directly above and in Group V must be taken in residence. Minimum Total Units Required — 125.

Musical Theatre Option
An emphasis in the area of musical theatre is available under the general fine arts studies major. Students in this option must select a concentration in dance, drama, or music, and must meet the following requirements: Groups I, II, III, and IV as outlined above. (Students concentrating in dance must complete G.Bio 159a-159b to fulfill the Group III laboratory science requirement.) To fulfill the Group V and VI requirements, students must complete Ph.Ed. 259b; Dram. 105, 106, 115, 140a-140b, 149, 151, 250, 251; Mus. 110a-110b, 120a-120b, 130a-130b, two units of 2010 and one unit of 205, ten units of voice including four units of 285v, plus either A, B, or C, as follows.

A. For drama concentration, Dram. 449, 451, 452, 453, two units of Ph.Ed. 175, one unit of Ph.Ed. 112a, one unit of Ph.Ed. 152a, and ten units of drama electives. B. For music concentration, one unit of Mus. 205, 220a-220b, two units of 405, 330a-330b, four units of voice (additional units of voice may be required if student cannot meet minimum graduation requirement of four units of voice at 285v level), two units of Ph.Ed. 175, one unit of Ph.Ed. 112a, one unit of Ph.Ed. 152a, and three units of music electives. C. For dance concentration, Ph.Ed. 240a-240b, 241a-241b, 244a-244b, 340a-340b, 343a, 343d, 370 (section for dance majors), and three units of dance electives.

All majors must complete a minimum of four units from the following: Dram. 111, 112, 113, Mus. 205 (production emphasis) or Ph.Ed. 247a-247b; and two semesters of one unit each of musical theatre practicum — Dram. 197 or 497, Mus. 494, or Ph.Ed. 394. (The musical theatre adviser and the course instructor should be consulted before registering for musical theatre practicum courses.)

Drama and music concentrators must appear in one major musical theatre role in a University of Arizona production or present a minimum of one-half public solo voice recital, which must include a significant portion of musical theatre repertory. To fulfill two units of electives in the concentration, majors are encouraged to register for one or more musical theatre internships as approved by the musical theatre adviser and the musical theatre committee. Such registration is possible only when suitable internship possibilities are available.

Cinema Option
An emphasis in cinema is available under the general fine arts studies major. Students in this option must meet the following requirements: Groups I, III, and IV as outlined above; Group II must include Engl. 300a-300b and either 6 units of journalism or 8 units in one foreign language; Group V must include the following: Art 101a or 101b and either 117 or 118 or 119; Dram. 101 and either 140a or 140b; Music 100 and either 107 or 108; and R.T.V. 111 and 213. Group VI must include the following: 24 units in Dram. including Dram. 170, 171, 200, 245, 270a-270b, 460a, and either 496b or 497g or 421 and 3 units of Dram. electives and 24 units in radio-television including R.T.V. 141, 215, 302, 315, 375, 415, 444, 493g and 3 units of radio-television electives.
COURSES USED TO SATISFY GROUP UNIT REQUIREMENTS

Courses listed below normally are used to satisfy the Humanities Group Unit Requirement in the programs offered by the Faculty of Fine Arts. Students wishing to use courses other than those listed here should consult with their advisers and then submit a College Recommendation Form (obtainable in the deans' office) to the dean prior to enrollment in the course.

**Humanities Option:** Art 117, 118, 119, Ph.Ed. 259a-259b, Dram. 140a-140b, Mus. 107, 108, Sp.C. 181, Engl. 260, 261, 265, 267a-267b, 370a-370b, Clas. 126, 250a-250b, 301, Fren. 300a-300b-300c, 382a-382b, Ger. 270a-270b, 302a-302b, 345, 371, Ital. 400a-400b-400c, Or.S. 140a-140b, Phil. 111, 113; Port. 383, 400a-400b, 464, Russ. 300a-300b-300c; 405a-405b, Span. 332, 400a-400b, 401a-401b, W.S. 200.

**MINOR**

A twenty-unit minor is required in both the Bachelor of Arts and the Bachelor of Science degree programs. The minor is normally done in a department related to the major and must have the approval of the student's adviser. Completion of this requirement may be met in one of the following manners:

A. Twenty units in one department.
B. A **Split Minor**, wherein work is done in two departments with at least eight units in one and twelve units in the other.
C. A **Fine Arts Minor**, consisting of twenty units representing a broad survey in the field of fine arts. Courses, outside of the major, must include six to nine units from three of the following departments: art, dance, dram., mus., r.t.v., and sp.c.

Speech and hearing sciences majors may select a minor as outlined above or, with the approval of their advisers, select a group of courses which would support the major but would not constitute a traditional "minor." Twenty units would still be required under this option.

**GENERAL PROCEDURES AND REGULATIONS**

Students majoring in art education, drama education or music education must complete at least 56 units applicable to their degree with a grade-point average of 2.5000 or better before being admitted to certain professional education courses.

All courses used to satisfy the Group Unit Requirements, the minor, and the Group VI requirement for the major in general fine arts studies, must be home department registrations for any courses that are crosslisted. Home department is the department actually teaching the course and is designated in the catalog by a complete course description. Courses taught in the major may not be used to satisfy Group Unit Requirements.

Students must attain a grade-point average of 2.0000 or better for all work in the major field as well as the overall grade-point average of 2.0000 which is required for graduation. (See Requirements for Graduation in another section of this catalog.)

No course may be used to satisfy more than one requirement in any degree program offered by the Faculty of Fine Arts.

Candidates for the Bachelor of Fine Arts or the Bachelor of Music degrees must take no fewer than 44 general academic units outside of the major department (the Group Units required are counted toward these 44 general academic units). Candidates for the Bachelor of Fine Arts degree with a major in general fine arts studies must take at least 44 units outside of courses offered through the Faculty of Fine Arts.

Candidates for the Bachelor of Arts or the Bachelor of Science degrees may not count more than 48 units in their major field toward the degree.

A student may change his or her major effective with the beginning of the next semester by completing a change-of-college/change-of-major form available at the deans' office.
Admission or readmission applications and/or change-of-college/change-of-major forms must be submitted no later than one month prior to the beginning of each new period of registration. Applications and forms will be honored only so long as staff and facility availability allows. None shall be honored after the last day of registration for credit.

Students are encouraged to participate in on- or off-campus nondepartmental productions or performances which will materially increase the student's educational experiences and where such participation will not conflict with commitments already made by the student to his or her own departmental programs and student colleagues within those programs. Where such conflicts are imminent, the student is advised to consult in advance with his or her department head or director.

GENERAL INFORMATION

Library

Besides standard volumes in the fine arts, the University Library has special collections of unusual character in this field, including the T.E. Hanley collection of more than 37,000 volumes, in the great part devoted to painting, sculpture, music and drama; the Statler Memorial Collection of music scores and books; the Thomas Wood Stevens Memorial Theatre Collection of 1,500 volumes on drama and the theatre.

The School of Music maintains a branch library with a working collection of records, scores and some research material. The Art Department maintains over 70,000 color slides covering a good portion of art and architecture from the beginning of recorded history through the middle of the 20th century.

Speech Center

The Department of Speech and Hearing Sciences maintains a speech and hearing center where any University student may receive personal therapy. The Center also provides diagnostic and referral assistance for any Arizona citizen.

Activities

Various extracurricular groups and organizations offer opportunity for growth beyond the curricular requirements. Students can participate in art exhibits; productions by the Drama Department; intramural and intercollegiate offerings by the Speech Communication Department including debate and Readers’ Theatre; student recitals and ensembles in the School of Music including various bands, orchestras, opera theatre, choirs, jazz ensembles, chamber ensembles and collegium musicum, dance ensembles under the direction of the Department of Physical Education and radio and television productions under the direction of the Division of Media and Instructional Services.

Faculty recitals and the University Artist Series also provide unusual opportunities for hearing the literature performed by artists.

Student Professional and Honorary Associations

The following student professional and honorary organizations are active in the fine arts:

- American Guild of Organists—Student Chapter
- American Musicological Society—Student Chapter
- International Society for Music Education—Student Chapter
- Kappa Kappa Psi—Band Fraternity for Men
- Music Educators National Conference—Student Chapter
- Music Teachers National Association—Student Chapter
- 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
- Sigma Phi Epsilon—National Collegiate Players
DEGREE PROGRAMS IN THE LIBERAL ARTS AND SCIENCES

The Faculties of Humanities, Science, and Social and Behavioral Sciences offer programs leading to the degrees of Bachelor of Arts, Bachelor of Science, Master of Arts, Master of Science, Master of Fine Arts, and Doctor of Philosophy. The following undergraduate majors are available for the degree of Bachelor of Arts:

Anthropology
Astronomy
Biochemistry
Chemistry
Classics
Creative Writing*
Ecology & Evolutionary Biology
Economics
English
French
General Studies**
Geography
Geosciences
German
Greek***
History

Italian
Journalism
Latin***
Latin American Studies
Linguistics
Mathematics
Mexican American Studies
Oriental Studies
Philosophy
Political Science
Portuguese
Psychology
Religious Studies
Romance Languages
Russian
Sociology
Spanish

The following undergraduate majors are available for the degree of Bachelor of Science:

Astronomy
Atmospheric Sciences
Biochemistry
Cellular & Developmental Biology
Chemistry

Ecology and Evolutionary Biology
General Biology
Mathematics
Microbiology
Physics
Psychology

* Listed under English.
** See description in this section.
*** See Classics.

Admission

See "Special Requirements for Admission to Particular Colleges" in the Admission to the University section of this catalog. Students with entrance deficiencies are expected to remove them prior to the sophomore year.

Requirements for the Degrees of Bachelor of Arts and Bachelor of Science

Requirements for the degrees of Bachelor of Arts and Bachelor of Science must be met as specified in the catalog under which the student has chosen to graduate. At least 125 units are required. Both the B.A. and the B.S. require a minimum of 30 upper-division units. Only students in the College of Arts and Sciences may earn the B.A. with a major in economics, geography, or geosciences. Some departments offer both the B.A. and the B.S.

In addition to courses satisfying the Group Requirements for the B.A. or B.S., the student's curriculum must include a major, a minor, and elective courses, all selected in consultation with an adviser. Students choosing a general studies major or a double major (except English and creative writing) need not include a minor. No fewer than 90 units of course
work must be taken from the programs or departments in the Faculties of Humanities, Science, and Social and Behavioral Sciences. Up to thirty units of econ., 35 units of geog., and thirty units of geos. may be counted toward these ninety units.

GROUP REQUIREMENTS

A major automatically satisfies the Group Requirement with which it is identified. A minor made up entirely of courses within one Group, with at least six units in one department, will fulfill that Group Requirement. For restrictions on the language minor, see Restrictions on the Minor elsewhere in this section. No major, minor, or course may be used to satisfy two different Group Requirements, except that suitable math. courses which are required as part of a major or minor in some other discipline may be used to satisfy Group V. If a major or minor as a whole is not used to satisfy a Group Requirement, otherwise acceptable courses from that major or minor may be applied to one Group Requirement. Students majoring in Oriental studies, Latin American studies, Mexican American studies, or philosophy should consult their major advisers regarding applicability of these areas to the Group Requirements. Independent study courses (those with numbers ending in 99) are not acceptable for satisfying Group Requirements. At least one course from Group II or Group IV must have a substantial non-Western component, and one a substantial Western component. Courses satisfying these requirements are listed in the office of the deans.

Group Units

I. FRESHMAN COMPOSITION ................................................................. 6-9
   All freshmen must enroll in Freshman Composition.
   Completion of one of following sequences:
   A. Engl. 100, 101, and 102.
   B. Engl. 101 and 102.
   C. Engl. 103 and 102.
   (See "University Requirement in Composition" in the Academic Guidelines section regarding placement in English.)

II. HUMANITIES ................................................................................ 8-9
   All candidates for the Bachelor of Arts or the Bachelor of Science are required to complete, either
   A. Two semesters of Hum. 250a-250b (8 units); or
   B. No fewer than 9 units from at least two of the following groups:
      1. Clas. 250a-250b, Dram. 140a-140b, Engl. 267a-267b, Ital. 282a-282b, Ger. 270a-270b, Hum. 250a-250b-250c, Russ. 250a-250b, Sp.C. 181, W.S. 200,
      2. Art 117, 118, Hist. 104a-104b, Mus. 107, 108, Or.s. 140a-140b, Reli. 120, 130,

III. FOREIGN LANGUAGE ...................................................................... Variable
   The basic requirement for the bachelor's degree is demonstration of proficiency in a foreign language at the fourth-semester level. This proficiency may be demonstrated by successful completion of a fourth-semester course in a foreign language, successful completion of a course for which attainment of proficiency at the fourth-semester level is a prerequisite, or demonstration of proficiency at the fourth-semester level on a proficiency examination administered by a foreign language department (no credit given). If proficiency is demonstrated through course work, the course that establishes proficiency must be taken for a letter grade, not P/F.
   Evidence of having completed the required work in high school is not sufficient to establish proficiency in a foreign language.
   Placement in language courses for students continuing foreign languages already taken in high school will be based upon the results of a placement examination given by the department concerned.
   Students whose native tongue is a language other than English may satisfy the language requirement by completing successfully English 101 and 102, or 107 and 108. They may be allowed credit by transfer in their native language only for those courses taken during the years equivalent to the United States college years. (For information regarding credit by examination, please refer to "Special Examination for Credit or Grade" in the Academic Guidelines section of this catalog.)
   It should be noted that some departments require certain languages to meet their major requirements. Please consult the departmental headnotes for this information.

IV. SOCIAL SCIENCE ........................................................................... 9
   Completion of nine units selected from anth., econ., geog. (except 103a-103b, 104a-104b), hist. (except 104a-104b), jour. 151, 470, ling. (except 203a-203b, 260, 420, 423a-423b, 461),
Mexican American studies (except language and literature courses), Oriental studies (except language, literature, religion, and humanities courses), phil. (except 111, 112, 113, 260, 261, 262, 263, 309, 325, 328, 425, 426), pol., psyc., soc., w.s. (except 180, 200, 317, 341, 417, 418). Six units must be in one department or program and three in another. At least three units must be in a course at the 200 level or above or in a limited-enrollment course (maximum of 40 students) at the 100 level taught entirely by a faculty member and requiring some form of term paper.

V. MATHEMATICS

Three units selected from Math. 101a, 101b, 117e, or any mathematics course numbered above 117e.

VI. SCIENCE

Completion of A or B:

A. Laboratory option — 8 units in a single department: astr., atmo., cell., chem., ecol., g.bio., geog. 103a-103b and 104a-104b, geos., hydr. 101a-101b, micr., phys., pty.s. At least two of these units must be devoted to providing a “laboratory experience” (which can take the form of traditional laboratories, field trips, or data analysis/discussion sessions) designed to expose students to the data used in the discipline.

B. At least nine units selected from at least two different departments. At least three units must be in biological sciences (cell., ecol., g.bio., micr.) and at least three units must be in the physical sciences (astr., atmo., chem., geog. 103a-103b, geos., hydr., 101a-101b, phys., pty.s.).

Courses in the Foundations of Science series (all numbered 112) are for pre-elementary education students only. They may not be used to satisfy the Group VI requirement.

**Majors and Minors**

**MAJOR** — The requirements for the majors (see “Degree Programs in the Liberal Arts and Sciences” in this section) are specified by the individual departments of the college in the Departments and Courses of Instruction section of this catalog. Certain departments exclude from their majors the basic first-year courses and so indicate in their descriptions of the majors.

**Restriction on the Major:** No later than the junior year each student should choose a major subject and a supporting minor. At least fifteen units in the major must be university-credit course work. A graduation grade average of 2.0000 is required for all university-credit courses undertaken in the major. This average includes the grades for the introductory first-year course, even though it may be excluded from the major as defined in the department.

No more than 48 units in any one department or subject may be applied to graduation requirements.

The following courses must be included in the 48-unit rule: honors courses in the major and courses crosslisted with an academic committee (American Indian Studies, Black Studies, Mexican American Studies, Religious Studies, and Women’s Studies).

The following are excluded from the 48-unit rule: freshman composition, the first year (elementary) of foreign languages, and courses crosslisted in a second academic department if that second academic department is home for those courses. In addition, a student with a major in English and a minor in creative writing or a major in creative writing and a minor in English will be allowed to take 57 units in the Department of English, while students with a double major in English and creative writing may take 72 units in that department.

Students may request a change of major at any time by informing the major adviser and reporting the change in person or in writing to Student Records in 347 Modern Languages, where a change-of-major form will be initiated. Senior students whose applications for degree candidacy are already on file in the Registrar’s office must also report any such change to their degree checkers.

**DOUBLE MAJOR** — A student may elect to take a double major by satisfying the requirements for the major in two departments within the college; however, the type of bachelor’s degree offered in each case must be the same (that is, either B.A. or B.S.). The second major obviates the necessity of declaring a minor except in the English and creative writing double major. Since the University cannot accept student records under two different majors, the student must consistently cite the preferred major when the major is to be designated in routine academic documents. When filing for the degree in the Registrar’s office, however, the student must declare both majors. It is incumbent upon the student to maintain contact with the advisers in both departments to ensure that all requirements are being met. The minimum units required for graduation remain at 125. At least fifteen units in each major must be university-credit course work.
MINOR—A minor is defined as twenty units selected from one or more supporting or complementary areas (see list of "Academic Divisions" elsewhere in this section) with the assistance and approval of the student’s major adviser. It is incumbent upon both the student and the major adviser to explore the various available alternatives in selecting a group of subjects from a single discipline or from two or more disciplines, and from one or more colleges. Advisers in the office of the deans and the advisers in the subject departments of the minors are prepared to assist in this regard.

Teaching minors and certain other minors are structured (that is, the specific requirements are designated); others are not. The headnotes of the individual disciplines describe the structured minors. If there is no reference to the minor, it is to be assumed that any twenty units in the discipline which the student is eligible to take, and which are not otherwise excepted, constitute a minor. A teaching minor is for pre-education majors, but it may be used to satisfy the requirement for the minor for the Bachelor of Arts or the Bachelor of Science if a minimum of twenty units is completed. When the minor is in one or two disciplines, the student filing for a degree need not specify the individual courses making up the minor. If, however, the minor is made up of subjects from three or more disciplines, the student must submit a list of courses making up the minor. This submission is to be made at the time of filing for the degree. A standard form is available in the office of the deans and the departmental advisers. The submission must be approved by the student’s departmental adviser and in the office of the deans. Upon completion, the form is submitted to Degree Certification.

Restrictions on the Minor: The supporting minor may not include freshman composition or first-year courses in a foreign language (except for Greek, American Indian languages, the Oriental languages, Fren. 302a-302b, Port. 202a-202b, and Span. 202a-202b), or courses in physical education (except 259a-259b, 288, 279, 328, 346, 348, 358, 370, 373, 374, 380, 408, 422, 485, 496a, and 496b), Military Aerospace studies, Military Science, or the School of Health Related Professions. Courses selected for the minor from two or more departments or programs must be approved by the office of the deans if the minor is to be used to satisfy a group requirement, except in the case of the equivalent of a minor in humanities. For unstructured minors, at least six units must be in upper-division courses.

General Studies Curriculum for the Degree of Bachelor of Arts

The general studies major is designed to meet the educational needs and interests of the student who wishes a broad educational approach to a degree program. It provides the flexibility which enables the student to develop an individual study program of high academic quality. This program must be built around study areas according to the student’s abilities and educational goals.

Requirements for this degree must be completed as follows:

GROUP REQUIREMENTS (for details, see this same subheading elsewhere in this section)

GROUP I. Freshman Composition (6 units)
GROUP II. Humanities (8-9 units)
GROUP III. Foreign Language (variable)
GROUP IV. Social Science (9 units)
GROUP V. Mathematics (3 units)
GROUP VI. Science (8-9 units)

SUBJECT AREAS
Subject Area I (20 units)
Subject Area II (20 units)
Subject Area III (20 units)

ELECTIVES to total 125 units.

A subject area is defined as a twenty-unit block of courses which is to be designed with the assistance of an academic adviser in the deans’ office. Subject Areas I and II each must be in a single program or major field of study in which a student could earn a Bachelor of Arts or Bachelor of Science. Subject Area III may be in courses from one of these disciplines, from an approved combination of courses unified by a common theme, or from another college. Courses in Subject Area III may not be in more than three academic disciplines. If they are in three, at least six of the units must be in upper-division course work. Freshman Composition, the first year in a foreign language (except in Greek, American Indian languages, the Oriental languages, Fren. 302a-302b,
Port. 202a-202b, and Span. 202a-202b), and courses in physical education (except for 259a-259b, 288, 279, 328, 346, 348, 358, 370, 373, 374, 380, 408, 422, 485, 496a, and 496b), Military Aerospace studies, Military Science, or the School of Health Related Professions may not be included in the subject areas. A maximum of nine units of independent study may be included in the subject areas, with no more than six units in a single subject area. At least twelve units in Subject Areas I and II must be university credit from the University of Arizona. Ninety units in the degree must be taken in courses offered through the Faculties of Humanities, Science, and Social and Behavioral Sciences. Thirty upper-division units are required, including at least eighteen upper-division units in the three subject areas collectively. At least twelve upper-division units are required in Subject Areas I and II collectively. Up to thirty units of economics, 35 units of geography, and thirty units of geosciences may be counted toward these 90 units. A graduation average of 2.0000 is required for all university credit courses taken and included collectively in the subject areas. Approval of the entire degree program by the deans’ Scholastic Committee must be obtained prior to acceptance as a general studies major. When filing for the degree, the student must submit on a special form an approved list of all completed and scheduled courses for all three subject areas. Students electing a double major must consult an academic adviser in the deans’ office.

Good Standing

Since 125 units are required for either the Bachelor of Arts or the Bachelor of Science degrees, the student in good standing will normally take sixteen units per semester. A maximum of eighteen may be carried without special permission, but a student wishing to take a heavier course load must obtain approval from the office of the deans.

Good standing means that a student has achieved a certain minimum grade point average, according to the following table:

<table>
<thead>
<tr>
<th>Total units completed</th>
<th>Minimum grade point average based upon university credit carried at University of Arizona</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fewer than 25 units</td>
<td>1.7500</td>
</tr>
<tr>
<td>From 25 through 55 units</td>
<td>1.9000</td>
</tr>
<tr>
<td>56 or more units</td>
<td>2.0000</td>
</tr>
</tbody>
</table>

Students whose cumulative averages fall below those given above face academic probation and disqualification, the conditions for which are given elsewhere in this catalog.

PREPROFESSIONAL PROGRAMS

The Prehealth/Prelegal Professions Committee has been established in the College of Arts and Sciences to help students qualify for admission to professional schools of dentistry, law, medicine, occupational therapy, optometry, osteopathy, physical therapy and podiatry. Students interested in the programs leading to these professions should consult an adviser in the deans’ office, 347 Modern Languages Building, early in their careers.

These preprofessional programs are not majors in themselves; that is, there are no majors called “premedical,” “predental,” “prelaw,” etc. In each program the student must select an established major in this college or in one of the other colleges.

Students embarking upon other preprofessional programs (such as education, nursing, pharmacy, veterinary medicine) can obtain preliminary assistance from a counselor in the deans’ office, but they should seek advice in the appropriate colleges.

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

In many of the sixty schools and colleges of dentistry, the stated “formal minimum” predental training is two years and the “generally acceptable minimum” is three or four years. The vast majority of those accepted into dental school, however, have a bachelor’s degree. Basic minimum requirements include one year each of biology, English, inorganic chemistry, organic chemistry, physics, and usually mathematics. Additional suggested or required course work varies considerably from a “broad liberal arts background” (courses in psychology are often mentioned) to art, sculpturing, and a metal machine shop. A student planning to apply for admission to a particular dental school should refer to Admission Requirements of U.S. and Canadian Dental Schools, published annually by the American Association of Dental Schools, to insure that the specific requirements are met.

Evaluation is based upon the entire academic record, the Dental Admission Test (DAT), extracurricular activities, letters of recommendation, and personal interviews. Although no major is preferred, it is important that the student excel in the major. The DAT must be taken no later than the fall of the year preceding that in which the applicant plans to enter dental school.

Education

Education is a professional college and admits only students who have reached junior standing. Because certification requirements for teaching involve lower-division courses, students should see an adviser in the College of Education regarding course selection during lower-division study. (See also College of Education section of this catalog.)

Law

A broad liberal education is considered an excellent preparation for a career in law, and it is generally accepted that there is no preferred major for such preparation. Every good lawyer must be highly skilled in the use of language and have a deep understanding of social, political, and economic institutions.

The two most important law school admission criteria are the student’s undergraduate grade point average and Law School Admission Test (LSAT) scores. The Prelaw Handbook is an excellent source of information for prelaw students. Students are also encouraged to read the College of Law section of this catalog. Students interested in a prelaw program of studies should seek the guidance of a prelaw adviser no later than their sophomore year.

Medicine

Although colleges of medicine differ in their specific entrance requirements, all emphasize a well-balanced cultural education, strong foundations in the natural sciences and mathematics, highly developed communication skills, a solid background in the social sciences and humanities and outstanding personal characteristics. Most of them require a bachelor’s degree and all of them specify minimum requirements. A student planning to apply for admission to a particular medical college should refer to Medical School Admissions Requirements, published annually by the Association of American Medical Colleges, to insure that the specific requirements are met.

Evaluation is based upon the entire academic record, the Medical College Admission Test (MCAT), extracurricular activities, letters of recommendation, and personal interviews. Although no major is preferred, it is important that the student excel in the major.

The University of Arizona College of Medicine has established the following minimum requirements:

a. Successful completion of ninety semester units (thirty upper division) or 135 quarter units (45 upper division) at an approved college or university;

b. Successful completion of two full semesters (or three quarters) in each of the following areas: general chemistry, organic chemistry, physics, general biology or zoology, and English;

c. Completion of the MCAT no later than the year preceding that in which the applicant plans to enter medical school.

In addition, applicants cannot be considered unless they are residents of Arizona, Alaska, Montana or Wyoming, which participate in the WICHE program.

Nursing

Nursing is a professional college which admits students selectively to the upper-division clinical nursing courses beginning in the junior year. Students are admitted to the College of Arts
and Sciences for the preclinical portion of the program. Advisers in the office of the deans assist students in planning these first two years. (See the College of Nursing section for the specific requirements.) Since enrollment in the College of Nursing is limited, completion of the required preclinical courses does not assure the student of admission to the nursing major. The special application form to request admission to the clinical portion of the program must be obtained directly from the College of Nursing and submitted approximately one year in advance.

**Optometry**

Entrance requirements for the thirteen optometric schools and colleges vary slightly, but the minimum preoptometric requirements consist of two years of undergraduate course work (sixty units), including one year each of English, general biology or zoology, inorganic chemistry and physics. Most of the institutions also require one semester each of organic chemistry and calculus and one year of psychology. The science courses should have laboratories and should be of preprofessional caliber. Students considering the study of optometry should contact either the American Optometric Association or the schools they intend to enter regarding specific requirements for admission. All applicants are required to take the Optometric College Admissions Test (OCAT), offered twice a year.

**Pharmacy**

To be admitted to the College of Pharmacy, a student must have completed 66 units of college-level courses, including Freshman Composition; Chem. 103a-103b, 104a-104b, 241a-241b, 322, 323; Math. 123, 263; G.Bio. 102, 104; Phys. 102a-102b, 180a-180b; Econ. 210; Micr. 110; and ten to twelve units of electives from Groups I and II. (See the College of Pharmacy section.)

**Podiatry**

There are five colleges of podiatric medicine in the United States. Although all require at least sixty semester units (ninety quarter units) of undergraduate course work, about 98 percent of the students selected have completed three or more years of prepodiatric education, and about ninety percent have a bachelor's degree. Minimum prepodiatric requirements consist of one year each of English, general biology or zoology, and inorganic chemistry; one semester each of organic chemistry and physics; and a variable number of other courses (including, in some cases, additional chemistry, physics, and mathematics), particularly in the humanities and social sciences. The science courses should have laboratories and be of preprofessional caliber. Students considering the study of podiatry should contact either the American Association of Colleges of Podiatric Medicine or the schools they intend to enter regarding specific requirements for admission. The colleges of podiatric medicine have adopted the new Medical College Admission Test (MCAT) as an entrance requirement for applicants.

**SUPPORTING MINORS**

**American Indian Studies**

A supporting minor is offered in American Indian studies. This minor, consisting of at least twenty units selected from the courses listed under "American Indian Studies" in the Departments and Courses of Instruction section of this catalog, provides a wide range of instruction in the history, culture, lifeways and contemporary problems of the native people of the New World. The Departments of Anthropology, Art, English, Linguistics, Political Science, and Sociology, and various departments in the College of Education contribute to this program, which provides American Indian students with basic information on their cultural heritage and its significance in the contemporary world. It also provides other students with a greater appreciation for the lifeways and value systems of American Indians.

**Black Studies**

A supporting minor is offered in Black studies. This minor consists of at least twenty units selected by the student, in consultation with the chairman of the Black Studies Committee, from the courses listed under "Black Studies" in the Departments and Courses of Instruction section of this catalog. The Black studies minor is designed to provide Black students with basic information about their cultural heritage and to provide other students with a greater appreciation for the culture of Black people.
Women's Studies

A supporting minor is offered in women's studies. The minor, consisting of at least twenty units selected by the student from the courses listed under "Women's Studies" in the Departments and Courses of Instruction section of this catalog, offers an opportunity to explore scholarly materials and research not found in the traditional curriculum.

SPECIAL PROGRAMS

Cooperative Program in International Management Careers
College of Arts and Sciences/American Graduate School of International Management

The College of Arts and Sciences of the University of Arizona and the American Graduate School of International Management (Thunderbird) offer a cooperative program which combines liberal with professional education as preparation for an international career.

The college provides academic counseling to undergraduates in preparation for the intensive graduate courses at Thunderbird. The interested student should take a foreign language, international studies, and a combination of business classes. A complete preparatory program includes course work in statistics, mathematics, computer science, English business and technical writing, finance, and upper-division courses in a business specialization area. Matriculation in upper-division business courses requires a grade point average of 2.2500. The major may be selected in consultation with an adviser in the deans' office.

Business or public service experience makes a valuable contribution to the overall success of the graduate, as does extended experience overseas. Students who take a technical degree are enjoying marked success in combining their technical skills with the tripartite curriculum of AGSIM.

Exceptional opportunities are open to both U.S. and foreign students who demonstrate maturity, leadership capabilities, and preparation in various phases of multinational business or international affairs. At this time, women make up approximately 27 percent of the enrollment.

Recommended courses in business have been combined for the Thunderbird preparatory program and the college's requirement of a minor. Additional information is available from the deans' office.

Foreign Service

Students preparing to take the United States Government Foreign Service examinations may major in any of several departments but should plan a program of study emphasizing (1) economic analysis, personnel management and public relations; (2) area studies — geography, history, political science, and language or languages of the area chosen; (3) United States government, history, literature, and English composition; and (4) comparative government, international relations.

The international relations field of study within the political science major in the Department of Political Science is specifically intended for students interested in foreign service. Students should consult the foreign service adviser in that department.

East Asia Study Center and Near Eastern Center

The Centers coordinate teaching and research relating to the Middle East and East Asia in the disciplines of anthropology, art, economics, geography, history, literature, philosophy, political science, and Oriental languages and cultures. Several interdisciplinary programs of study, where Oriental languages and area instruction represent a strong concentration, are found in curricula leading to the Bachelor of Arts degree with a major in Oriental studies. The Master of Arts and the Doctor of Philosophy degrees in Oriental studies. Descriptions of the major and its various programs of study are included under "Oriental Studies" in the Catalog of Instruction section of this catalog.

STUDY ABROAD — The University is a member of the Center for Arabic Studies Abroad and of the American Research Center in Egypt, both of which offer selected undergraduate and graduate students opportunities for intensive study of Arabic language, literature, and culture in Cairo, Egypt. The University also participates in a graduate exchange program with the National Taiwan and the Cheng Kung Universities in Taiwan. The University is a member of the
American Schools of Oriental Research, which has student programs in ancient Near Eastern studies, Biblical studies, and archaeology at its centers in Nicosia, Jerusalem, and Amman.

Social Work

Students interested in professional careers in social work should plan on study through the master's degree. Because each graduate school of social work has its own statement of requirements, students wishing to know more about the nature of professional social work should consult an adviser in the office of the deans, examine catalogs from the graduate schools of social work, or register in relevant course work on this campus. Although the college has no degree program in social work, it does offer courses which would be important to a student interested in that subject.

Cooperative Education

The College participates fully in the program joining work experience with progress toward a degree. For further information, please contact the office of the deans.

HONORS IN THE COLLEGE OF ARTS AND SCIENCES

HONORS PROGRAM — The departments of the college participate in the Honors Program. DEANS' HONOR LISTS — The Deans' Honor Lists are composed of the names of those students in the college who carry at least fifteen units of work in a semester and attain a grade average of 3.5000 or better. Students carrying from twelve to fifteen units of work and attaining the required 3.5000 or better scholastic average are listed on the Honorable Mention List. These lists are posted in the college office at the close of each semester.
The college offers professional education in business and public administration. Its purpose is to prepare men and women for managerial and professional positions in the public and private sectors. The college also provides continuing educational opportunities for those seeking to improve their positions. Faculty of the college are actively engaged in research on a wide range of economic and administrative topics.

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

The college faculty offers a rich combination of experience in professional management problems and practices, scholarship, teaching and research. Many members serve as consultants in industry, government, health care, education and transportation. The faculty averages $1 million annually in research grants and contributions. Several faculty members have authored texts which are widely used in management education throughout the U.S. In addition, the faculty is well represented on the editorial boards of major professional publications.

The college includes the following departments: Accounting; Economics; Finance and Real Estate; Geography and Regional Development; Management; Management Information Systems; Marketing; and Public Policy, Planning and Administration.

**DEGREE PROGRAMS**

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

UNDERGRADUATE MAJORS — Within the B.S.B.A. degree program, students may select a major in accounting, business economics, finance, general business administration, management information systems, marketing, operations management, personnel management, real estate, or regional development.

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

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

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

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

GRADUATE DEGREES — The Graduate College, through the College of Business and Public Administration, offers a number of graduate degrees for qualified students. These include the Master of Business Administration; Master of Public Administration; Master of Accounting; Master of Arts degree with majors in economics and geography; and Master of Science degree
with majors in finance, management, management information systems, marketing, and urban planning.

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

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

STUDENT ADVISEMENT

Students should consult with advisors regarding all relevant aspects of their academic programs.

The Undergraduate Programs Office, located in BPA 108, provides advising for all freshmen and sophomores in the college. General business administration majors are advised throughout all four years in the Undergraduate Programs Office. This office also advises upper-division transfer students (whether from other colleges on the campus or from other universities) during their first term in the college.

Continuing students registering for their junior and senior years are advised through the department administering their major. Students should request an advisor in the department office.

The degree of Bachelor of Science in Education with a major in business education is available in the College of Education. Students majoring in business education are advised by the Department of Business and Career Education in that college. For requirements for the major, see the Department of Business and Career Education elsewhere in this catalog.

SPECIAL ADMISSION REQUIREMENTS

Incoming freshmen should present credit in mathematics as follows: one unit of elementary algebra, ½ unit of intermediate algebra, and ½ unit of advanced algebra.

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

TRANSFER CREDITS

GENERAL STATEMENT — Undergraduate programs in business administration in universities normally concentrate the professional courses in the last two years of a four-year program. Only a limited amount of work in business courses is offered below the junior year. The objective of this policy is to permit the student to acquire a foundation of work in the basic arts and sciences as a prerequisite for professional courses in business.

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

Students planning to take their first two years of work at a junior college or at another four-year institution should take only those courses in business that are offered as freshman- or sophomore-level courses at any of the three state universities. These lower-division courses are numbered 1 through 299. A maximum of thirty hours of business and economics courses from community colleges will be accepted toward a bachelor's degree in business administration.

Professional business courses taught in 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 business law will be accepted as an exception to this policy). Such courses may be utilized in the free elective category subject to the thirty-hour 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.

**SUGGESTED COURSES** — The following general pattern of courses is recommended for students completing their first two years’ work in a junior college and planning to transfer to one of Arizona’s universities without loss of credit:

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounting</td>
<td>6</td>
<td>English</td>
<td></td>
</tr>
<tr>
<td>Economics</td>
<td>6</td>
<td>Mathematics</td>
<td></td>
</tr>
<tr>
<td>Quantitative Analysis &amp; Statistics</td>
<td>3</td>
<td>Science</td>
<td></td>
</tr>
<tr>
<td>Business Law</td>
<td>3</td>
<td>Humanities</td>
<td></td>
</tr>
<tr>
<td>Lower-Division Business Electives</td>
<td>12</td>
<td>Social Science</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Electives</td>
<td></td>
</tr>
</tbody>
</table>

**UPPER-DIVISION BUSINESS COURSES** — Normally, the college accepts transfer credit in upper-division courses only from schools or colleges whose programs are accredited by the American Assembly of Collegiate Schools of Business.

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

**ADVANCED STANDING**

Upper-division (300 and 400 level) courses in the College of Business and Public Administration offered during the fall and spring terms are open only to students who have been admitted to advanced standing in the college or with prior approval of the dean of the college. Any ineligible student who has inadvertently been enrolled in an upper-division BPA course will have the enrollment cancelled. Preregistration requests for any 300- and 400-level BPA courses from a student without advanced standing or the proper approval will be deleted and will not appear on the preregistration assignment schedule form sent from the registrar's office.

All students seeking to enroll in upper-division BPA courses must apply for permission to do so. Application forms are available in the Undergraduate Programs Office, BPA 108. To qualify for preregistration in upper-division BPA courses, an application must be filed by March 15 for fall or September 15 for spring. Otherwise, an application must be filed at least one month prior to walk-through registration for the semester in which upper-division enrollment is sought. Continuing students will be required to submit their most recent grade slip (or other official record of academic performance) from the University of Arizona. Students who have attended other institutions must provide transcripts of all prior work undertaken as part of their application.

A student having attained advanced standing, who is absent from the University for a regular semester or longer, regardless of reason, must reapply to have the advanced standing revalidated upon readmission to the University.

**BPA students:** To attain advanced standing in the college, a B.S.B.A. or B.S.P.A. program student must have completed at least 56 units of specified lower-division courses (including all prescribed English, mathematics, and business and/or public administration requirements) with a cumulative grade-point average of 2.25 or higher on all work undertaken.

Students who are currently enrolled in course work that will complete all requirements for advanced standing and who wish to preregister for upper-division BPA courses in the following semester may apply for conditional advanced standing on a one-time basis. Conversion to regular advanced standing will be made upon successful completion of the in-process course work. However, if all requirements have not been met prior to the beginning of the subsequent term, the conditional admittance will be revoked and any registrations in 300- and 400-level BPA courses cancelled.

**Non-BPA students:** Students enrolled in other colleges and divisions of the University must apply to the College of Business and Public Administration for permission to register for any upper-division BPA course. Students in degree programs outside the college who have specific catalog-designated, upper-division BPA course requirements in their majors will be
given permission to enroll on a course-by-course basis upon joint agreement of the dean of the
student’s college and the College of Business and Public Administration.

Students in other colleges and divisions of the University who wish to register for 300-
and 400-level courses, either as electives or as part of a program minor, can attain advanced
standing status in the college if they have upper-division standing in their own colleges and
have a cumulative grade-point average of 2.25 or higher in all work undertaken. These students
must also meet stated prerequisites or be otherwise eligible for the specific courses selected.

PRESCRIBED CURRICULUM FOR BACHELOR OF SCIENCE
IN BUSINESS ADMINISTRATION

A student is required to earn 125 units for the B.S.B.A. degree. These include (1) at least
56 units of the specified lower-division requirements; (2) an additional 15 units, of which nine
must be upper-division, in non-business subjects beyond those taken to fulfill the lower-division
requirements; (3) 21 units of required professional courses; (4) a major of at least 15 units in
one of the major fields of business administration; and (5) sufficient free electives to meet the
minimum 125 total unit requirement for graduation. The number of units of free electives re-
quired varies because of pre-major requirements and other options selected. Free electives may
include any university credit course or acceptable college-level credit.

Lower-Division Requirements

These courses are required during the freshman and sophomore years. Students must
adhere to course prerequisites as indicated in the catalog.

<table>
<thead>
<tr>
<th>Courses</th>
<th>Units</th>
<th>Yr. Normally Taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engl. 101 or 103</td>
<td>3</td>
<td>Fr.</td>
</tr>
<tr>
<td>Engl. 102</td>
<td>3</td>
<td>Fr.</td>
</tr>
<tr>
<td>Pol. 102</td>
<td>3</td>
<td>Fr.</td>
</tr>
<tr>
<td>Math. 119*</td>
<td>3</td>
<td>Fr.</td>
</tr>
<tr>
<td>Math. 123*</td>
<td>3</td>
<td>Fr.</td>
</tr>
<tr>
<td>M.I.S. 111</td>
<td>3</td>
<td>Fr.</td>
</tr>
<tr>
<td>Social Science</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Selected from anth., psyc., soc., geog. (102a, 102b, 151, 207 and 275 only).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural Science</td>
<td>6-8</td>
<td>Fr. or So.</td>
</tr>
<tr>
<td>Phil. 112 and one semester of natural sci. or two semesters of natural sci. selected from astr., atmo., cell., chem., ecol., g.bio., geog. (103a, 103b, 104a, and 104b only), geos., hydr., micr., phys.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humanities or Foreign Language</td>
<td>8-10</td>
<td>Fr. or So.</td>
</tr>
<tr>
<td>Fullfilled by two semesters of the same foreign language or by humanities course options selected from list available in BPA 108.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acct. 200</td>
<td>3</td>
<td>So.</td>
</tr>
<tr>
<td>Acct. 210</td>
<td>3</td>
<td>So.</td>
</tr>
<tr>
<td>Econ. 201a and 201b</td>
<td>6</td>
<td>So.</td>
</tr>
<tr>
<td>or Econ. 210 and Econ. 300 (in junior year).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sp.C. 112</td>
<td>3</td>
<td>So.</td>
</tr>
<tr>
<td>Mgmt. 275</td>
<td>3</td>
<td>So.</td>
</tr>
<tr>
<td>Any 100-200 level pre-major requirement</td>
<td>0-6</td>
<td>So.</td>
</tr>
</tbody>
</table>

*The math. readiness test, given prior to registration periods, is used to determine math. placement and the student’s readiness for either Math. 119 or 123. College algebra or two entrance units of high school algebra are prerequisites for Math. 119 and 123.

Non-Business Requirements

All candidates for the degree must complete 15 units in non-business courses beyond those taken to fulfill the lower-division requirements above. At least nine of the units must be in courses numbered 300 or above.
These units may be chosen from any University offering, including geography, public administration, and urban planning within the college, but not from the Departments of Accounting, Finance and Real Estate, Economics, Management, Management Information Systems, and Marketing. Courses in the college crosslisted with departments in other colleges may be included as non-business courses if not specified as part of the student’s major.

No more than six units of military science and aerospace studies may be used to meet this requirement.

**Required Professional Courses**

All candidates for the degree must complete the professional courses listed below. These courses should be completed in the junior year, with the exception of the course in business policy which should be taken in the senior year. Advanced standing is required for admission to these courses.

- Econ. 330.
- Fin. 311.
- Mgmt. 305, 320, and 373.
- Mktg. 361.
- Business policy. [option varies; see description of major fields]

**MAJOR FIELDS AVAILABLE**

Students declare one of the major fields of business administration upon enrollment. Any subsequent change in major is accomplished by completing a change-of-major form available in BPA 108.

The major consists of 15 units with additional units optional to the student. The grade-point average earned in the major must be 2.0000 or better to meet graduation requirements and includes all courses undertaken in the major, but does not include courses taken for the business policy option. Transfer students must offer at least six University of Arizona credit units toward the major with no more than nine units being transferred from other institutions.

The requirements for each major field in business administration are given below. Advanced standing is required for enrollment in all 300- and 400-level BPA courses.

**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. All students planning to major in accounting must complete M.I.S. 121 before beginning the major. Accounting majors must take Acct. 310 and Mgmt. 471 or M.I.S. 471 to fulfill the business-policy requirement.

(a) All students in this major will complete: Acct. 300a-300b.
(b) An additional nine units (three courses) must be selected from the following: Acct. 320, 401, 410, 422, 431, 461, 472, 481.

Additional upper-division accounting courses may be taken by students who want further undergraduate education for career fields or for the Uniform C.P.A. Examination. Some states now require a five-year program to sit for the 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 1645 W. Jefferson, Phoenix, Arizona 85007.

**Business Economics**

This major is designed for those who wish to concentrate in economic analysis and to prepare themselves for such professional work in business firms, governmental agencies, private research, or consulting firms; or to enter college teaching following graduate study.
Business economics majors must take Econ. 361 and Mgmt. 375 prior to beginning major courses, and Geog. 471, Mgmt. 471, M.I.S. 471, or Mktg. 471 to fulfill the business policy requirement.

The major consists of fifteen units of economics, including Econ. 332, to be selected from the 300- and 400-level courses offered by the Department of Economics.

Financial Economics

This major offers undergraduate preparation for careers or graduate work in corporate financial management, investment analysis, security brokerage, and investment or commercial banking. Finance majors must take Acct. 320 and Mgmt. 375 prior to beginning major courses, and Fin. 471 or Mgmt. 471 to fulfill the business-policy requirement.

(a) All students in this major will complete Fin. 412, 421, and 431.
(b) Six additional units (two courses) will also be chosen from the following: Acct. 300b, 401; Econ. 332, 422, 442; Fin. 361, 362, 422; A.Ec. 313; Mgmt. 426.

General Business Administration

This major gives the student a broad knowledge of the principal areas of business administration. It prepares the graduate for a variety of careers (including intensive graduate study in business), and aims to educate generalists rather than specialists. General business administration majors must take Mgmt. 471 to fulfill the business-policy requirement.

The major consists of fifteen units. Students will select one three-unit 300- or 400-level course from each of five of the following seven areas: (1) accounting; (2) economics; (3) finance and real estate; (4) geography and regional development (305, 371, 379, 453, 456, 461, or 471 only); (5) management; (6) management information systems; and (7) marketing (364 and 366 may not be selected).

Management Information Systems

This major is designed for students with interest in establishing careers in the analysis, design, implementation, use and management of computerized information systems in an organizational environment.

All students planning to major in management information systems must complete M.I.S. 121 before beginning the major. M.I.S. majors must take M.I.S. 471 to fulfill the business-policy requirement.

(a) All students in this major will complete M.I.S. 301, 341, 441, and an approved major course.
(b) An additional three units (one course) must be selected from the following: M.I.S. 331, 421, 422, 451, and 461.

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

Marketing

The major offers undergraduate preparation for careers both in business and in nonprofit organizations. Attention is given to understanding the changing wants of customers and the public; the development of products and services; pricing; distribution; promotion; planning, execution and control of marketing programs; and maintenance of satisfactory relationships with customers and the public. Marketing majors must complete Mgmt. 375 prior to beginning major courses, and Mktg. 471 to fulfill the business-policy requirement.

(a) All students in the major will complete Mktg. 440 and 450. (Mktg. 361, 440, and 450 should be taken as soon as one becomes eligible in order to ensure flexibility in selecting major courses.)
(b) Nine additional units (three courses) are to be selected from 400-level marketing courses.
Operations Management

This major offers preparation for management careers in manufacturing and service operations. Emphasis is placed on operation and control of inventory systems, materials management, plant and project scheduling, and service design. Both quantitative and computer based techniques are used for specific applications in these areas.

The major is also useful for those who wish to understand more about the functioning of the production system of any organization. All students planning to major in operations management must complete M.I.S. 121 or 122 before beginning the major. Operations management major must take Mgmt. 471 to fulfill the business-policy requirement.

(a) All students in the major will complete Mgmt. 473a-473b.
(b) Nine additional units (three courses) will be completed from the following: Mgmt. 474, 476, 477; M.I.S. 301, 331, 421; S.I.E. 405, 482.

Personnel Management

This major is concerned with the recruiting, development, compensation, and utilization of human resources, and with the creation of constructive human relationships within modern organizations. Prospective majors are strongly urged to choose elective courses in psychology and sociology. Psyc. 100a-100b should be elected in the freshman or sophomore years. Personnel management majors must complete Mgmt. 471 to fulfill the business-policy requirement.

(a) All students in this major will complete Mgmt. 330 and 430.
(b) Nine additional units (three courses) must be selected from the following: Coun. 521; Econ. 382, 383, 386; Psyc. 450; Sp.C. 412; P.P.P.A. 411, 413, 417, 444; Mgmt. 435, 480.

Real Estate

This major, by providing a broad basic understanding of the legal, economic, social, and civic aspects of real property, prepares the student for a career in both the real estate profession and related industries. Real estate majors must take Acct. 320 and Fin. 261 before beginning major courses, and Geog. 471, Mgmt. 471 or Fin. 471 to fulfill the business-policy requirement.

(a) All students in this major will complete Fin. 361, 362, 461.
(b) Six additional units (two courses) must be selected from the following: Econ. 435, 436; Fin. 251, 463, 465; Geog. 379; Mgmt. 426; U.Pl. 485.

Regional Development

This major is designed for those interested in careers in the field of regional development, i.e., conducting research in problems of local and regional growth and development and in devising and supervising public or private programs for regional development. The regional development major is also appropriate for those who anticipate graduate study in urban and regional planning and development. Regional development majors must complete Geog. 471 to fulfill the business-policy requirement.

(a) All students in this major will complete Geog. 371, 379 or 456, and 453.
(b) Six additional units (two courses) must be selected from the following: Econ. 484; Geog. 257, 305, 457, 461, 481, 485; U.Pl. 300.

PRESCRIBED CURRICULUM FOR BACHELOR OF SCIENCE IN PUBLIC ADMINISTRATION

A student is required to earn 125 units for the B.S.P.A. degree. These include (1) at least 62 units of the specified lower-division requirements; (2) nine units of upper-division courses offered outside the College of Business and Public Administration; (3) 18 units of required professional courses; (4) a major totaling 21 units that consists of 12 units of restricted options in a major field, and nine units of required courses and restricted options in a management emphasis area; and (5) sufficient free electives to meet the minimum 125 total unit requirements for graduation. The number of units of free electives required varies depending upon options se-
lected. Free electives may include any university credit course or acceptable college-level credit.

Lower-Division Requirements

These courses are required during the freshman and sophomore years. Students must adhere to course prerequisites as indicated in the catalog.

<table>
<thead>
<tr>
<th>Courses</th>
<th>Units</th>
<th>Yr. Normally Taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.P.P.A. 100</td>
<td>3</td>
<td>Fr.</td>
</tr>
<tr>
<td>Engl. 101 or 103</td>
<td>3</td>
<td>Fr.</td>
</tr>
<tr>
<td>Engl. 102</td>
<td>3</td>
<td>Fr.</td>
</tr>
<tr>
<td>Pol. 102</td>
<td>3</td>
<td>Fr.</td>
</tr>
<tr>
<td>Pol. 103</td>
<td>3</td>
<td>Fr.</td>
</tr>
<tr>
<td>Math. 119*</td>
<td>3</td>
<td>Fr.</td>
</tr>
<tr>
<td>Math. 123*</td>
<td>3</td>
<td>Fr.</td>
</tr>
<tr>
<td>M.I.S. 111</td>
<td>3</td>
<td>Fr.</td>
</tr>
<tr>
<td>Social Science</td>
<td>3</td>
<td>Fr.</td>
</tr>
<tr>
<td>Selected from anth., geog. (102a, 102b, 151, 207 and 275 only), psyc., soc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural Science</td>
<td>6-8</td>
<td>Fr. or So.</td>
</tr>
<tr>
<td>Phil. 112 and one semester of natural science, or two semesters of natural science selected from astr., atmo., cell., chem., ecol., g.bio., geog. (103a, 103b, 104a and 104b only), geos.,hydr., micr.,phys.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humanities or Foreign Language</td>
<td>8-10</td>
<td>Fr. or So.</td>
</tr>
<tr>
<td>Fulfilled by two semesters of the same foreign language or by humanities course options selected from list available in BPA 106.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P.P.P.A. 204**</td>
<td>3</td>
<td>So.</td>
</tr>
<tr>
<td>Acct. 200</td>
<td>3</td>
<td>So.</td>
</tr>
<tr>
<td>Acct. 272</td>
<td>3</td>
<td>So.</td>
</tr>
<tr>
<td>Econ. 201a and 201b</td>
<td>6</td>
<td>So.</td>
</tr>
<tr>
<td>or Econ. 210, and either Econ. 217 or Econ. 300 (in junior year).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sp.C. 112</td>
<td>3</td>
<td>So.</td>
</tr>
<tr>
<td>Mgmt. 275</td>
<td>3</td>
<td>So.</td>
</tr>
</tbody>
</table>

* The math. readiness test, given prior to registration periods, is used to determine math. placement and the student's readiness for Math. 119 or 123. College algebra or two entrance units of high school algebra are prerequisites for Math. 119 and 123.

**To be taken prior to Mgmt. 275.

Non-Business Upper-Division Requirement

The student must complete nine units at the upper-division level in courses offered outside the College of Business and Public Administration.

Required Professional Courses

All candidates for the degree must complete the professional courses listed below. These courses generally should be completed in the junior year with exception of P.P.P.A. 472, which should be taken in the senior year. Advanced standing is required for admission to the 300- and 400-level BPA courses.

Mgmt. 305
Mgmt. 373
P.P.P.A. 410a
Econ. 435
Pol. 474
P.P.P.A. 472
MAJOR FIELDS AVAILABLE

Students declare one of the major fields of public administration upon enrollment. Any subsequent change in major is accomplished by completing a change-of-major form available in BPA 108.

The major consists of 12 units of restricted options in a major field plus 9 units of required courses and restricted options in a management emphasis area. The grade-point average earned in the major must be 2.0000 or better to meet graduation requirements and includes all courses undertaken in the major. Transfer students must offer at least 12 University of Arizona credit units toward the major with no more than 9 units being transferred from other institutions.

The requirements for each major field in public administration are given below. Advanced standing is required for enrollment in all 300- and 400-level BPA courses.

Public Management

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

(a) All students in this major will complete P.P.P.A. 401, 413, 414, Mgmt. 330. Three units of other course work may be substituted for one of these courses if approved by the student's major advisor.
(b) Nine additional units (three courses) must be selected from the required courses of one of the management emphasis areas listed below. Some public management major required courses overlap with courses in the management emphasis areas. If this occurs, students selecting these courses cannot use them to fulfill the management emphasis area requirement. Substitutions must be approved by the student's major advisor.

Criminal Justice Administration

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

(a) All students in this major will complete P.P.P.A. 330, 332, 337, 430. Three units of other course work may be substituted for one of these courses if approved by the student's major advisor.
(b) Nine additional units (three courses) must be selected from the required courses of one of the management emphasis areas listed below.

Health Services Administration

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

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

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

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

Public Recreation Administration

Offered in cooperation with the Department of Physical Education and the School of Renewable Natural Resources, the major in public recreation administration prepares students to exercise staff skills and administrative responsibility in public and private recreational and group work facilities, and offers preparation for graduate work in recreational planning or administration.

(a) All students in this major will complete Ph.Ed. 322, 328, 425, 426; N.R.R. 381.
(b) Four additional units (two courses) must be selected from U.PI. 300; Ph.Ed. 325, 393a, 422, 493a.
(c) Three additional units (one course) must be selected from P.P.P.A. 463; Ph.Ed., 321; N.R.R. 388, 475; Ws.M. 480.

Management Emphasis Areas

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

OPERATIONS MANAGEMENT — All students choosing this management emphasis area will complete:
(a) Mgmt. 476, P.P.P.A. 414.
(b) Three units of course work selected from Mgmt. 435, 474. Three units of other course work may be substituted with approval of the student's major advisor.

HUMAN RESOURCES MANAGEMENT — All students choosing this management emphasis area will complete:
(a) Mgmt. 330, 430.
(b) Three units of course work selected from Mgmt. 435, 480; P.P.P.A. 347, 411, 413, 417, 444; Econ. 382, 383, 386; Coun. 401; Psyc.450.

POLICY ANALYSIS AND STRATEGIC PLANNING — All students choosing this management emphasis area will complete:
(a) P.P.P.A. 401, 405.
(b) Three units of course work selected from P.P.P.A. 410b; Econ. 436; Pol. 406, 407, 480; Mktg. 470.

OTHER COLLEGE PROGRAMS

The Board of Advisors — A group of leading executives from Arizona and other states serves as the Board of Advisors to the College of Business and Public Administration, assisting in the development of resources, providing a communication link between the college and management community, reviewing the goals and objectives of the college, and advising and assisting the dean in the resolution of important policy issues. An important dimension of the board's activities centers around member interaction with the students and faculty of the college.

The Business Partners — Believing that it exists within the total context of the private and public organizational sectors, the college maintains a Business Partners Program in which the institution and the business community provide one another with resources. Among the services supplied to business and industry is assistance in the recruitment of graduates.
The College Alumni Council — The College of Business and Public Administration is one of several within the University which has organized its own Alumni Council. The council assists in obtaining wide recognition of its accomplishments by sponsoring public events at which faculty expertise is made available to the larger community.

The Division of Economic and Business Research (DEBR) — One of the major public services of the college, the division specializes in applied research (as differentiated from scholarly research undertaken by departmental faculty) into economic matters affecting the state of Arizona. The division publishes statistical material as well as the Arizona Review and Arizona's Economy, which contain articles of general interest about the state's changing economy.

The Department of Executive Programs — The Department of Executive Programs utilizes college faculty, as well as experts from across the country, in the presentation of conferences, programs and seminars for executives. The Executive Development Conference, a semi-annual, nine-day program, attracts top executives from throughout the U.S. and several foreign countries.

Distinguished Lectures — Throughout the academic year, leaders in American business and public management are brought to the college to speak to students and faculty. The MBA Student Association sponsors an Executive Lecture Series. Other lectures are presented periodically when exceptional executive talent is available.

Career Guidance — In addition to the services offered by the University of Arizona Placement Office, the College of Business and Public Administration provides career assistance to its students. At career forums throughout the year, students learn more about the kinds of career opportunities available in a variety of business and public fields. Executives also serve as guest speakers in classes and at special programs sponsored by BPA student organizations.

STUDENT INVOLVEMENT

The college encourages student participation in the numerous professional clubs, organizations and honorary societies associated within the various fields with business and public administration.

The BPA student council is a college-wide service organization which serves as a liaison between students, faculty, administration and other student organizations. The council sponsors and participates in a variety of college activities and programs.

The honoraries and professional organizations affiliated with the college include Alpha Kappa Psi, a professional business fraternity; Alpha Mu Alpha, a national marketing honorary; American Marketing Association, a professional marketing organization student chapter; Beta Alpha Psi, a national accounting honorary; Beta Gamma Sigma, a national scholastic honor society; Delta Sigma Pi, an international business fraternity; Management Information Systems Association, a professional information systems organization; Phi Chi Theta, a college professional fraternity; Pi Alpha Alpha, the National Honorary Society for Public Administration; Public Administration Student's Association, and University of Arizona Personnel Administration Association, a student chapter of the American Society for Personnel Administration.

Outstanding student accomplishments are recognized each year through the presentation of a number of awards and honors.
College of Earth Sciences

The College of Earth Sciences is concerned with the earth as a planet. Academic and research programs include those that deal with the solid earth, the hydrosphere, the atmosphere, and the interaction and relationships of these three physical components with each other and with the biological world, including man. The scope of the College includes not only the dynamic processes of the contemporary earth but also the history of the earth and its inhabitants. Other colleges and units within the University also deal with major components of the planet earth in their academic and research programs, and strong relationships are maintained between those groups and the College of Earth Sciences. The College is composed of the Department of Geosciences, the Department of Hydrology and Water Resources, the Laboratory of Tree-Ring Research, and the Water Resources Research Center.

Programs of instruction are augmented at all levels with field trips in Arizona, a state which contains a great diversity of natural features and climatic zones, making it a superb outdoor laboratory for students of earth sciences. Summer field programs are conducted in hydrology, geophysics, and geology. The five-week geology program takes advantage of the Colorado Plateau environment for the first period and emphasizes the more complex geology of the Basin and Range geological province of Southern Arizona during the second half.

DEGREES OFFERED

The College of Earth Sciences offers academic programs leading to the following degrees: Bachelor of Science in Geosciences (concentrations in geochemistry, geology, and geophysics), and Bachelor of Science in Hydrology; Master of Science and Doctor of Philosophy with majors in geosciences (concentrations in geobiology, geochemistry, geology, and geophysics), hydrology, and water resources administration.

A Bachelor of Arts degree program with a major in geosciences is offered by the College of Arts and Sciences through the Department of Geosciences.

ADMISSIONS

FRESHMAN STANDING — See chapter on Admissions. Study in most of the academic programs of the College of Earth Sciences necessitates an extension of the general requirements for admission to the University of Arizona. Admission to full standing in the College of Earth Sciences, except as indicated below*, requires all entering freshman students to present high school credits in the following subjects:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elementary Algebra</td>
<td>1</td>
</tr>
<tr>
<td>†English</td>
<td>4</td>
</tr>
<tr>
<td>Intermediate Algebra</td>
<td>½</td>
</tr>
<tr>
<td>Plane Geometry</td>
<td>1</td>
</tr>
<tr>
<td>Trigonometry</td>
<td>½</td>
</tr>
<tr>
<td>Advanced Algebra</td>
<td>½</td>
</tr>
<tr>
<td>History</td>
<td>1</td>
</tr>
<tr>
<td>Chemistry</td>
<td>1</td>
</tr>
<tr>
<td>Physics</td>
<td>1</td>
</tr>
<tr>
<td>Electives</td>
<td>5½</td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
</tr>
</tbody>
</table>

†For three units of English and two units of foreign language, in which case the number of units of electives is reduced to 4½.

*Those students electing the curriculum leading to the Bachelor of Science in Education degree (earth science teaching major) will meet only the general requirements for admission to the University of Arizona.

Electives should include credits in such subjects as biology, social studies, government, humanities, and foreign languages.
ENTRY DEFICIENCIES — Students will be permitted to enter the College of Earth Sciences if they are deficient in one or more of the high school courses listed above. A student who has a deficiency in English, intermediate algebra, advanced algebra, or trigonometry is required to take respectively Freshman Composition or Math. 116, 117e, or 118. Deficiencies in chemistry or physics will be waived upon satisfactory completion of Chem. 103b and 104b, or Phys. 103b or 110, respectively.

ADVANCED PLACEMENT — Students who have completed college-level courses in high school and have taken the Advanced Placement Examinations of the College Entrance Examination Board (CEEB) will be considered for advanced placement and for the granting of college credit towards degree requirements. (See "Advanced Placement" under the general section on Admission to the University.)

ADVANCED STANDING (Transfer Students) — See “Transfer Students” under Admission to the University.

GRADUATE STANDING — Prospective graduate students should contact the head of the department in which the major is planned for information about graduate degree programs.

HYDROLOGY (WRSP) PROGRAM — The University of Arizona cooperates in the Western Regional Student Program (WRSP) of the Western Interstate Commission for Higher Education by extending special consideration to qualified students who are residents of the thirteen Western states and who desire to enroll in the hydrology curriculum of the College of Earth Sciences. The program is designed to afford such students preference in admission to the University of Arizona as well as exemption from payment of out-of-state tuition. Additional information concerning this cooperative educational program is available from the Dean of Admissions and Records, University of Arizona, Tucson, Arizona 85721.

REQUIREMENTS FOR DEGREES

NUMBER OF UNITS REQUIRED — Each undergraduate curriculum in the College of Earth Sciences is designed so that graduation requirements can be met through a four-year period of study. However, each is sufficiently flexible to permit an extension of study time if such is desired by the student.

A minimum of 135 total units of credit for hydrology majors and 134 total units of credit for geosciences majors must be completed to earn the bachelor’s degree. This total includes credit in required summer field courses. The program must follow one of the prescribed curricula; deviations must be approved through proper channels of the College of Earth Sciences. A regular student who earns sixteen units in each semester and the necessary summer units can complete the degree requirements in four years. A student who earns on the average of fifteen units in each semester plus summer field work will require four and one-half years to earn a degree. Any student earning units at a rate that will ensure completion of degree requirements within four and one-half years and who is maintaining a satisfactory grade record will be considered by the college to be making normal progress toward a degree.

Candidates for a bachelor’s degree may elect to fulfill degree requirements as outlined in any one catalog in effect during their dates of registration for credit at the University. A student who transfers to the College of Earth Sciences from another college in the University must meet the degree requirements under the catalog in effect at the time of the transfer, or any subsequent catalog. (See “Choice of Catalog” under Academic Guidelines.)

MAXIMUM UNITS PER SEMESTER — An undergraduate student may register for a maximum of nineteen credits in a given semester. This maximum may be exceeded by students who have permission of the dean of the college.

GRADUATE DEGREES — The general requirements for graduate degrees are established by the Graduate College. See the Graduate College section of this catalog, or the Graduate Catalog published by the University.
CURRICULUM LEADING TO THE DEGREE OF BACHELOR OF SCIENCE IN GEOSCIENCES

This curriculum is designed to accommodate students wishing to attain a general background in or to specialize in some aspect of the geosciences. Opportunity is provided for the student to broaden his or her background through a wide selection of courses, as well as to attain a breadth of practical experience in the geosciences. Some areas of concentration will prepare graduates for a professional career, while other areas will require additional work at the graduate level.

Several areas of concentration are available within the Bachelor of Science in Geosciences degree. These concentrations, which demand specialized curricula to achieve professional training, are: (1) Geochemistry — The application of chemical properties of elements and their isotopes to the study of the Earth. (2) Geology — The study of earth processes as well as the search for water, mineral, and energy resources. (3) Geophysics — The application of physics to practical and theoretical earth studies.

A core program required of all students working toward this degree is listed below. Additional requirements for various concentrations are listed following the core program.

Core Program for Bachelor of Science in Geosciences Degree

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman Composition</td>
<td>6</td>
</tr>
<tr>
<td>General education electives to be selected from the hum., soc.sci., or for. lang., with no more than 16 units from any one of the three groups. These may be taken during any period of the academic program.</td>
<td>30</td>
</tr>
<tr>
<td>Math. 125a-125b; two additional courses selected from Math. 160 or 263, 215, 223, 253, or 254</td>
<td>12-14</td>
</tr>
<tr>
<td>C.Sc. 115 or 122 or S.I.E. 272 or Math. 275</td>
<td>3</td>
</tr>
<tr>
<td>Geos. 101a-101b</td>
<td>8</td>
</tr>
<tr>
<td>*Field program</td>
<td>6</td>
</tr>
<tr>
<td>Chem. 103a-103b, 104a-104b</td>
<td>8</td>
</tr>
<tr>
<td>†Phys. 110, 116, 121</td>
<td>11</td>
</tr>
<tr>
<td>Eight additional units, approved by the adviser, are to be selected from advanced bio., chem., phys., math., or other approved courses.</td>
<td>8</td>
</tr>
<tr>
<td>Total core</td>
<td>92-94</td>
</tr>
</tbody>
</table>

*Students in the geophysics concentration will meet this requirement by taking the geophysics field course as well as Geos. 412 and 420.
†Phys. 103a-103b and 180a-180b are acceptable and may be substituted with the approval of the adviser.
**For students in the geophysics concentration, this requirement is met by required courses in that concentration.

Geochemistry Concentration

In addition to the core program for the degree of Bachelor of Science in Geosciences, the student must take the following courses:

- Geos. 109 (5), 221 (4), 302 (3), 315a-315b (3-3), 457 (3), 458 (3); plus 15 units of electives for a total of 39 additional units.
- Total units necessary for graduation — 134

Geology Concentration

In addition to the core program for the degree of Bachelor of Science in Geosciences, the student must take the following courses:

- Geos. 109 (5), 221 (4), 225 (4), 302 (3), 303 or 422 or 435 for a total of three units, 315a-315b (3-3); plus fourteen units of electives for a total of 39 additional units.
- Total units necessary for graduation — 134
Geophysics Concentration

In addition to the core program for the degree of Bachelor of Science in Geosciences, the student must take the following courses:

Geos. 107 (4), 221 (4), 302 (3), 419 (3), 420 (4), 424 or 430 or 432 or 434 or 436 for a total of 3 units; Math. 422a-422b (3-3); Phys. 410 or 425 or 460 for a total of 3 units; Phys. 415a (3) or E.C.E. 381 (4); plus electives.

Total units necessary for graduation — 134

CURRICULUM LEADING TO THE DEGREE OF BACHELOR OF SCIENCE IN EDUCATION (EARTH SCIENCE TEACHING MAJOR)

Students in this curriculum will enroll in the College of Earth Sciences for their first two years and transfer to the College of Education at the beginning of their junior year to complete degree requirements. The necessary general education electives to complete this program must have the approval of the Department of Geosciences.

Courses Required*

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth Sciences:</td>
<td></td>
</tr>
<tr>
<td>Astr 110a-110b</td>
<td>8</td>
</tr>
<tr>
<td>Atmo. 171</td>
<td>3</td>
</tr>
<tr>
<td>Geos 101a-101b</td>
<td>3</td>
</tr>
<tr>
<td>Approved earth sciences courses</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>31</td>
</tr>
<tr>
<td>Minor to be selected from chem., phys, or math.</td>
<td>18-22</td>
</tr>
<tr>
<td>Electives</td>
<td>14-20</td>
</tr>
<tr>
<td>Approved bio.</td>
<td>3-5</td>
</tr>
<tr>
<td>Freshman Composition</td>
<td>6</td>
</tr>
<tr>
<td>Pohl. 110</td>
<td>3</td>
</tr>
<tr>
<td>College of Education Requirements</td>
<td>24</td>
</tr>
<tr>
<td>General education electives must be selected from the hum-soc.sci. course listings</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>125</td>
</tr>
</tbody>
</table>

*Candidates for this degree must include at least forty units of upper-division work in the total number of units offered in satisfaction of the requirements for a degree.

CURRICULUM LEADING TO THE DEGREE OF BACHELOR OF SCIENCE IN HYDROLOGY

The hydrology curriculum is designed to give the student a basic knowledge of hydrology and allied subjects. Flexibility is offered through the selection of electives so that a program of study can be developed which best fits the student's desired emphasis.

The graduate from this curriculum will be prepared to undertake professional work in hydrology or related fields, and the better student will be well prepared for graduate studies. See the Hydrology and Water Resources course section for descriptions of courses.

Courses Required

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydr. 150, 296a, 405, 414, 423, 435, 445, 480</td>
<td>25</td>
</tr>
<tr>
<td>Geos. 151, 221, 450</td>
<td>11</td>
</tr>
<tr>
<td>Math. 125a-125b, 223, 254, Stat. 361</td>
<td>16</td>
</tr>
<tr>
<td>Chem. 103a-103b, 104a-104b, and Hydr. 350 or another chem. course beyond 103b, 104b</td>
<td>11</td>
</tr>
<tr>
<td>Phys. 103a-103b</td>
<td>6</td>
</tr>
<tr>
<td>Phys. 180a-180b</td>
<td>2</td>
</tr>
<tr>
<td>Freshman Composition</td>
<td>6</td>
</tr>
<tr>
<td>English 308</td>
<td>3</td>
</tr>
<tr>
<td>Course</td>
<td>Credits</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>C.E. 321</td>
<td>3</td>
</tr>
<tr>
<td>Pl.Sc. 100</td>
<td>3</td>
</tr>
<tr>
<td>Econ. 210</td>
<td>3</td>
</tr>
<tr>
<td>Atmo. 171</td>
<td>3</td>
</tr>
<tr>
<td>W.R.A. 401b, 476</td>
<td>6</td>
</tr>
<tr>
<td>S.I.E. 272</td>
<td>3</td>
</tr>
<tr>
<td>Electives (hum., soc., sci., fine arts, lang.)</td>
<td>15</td>
</tr>
<tr>
<td>Technical and other electives</td>
<td>19</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>135</strong></td>
</tr>
</tbody>
</table>

### WATER RESOURCES RESEARCH CENTER

The Water Resources Research Center (1965), an interdisciplinary organization formed in response to the U.S. Congress's Water Resources Act of 1964, is primarily devoted to assisting water-related research activities at the three state universities. The Center is also responsible for the dissemination of results of water-related research in the state.

In addition, the Center conducts certain special research investigations within its organization, including the harvesting of additional water from arid and semiarid watersheds; artificial recharging of the ground-water aquifers; evaporation suppression; seepage control; urban hydrology; and operation and maintenance of the research facility on the Casa Grande Highway as well as one undeveloped and three urbanized watersheds, all in or near Tucson. All of the members of the faculty of the Center are involved in graduate-student-research supervision, essentially on investigations being conducted by the Center.

### LABORATORY OF TREE-RING RESEARCH

The Laboratory of Tree-Ring Research, the world's oldest and largest center of its kind, houses extensive collections of prehistoric and modern tree-ring specimens and conducts research in all aspects of dendrochronology. Precisely dated tree-ring chronologies of up to 8600 years in length are used to study past climatic and hydrologic conditions; to furnish data for geochemical, biological, and ecological investigations; and to provide accurate dating for archaeological and geological events. Strong interdisciplinary ties with the social, atmospheric, biological, and water-related sciences are emphasized, and qualified students within these fields are encouraged to participate in the courses listed below, which are taught by Laboratory personnel. Through the Department of Geosciences and the Department of Hydrology and Water Resources respectively, dendrochronology and dendrohydrology are available as academic options at the graduate level. (For further description of research activities see Divisions of Research and Special Public Service section.)

Geos. 655, 557, 464a-464b, 566, 596v; individual-studies and house-numbered courses in related departments.

### RESEARCH IN THE DEPARTMENT OF GEOSCIENCES

Research programs are conducted by each faculty member of the Department of Geosciences. In many cases joint efforts by the faculty have resulted in research projects involving several disciplines of the earth sciences. Students interested in information concerning departmental research should write the faculty members in their areas of interest or the Department of Geosciences for a copy of the research report which describes work being conducted by the faculty and students.
FINANCIAL ASSISTANCE AND AWARDS — In addition to the scholarships, grants-in-aid, loans, and other types of financial assistance available to University students (described in the Scholarships and Financial Aid section), several part-time graduate assistantships in teaching and in research are awarded each year in all professional fields of the College of Earth Sciences. The stipends vary, depending on the amount of service rendered in each case.

COOPERATIVE PROGRAM WITH INDUSTRY — A voluntary student-trainee program on a five-year work-study plan is available for students working toward a Bachelor of Science in Geosciences degree. This program is administered in the College of Mines.

STUDENT ORGANIZATIONS — There are three professional organizations for students in the College of Earth Sciences: the Society of Sigma Gamma Epsilon, a college honor society in the earth sciences; the student chapter of the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME); and the student chapter of the American Water Resources Association (AWRA). Students interested in membership in these organizations should contact the Department of Geosciences or the Department of Hydrology and Water Resources.
College of Education

The College of Education is committed to the preparation of qualified individuals in the fields of instruction in elementary, secondary, special and postsecondary education, bilingual education, student personnel services, instructional media and library services, and rehabilitation, and in the supervision and administration of elementary and secondary schools, special education schools and facilities, community colleges, four-year colleges, and universities. The college is composed of the Departments of Business and Career Education, Counseling and Guidance, Educational Foundations and Administration, Educational Psychology, Elementary Education, Reading, Rehabilitation, Secondary Education, Special Education, the Graduate Library School, the Center for the Study of Higher Education, and the Arizona Center for Educational Research and Development.

DEGREES AND MAJORS

The College of Education offers academic programs leading to the Bachelor of Arts in Education, Bachelor of Science in Education, Master of Arts, Master of Science, Master of Education, Master of Library Science, Master of Teaching, Educational Specialist, Doctor of Education, and Doctor of Philosophy degrees. All departments within the College of Education offer programs leading to master’s degrees. Majors may also be selected from any one of over 24 other departments within the University. Educational Specialist degrees are offered with majors in educational administration, educational media, educational psychology, elementary education, reading, secondary education, and special education. Doctor of Philosophy and Doctor of Education degrees are available with majors in counseling and guidance, educational administration, educational psychology, elementary education, foundations of education, higher education, reading, rehabilitation, secondary education, and special education.

Course work is offered in the college leading to the undergraduate degrees of Bachelor of Science in Education with majors in business education, physical education, rehabilitation, and secondary education (with a teaching major in mathematics or any one of the natural sciences); and Bachelor of Arts in Education with majors in early childhood education, elementary education, and secondary education (all teaching majors other than those listed under the B.S.Ed.).

Major and minor subjects should be selected as early in the undergraduate program 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 fields is made late in the program, an additional semester or semesters may be necessary to complete the established requirements.

A major is defined as the principal subject which the student intends to teach, except in the cases of rehabilitation and elementary education. (Students majoring in secondary teaching will pursue a secondary teaching major and should refer to “Majors in Secondary Education” in this section.) Students will select majors in consultation with advisers in the College of Education. Specific requirements for given majors are described in the Departments and Courses of Instruction section of this catalog.

A teaching minor is a secondary field of specialization in which the student plans to teach. It too should be selected in cooperation with a College of Education adviser. The specific requirements for minors may also be found in the Departments and Courses of Instruction section of this catalog.

The College of Education also offers a noncertification track for educational programmers through the major in secondary education leading to a Bachelor of Arts in Education or Bachelor of Science in Education. This program is designed to prepare individuals for noncertificated, education-related positions as training officers or directors in organized educational activities.
outside of the formal classroom setting. The program provides sufficient flexibility in the developing of an individualized program of high academic quality to meet the needs and interests of the students in preparing for specific career goals.

The available secondary education teaching majors and minors are:

**Majors Requiring No Minor**

- *Business Education*
- Extended English

*Language Arts-Social Studies*
- Physical Education (K-12 emphasis)
- *Social Studies*

**The language arts-social studies program is a 50-unit special combination of language arts and social studies for junior high school teachers. The social studies major consists of 50 units. The language arts-social studies or social studies major is to be designed in cooperation with a secondary education adviser and with the approval of the department head.**

**A specialization in office or distributive education is available for the major.**

**Regular Majors and Minors**

<table>
<thead>
<tr>
<th>Major</th>
<th>French</th>
<th>Journalism</th>
<th>Physics</th>
<th>Political Science</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Business Education</strong></td>
<td>General Biology</td>
<td>Language Arts</td>
<td>Latvian</td>
<td>Russian</td>
</tr>
<tr>
<td>Chemistry</td>
<td>Geography</td>
<td>Mathematics</td>
<td>Physical Education</td>
<td>Spanish</td>
</tr>
<tr>
<td>Earth Science</td>
<td>German</td>
<td>Physical</td>
<td>Education</td>
<td>Speech Communication</td>
</tr>
<tr>
<td>English</td>
<td>History</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Minors Only**

- Anthropology
- Athletic Coaching
- Bilingual/Bicultural Education
- Chemistry-Physics
- Computer Science
- Economics
- Oriental Studies
- Portuguese
- Psychology
- Radio-Television
- Safety Education
- Sociology
- Special Education

**Teaching Majors in Other Colleges**

- *A specialization in office or distributive education is available for the major.**

<table>
<thead>
<tr>
<th>Major</th>
<th>French</th>
<th>Journalism</th>
<th>Physics</th>
<th>Political Science</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Business Education</strong></td>
<td>General Biology</td>
<td>Language Arts</td>
<td>Latvian</td>
<td>Russian</td>
</tr>
<tr>
<td>Chemistry</td>
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<td>Education</td>
<td>Speech Communication</td>
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<tr>
<td>English</td>
<td>History</td>
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</tr>
</tbody>
</table>

**ADMISSION AND DEGREE REQUIREMENTS**

Candidates for admission to the College of Education must have completed 56 semester units of credit applicable to a baccalaureate degree with a grade-point average of 2.5000 or better. Transfer students, whose cumulative grade-point averages (including work taken at other institutions) must meet the 2.5000 standard at the time of admission to the college, must also have grade-point averages above that for probation (2.0000) for all work taken at the University of Arizona. Provisions are made for the admission of those students who may not meet the minimum entrance requirements, but who demonstrate special skills deemed desirable in the field of professional education. The College of Education Admissions Committee, composed of five voting members of the college faculty, meets to hear and recommend to the dean all petitions for special admission.
Additionally, candidates for admission to teacher education programs in the College of Education, including teacher education students in other schools and colleges, must successfully achieve a 75 percent level of correctness on a proficiency examination in each of the areas of English grammar, reading and mathematics before they may enroll in the following professional education courses: B.C.Ed. 482; Elem. 322, 323, 324, 326, 327, 376, 377, 379; S.Ed. 330, 338, and 340. This examination is to be undertaken in the first semester of enrollment in the College so that students may have an opportunity for remediation, where necessary, before enrollment in the professional education courses listed above. Dates and times for the examinations can be obtained in the dean’s office, College of Education.

PROGRAM REQUIREMENTS — For prospective elementary teachers, education is regarded as the major field; however, another field of specialization may be developed in an area of the student’s choice. For prospective junior or senior high school teachers, emphasis is placed upon special topics to be considered in the major field and, ordinarily, in one or more teaching minors. Teaching major and minor subjects which are generally included in high school curricula in most states are listed under “Degrees and Majors” in this section. All teacher education majors are required to complete course work in the areas of state and federal constitutional government. This requirement may be fulfilled by passing Pol. 110, or 102 and either 103 or 214a or 214b; or by special examination.

All teacher education majors must complete two courses in the humanities and arts and one course in U.S. history as required for Arizona teacher certification.

The following courses may be used to meet the humanities and arts requirement (the literature courses listed are literature in translation): Art 117, 118, 119, 124; Clas. 250a, 250b; Dram. 140a, 140b; Engl. 260, 261, 265, 267a, 267b; Fren. 382a, 382b; Ger. 345, 270a, 270b, 371; Hist. 104a, 104b (no other hist. courses are acceptable); Hum. 250a, 250b, 250c; Ital. 282a, 282b; M.A.S. 443, 477b; Mus. 107, 108; Or.s. 140a, 140b, 340a, 340b, 449, 444a, 444b, 447a, 447b; Phil. 111, 113, 238, 260, 261, 262 (Phil. 112 is not acceptable); Port. 383; Russ. 300a, 300b, 300c; Span. 331, 332; Sp.C. 181.

The following courses may be used to meet the U.S. history requirement: Hist. 130a, 130b, 230, 245, 252, 253a-253b, 431, 432, 433, 434, 435, 436, 437, 440, 449a, 449b.

Transfer courses and other courses proposed to meet the above requirements must be approved by the department head and the dean.

Students in the College of Education who do not intend to meet classroom teacher certification requirements upon completion of their degree programs may pursue a nonteaching track for educational programmers through the major in secondary education. This track prepares graduates for education-related positions in business, government, military, social services, adult education, and industry.

SPECIFIC LIMITATIONS — All candidates for graduation from the College of Education are subject to the following restrictions: no more than 48 units may be taken for credit in any one department. (Activity courses are excluded in the computation of the 48-unit maximum in the physical education major.) Candidates for a secondary teaching certificate must include at least forty units of upper-division course work among the total number of units offered to meet degree requirements, while candidates for the elementary teaching certificate must offer 48 such units.

GRADES IN STUDENT TEACHING — Pass (P) or fail (F) are the only grades issued upon completion of Elem. 493a or S.Ed. 493a. Enrollment in these courses will not reduce the amount of course work for which a student may enroll under the regular pass-fail option as described in the section on Academic Guidelines in this catalog.

OPEN COURSES — Courses in the College of Education are generally restricted to those students who have been admitted to the college or the Graduate College, except for the following which are open to any student with junior standing, assuming that all of the necessary prerequisites have been met: B.C.Ed. 373, 379, 389, 471, 472, 473, 474, Coun. 401, 403, Ed.F.A. 325, 350, 399, 401, 408, 437, 465, 476, 487, 489, Ed.P. 301, 302, 310, 340, 400, Li.S. 400, 417, 480, 485, 486, Rdng. 304, 435, 494a, 494b, 494c, 494d, Rhab. 300, 310, 405, 410, 420, 430, 455, 480, S.Ed. 329, 417, 418, 449, 494t, Spec. 403, 407, 408, 410, 413, 419, 423, 456, 470.

FACULTY ADVISING — An adviser from the faculty of the College of Education will, upon request, be assigned to any student enrolled in the University who is interested in pursuing a career in education. Upon admission to the College of Education, students without an adviser will be assigned one by the major department or the office of the dean. The adviser will assist the student in selecting a field of specialization and in arranging an appropriate schedule of studies.

PRE-EDUCATION ADVISING — Students who have not yet acquired 56 semester units of credit applicable to a baccalaureate degree are generally enrolled in the College of Arts and Sciences rather than in the College of Education. The first two years of academic preparation for admission to education programs are very important. The College of Education provides a pre-education adviser to assist students in completing the course work required for admission to education programs.

DEAN'S HONOR LISTS — The Dean's Honor List is reserved for students who carry at least fifteen units of work in a semester, exclusive of pass-fail courses, and who attain a grade average of 3.5000 or better. Students who complete at least twelve units of work in a semester, of which part are pass-fail courses, and who attain a grade average of 3.5000 or better, are given honorable mention. The honors lists are posted on the College bulletin board at the close of each semester. All honors students will receive a certificate of recognition.

COLLEGE PROGRAMS

The faculty and administration of the College of Education are dedicated to the continuing development and improvement of programs in preprofessional and in-service teacher education. In addition, experimentation is carried on in some areas through the extension and implementation of various kinds of programs, innovative arrangements of course sequences, and contemporary content structures within courses. Students are regularly invited to participate in these experimental programs. Students are selected on the basis of those criteria which have been established for a given experiment and can enroll by special permission only.

The following programs are currently being offered through the Departments of Business and Career Education, Elementary Education, Rehabilitation, Secondary Education, Special Education, and the Graduate Library School.

Major in Business Education

The major in business education prepares students to teach in office education and distributive education programs at the middle-school, high-school, and community-college levels. The first two years of course work will be taken in the College of Business and Public Administration, with advising from the Department of Business and Career Education. For additional information, see departmental headnotes.

Major in Early Childhood Education

Early childhood education is the major for students in the College of Education or the School of Home Economics who intend to pursue teaching careers at the preschool, kindergarten, or primary-grade levels.

These students follow the program for the freshman and sophomore years as described under "Major in Elementary Education." The upper-division program includes those courses, with the exception that Elem. 376, 377, and 379 are substituted for Elem. 322 and 327.
Major in Elementary Education
(For Teachers of Grades Kindergarten Through Eight)

For students preparing to become elementary teachers, the freshman and sophomore years should be completed in the College of Arts and Sciences. Regardless of the college from which the student transfers, general education requirements include freshman composition, six units; social sciences, twelve units (including Hist. 130a or 130b, Psyc. 100a and Ling. 101); natural sciences, twelve units (selected from Astr. 100 or Pty.S. 105, G.Bio. 112, Chem. 112, Geos. 112, Phys. 112); mathematics, six units (including Math. 105a-105b); two courses in the humanities and arts (as listed under “Admission and Degree Requirements” in this section); political science, three through six units (selected from Pol. 110, or 102 and either 103 or 214a or 214b); and health, two units (Hlth. 181).

The basic major in elementary education includes the following courses, unless the student selects one of the two program options described under “Early Childhood Education” or “Bilingual and Elementary Education”:

- Art 430; Ed.F.A. 350; Ed.P. 301, 310; Elem. 322, 323, 324, 326, 327, 493a; Li.S. 480; Mus. 360 and 361; Ph.Ed. 351a, 351b, or 351c; and Rdng. 304 and 494. Elementary education majors are urged to specialize in English, language arts, science, mathematics, social sciences, fine arts, or physical education.

DUAL PROGRAM IN BILINGUAL AND ELEMENTARY EDUCATION (English and Spanish) —

This course of study is intended for students who desire to teach in classrooms operating bilingual curricula in English and Spanish. Students should follow the program for the freshman and sophomore years as described above. Electives should be taken in Mexican American studies. Proficiency in the Spanish language must be demonstrated by passing a proficiency examination. Course work must include Elem. 394 (6 units — 3 units of creative arts and 3 units of music); Span. 441, 473; Ph.Ed. 351a, 351b, or 351c; Ed.P. 301, 310; Ed.F.A. 325, 350, 427; Elem. 322, 323, 324, 326, 327, 493a; Engl. 408; and Rdng. 406, 494a.

DUAL PROGRAM IN BILINGUAL AND ELEMENTARY EDUCATION (American Indian Education) —

Courses of study available for prospective teachers of American Indian students provide an effective instructional foundation for meeting special culturally based needs. Students will meet the basic requirements in the College of Arts and Sciences for entry into the College of Education. Interested students should see an adviser in the Elementary Education Department. Professional work will include training in American Indian studies, linguistic study of an American Indian language, foundations of American Indian education, and a program in curriculum and methods, giving students a sound basis for development of effective strategies and materials for working with American Indian students. On-site teacher education programs are offered by the College of Education on several Arizona Indian reservations.

Major in Rehabilitation

The undergraduate major in rehabilitation will prepare students for selected positions in various service areas, including rehabilitation, social, and education programs. All course requirements for admission to the College of Education must be completed before the student may be accepted as a major in rehabilitation.

Students will enroll in colleges other than the College of Education during their freshman and sophomore years. Regardless of the college from which the student transfers, the following general education requirements must be met: freshman composition, six units; social sciences, twelve units (including Psyc. 100a-100b, plus two additional courses from anth., soc., or psyc.); G.Bio. 159a-159b, eight units; humanities, eight to nine units (as listed under “Admission and Degree Requirements” in this section); and Ph.ed. activity courses, two units. Course work used to satisfy lower-division requirements cannot be included as electives for the upper-division program.

Course work for the major in rehabilitation includes Ed.P. 340, 400, 458; Rhab. 300, 320a-320b, 325, 450, 460; and nine additional units of rhab. course work approved by an adviser. An eighteen-unit minor is required, including Psyc. 416, 418, and twelve additional units of course work from one of the following areas of concentration: anthropology, psychology, sociology, or special education. Course work for the major in rehabilitation with a specialization in interpreting for the deaf includes Rhab. 300, 320a-320b, 325, 405, 410, 420, 430, 450, 460.
and six additional units of rhab. course work approved by an adviser. An 18-unit minor is required, including Psyc. 416, 418, and twelve additional units as noted above. (See also Departments and Courses of Instruction section.)

Major in Secondary Education

College of Education students enrolled in a teacher preparation program in the Department of Secondary Education must complete a teaching major or a teaching major and minor from among the subjects and fields listed under “Degrees and Majors” in this section.

Though secondary education majors do not transfer to the College of Education until their junior years, they take S.Ed. 225 in their freshman or sophomore years. Students are encouraged to contact an adviser in the Department of Secondary Education during their lower-division years concerning the selection of appropriate teaching majors and minors.

Major and minor requirements and descriptions of all courses are found in the Departments and Courses of Instruction section of this catalog.

Students pursuing degrees in secondary education will complete 45 units in arts and sciences in the humanities, mathematics, natural sciences, foreign languages, social sciences, literature and/or fine arts. Course work from any one of these areas completed in fulfillment of the requirements for a teaching major and minor may be incorporated into the 45 units of arts and sciences credit. Students will complete six units of freshman composition (including Engl. 101 and 102 or 104), one course in Arizona and U. S. constitutional government (or satisfactorily pass an examination on the provisions and principles of the constitutions of Arizona and the U. S.), one course in U. S. history, one additional course in social and behavioral sciences, one course in general psychology, two courses in the humanities and the arts (as listed under “Admission and Degree Requirements” in this section), one course in natural science, and one course in mathematics.

The required professional sequence includes S.Ed. 225, Ed.P. 311, S.Ed. 329, 330, 338 or equivalent, 417, Rding. 435, S.Ed. 493a, 494b, 340. S.Ed. 330 is to be taken the semester immediately preceding student teaching or concurrently with student teaching in the professional semester program.

NONTEACHING TRACK: Students not wanting certification as classroom teachers upon completion of their degree programs may enroll in the nonteaching track for educational programmers of the secondary education major. Students will complete six units of freshman composition (including Engl. 101 and 102 or 104) and Engl. 207, Sp.C. 102, Hum. (6-8 units), Math. 116, lab. science (8 units), and social science (12 units with 6 in one area). Students will complete one of the listed secondary education teaching majors. Additionally, the nonteaching track for educational programmers consists of a minimum of 30 units including the following sequence of courses: B.C.Ed. 373, Ed.P. 311, 465, 487, S.Ed. 417, 449, 493n, 499 and three units of education electives. Students interested in pursuing this program may obtain information in the office of the dean.

Majors for Community College Personnel

The College of Education cooperates with departments in other colleges of the University in the preparation of students who are candidates for community-college academic or administrative certificates. The Arizona Board of Directors for Community Colleges has established the following standards for academic certification.

The minimum requirements for an Arizona Community College Regular Certificate, valid for six years, shall be:

a. a master's or higher earned degree with twelve graduate semester units in the field to be taught, or
b. a bachelor's degree in a specific area with a minimum of one year of occupational experience and skill in the area to be taught, or
c. a minimum of thirty semester units of general-education courses toward a bachelor's degree, at least fifteen semester units of professional preparation coursework, and at least three years of experience in the occupation to be taught.
Additionally, applicants must have completed (1) a course on the "community college as an educational institution," and (2) a course in the methods of teaching, or practice teaching, or internship, or one year of full-time teaching experience in a high school, community college, or four-year college or university. Regular certificates issued under "b" and "c" above must be renewed every six years through continuous teaching or five semester units of appropriate upper-division or graduate work until the requirements listed in "a" are met.

Provisional, special, and honorary Arizona community college certificates are available with varying requirements and periods of validity. The College of Education will assist individuals seeking application information on these certificates or on community college certification in other states. The above standards are subject to modification by the Arizona State Board of Directors of Community Colleges.

Minor in Special Education

Special education is concerned with children who deviate markedly in physical, mental, or emotional characteristics. An eighteen-unit, nonteaching minor in special education is offered at the undergraduate level (see departmental headnotes). Students interested in this program should consult a departmental adviser. In addition, special education is available as a graduate major.

CENTERS FOR RESEARCH AND SERVICE

Research and service centers operating within the College of Education greatly enhance the academic programs and research capabilities of the college. Basic and applied research is conducted in all contexts and at all levels of professional education. Professional services are available to clientele ranging from individuals to such institutions as school districts; public and private postsecondary institutions; local, state, and federal agencies; health-service-related agencies; correctional institutions; Indian tribal governments; and business and industry. A description of the nature and function of each of these centers is provided under the headings below.

Arizona Center for Educational Research and Development

Under the direction of the College of Education, the Arizona Center for Educational Research and Development makes the resources of the University available to school districts, other educational institutions, and government agencies in the state and nation. The operational units of the Center and some of their activities are described below.

Early Childhood Education Program. A comprehensive educational program for children ages three through twelve, emphasizing learning-to-learn skills, implemented in five communities nationwide through federal funding.

Office of Language and Literacy. Research on oral and written language processes and language learning, and dissemination of applications of such research to the educational profession.

Office of Psychoeducational Research. Psychological services to students and educators on the basis of continuing involvement, including identification and analysis of problems, interventions, and evaluations.

Office of Educational Evaluation and Measurement. Research and consultation services concerning continuous monitoring of educational programs as well as longterm assessment of educational outcomes.

Bureau of Educational Services

The Bureau of Educational Services provides professional services and personnel for school districts and various educational and governmental agencies within the state. Included in the available services are special-purpose and comprehensive surveys; action research; consultation in instructional, administrative, and special services; systems analysis; program development; and in-service workshops and institutes.
Center for the Study of Higher Education

The major objectives of the Center for the Study of Higher Education are the development and dissemination of knowledge about higher-education policy and operation; instruction at the graduate level leading to graduate degrees; facilitation of research by faculty members and students; and research studies and service activities for state and institutional needs and national, international, and regional governmental units and organizations.

University Rehabilitation Services

In addition to degree programs, the Department of Rehabilitation provides rehabilitation counseling services for the university community. Degrees are offered in several areas, including undergraduate and graduate majors in rehabilitation, a two-year master's program, and doctoral programs. As a member of the National Interpreter Training Consortium, the department offers undergraduate course work to prepare students to become interpreters for deaf persons. The department is used as a clinical and laboratory facility by many campus and community groups. Workshop and seminar programs provide opportunities for in-service training for professional workers in health and rehabilitation agencies. The staff of the department is trained in the practical application of rehabilitation techniques and provides statewide consultative services to rehabilitation agencies.

The department provides an excellent setting for interdisciplinary research and demonstration programs. Projects are directed by faculty members for various university departments. Research is encouraged in all aspects of rehabilitation.

A variety of services is available in the department, including comprehensive vocational and psychological evaluation, occupational and physical therapy, and audiology (in conjunction with the Department of Speech and Hearing Sciences). Vocational and psychological evaluations provide disabled and handicapped individuals with realistic vocational goals. The university-wide Disabled Student Services Program of the Department of Rehabilitation provides comprehensive support services and coordinates other campus resources for disabled students attending this university.

Instructional Materials Collection

The Instructional Materials Collection (IMC), operated by the University Library and located in the Media Center of the Main Library, was created to disseminate materials used by elementary and secondary school students. The collection is comprised of tradebooks, textbooks, and audiovisual materials, including teaching devices and instructional games. Samples are provided of various forms of informational packages. Courses of study for many subject fields are provided from various school districts and institutions of teacher education throughout the nation. An audiotutorial facility and audiovisual equipment center are available for student use.
College of Engineering

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 problems, and the habit of self-directed future learning. Graduates make a transition successfully 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, humanities, social science, economics and practice.

MAJOR PROFESSIONAL FIELDS OF STUDY

The college offers four-year curricula leading to the degree of Bachelor of Science in:

- Aerospace Engineering
- Agricultural Engineering
- Civil Engineering
- Computer Engineering
- Electrical Engineering
- Energy Engineering
- Engineering Mathematics
- Engineering Physics
- Industrial Engineering
- Mechanical Engineering
- Nuclear Engineering
- Systems Engineering

Each of these curricula is described in the following pages. In addition, the degrees of Bachelor of Science in Chemical Engineering, Bachelor of Science in Geological Engineering, Bachelor of Science in Metallurgical Engineering, and Bachelor of Science in Mining Engineering are available through the College of Mines. The latter curricula are described in the College of Mines section of this catalog.

The entering student is asked to designate a field of interest from among those listed above. Since a high degree of commonality exists among the various fields in the first year, it is often possible for a student to transfer from one field to another after the first year with only minor realignment of the study program.

GRADUATE STUDY TOWARD THE M.S. AND PH.D.

The Master of Science (M.S.) degree is offered with majors in aerospace engineering, agricultural engineering, civil engineering, electrical engineering, engineering mechanics, industrial engineering, mechanical engineering, nuclear engineering and systems engineering. The Doctor of Philosophy (Ph.D.) degree is offered with majors in aerospace engineering, civil engineering, electrical engineering, engineering mechanics, mechanical engineering, nuclear engineering, and systems engineering. Complete details of both graduate programs are set forth in the Graduate Catalog.

OPTIONS

BIOMEDICAL ENGINEERING OPTION — Biomedical engineering can be defined as a multidiscipline in which physical scientists and engineers interact with life scientists and physicians to solve problems ranging from basic investigations to applications in clinics and the health care delivery system. The Departments of Aerospace and Mechanical, Electrical and Computer, and Nuclear and Energy Engineering offer biomedical options available as undergraduate technical
electives and graduate minor programs and research. A University committee coordinates the option. See Biomedical Engineering for further details.

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

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

**MANUFACTURING SYSTEMS ENGINEERING OPTION** — The modern manufacturing systems engineer designs, installs, implements, improves and manages computer integrated manufacturing systems. This option prepares students in the areas of organizing, scheduling, and managing the total manufacturing system from product design through fabrication, distribution and consumer services. The Department of Systems and Industrial Engineering offers this option through the undergraduate degree program in industrial engineering by structuring the choice of technical electives. Contact the department for further details.

**PREMEDICAL OPTION** — An engineering degree can provide a valuable background for physicians who will utilize 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 adviser.

**ACCREDITATION**

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

**COLLEGE REQUIREMENTS**

**UNIT REQUIREMENTS** — The Bachelor of Science degree in the various engineering fields is awarded upon satisfactory completion of 127-134 units, as required by the University, the college, and the appropriate department. Fifteen to eighteen units per semester are considered a satisfactory work load.
ADVANCED STANDING

Students must have been granted advanced standing to enroll in 300- and 400-level courses in the College of Engineering. To qualify for advanced standing, students must meet the following criteria:

1. Completion of a minimum of 56 credit hours, including all required courses listed in the freshman and sophomore years of the curriculum of the students' major department. In addition, all admission deficiencies must have been removed.
2. A cumulative grade point average of not less than the minimum set by the major department, but in no case below 2.000.

Students otherwise qualified and lacking no more than three required lower-division courses may be granted provisional advanced standing. If these courses are not completed during the next semester they are offered, advanced standing will be revoked until such time as they are completed.

Application forms are available at the office of the dean of the College of Engineering (Room 100, Civil Engineering Building) and at all departmental offices in the College. Applications should be filed by May 1 or September 15 to qualify for preregistration, or one month prior to walk-through registration.

Students wishing to enroll in 300- and 400-level engineering courses, who are registered in colleges other than the College of Engineering, will normally be expected to have completed all course prerequisites and have fulfilled the above criteria relative to their own majors. These students will apply at the dean's office for special permission to enroll in 300- and 400-level courses on a semester-by-semester basis.

HUMANITIES AND SOCIAL SCIENCE ELECTIVES

Throughout the four-year programs in engineering are requirements for humanities and social-science electives, recognized as important in the education of engineers by the Accreditation Board for Engineering and Technology (ABET). The goals of these electives are to help the students acquire:

1. An understanding of the evolution of the social organization within which we live and of the influence of science and engineering on its development.
2. The ability to recognize and make a critical analysis of a problem involving social and economic elements, to arrive at an intelligent opinion about it, and to read with discrimination and purpose toward these ends.
3. The ability to organize thoughts logically and to express them lucidly and convincingly in oral and written English.
4. An acquaintance with some of the great masterpieces of literature and an understanding of their setting in and influence on civilization.
5. The development of moral, ethical, and social concepts essential to a satisfying personal philosophy, to a career consistent with the public welfare, and to a sound professional attitude.
6. The attainment of an interest and pleasure in these pursuits and thus an inspiration to continued study.

The courses to be submitted as humanities and social-science electives are selected from a college-approved list by the student in consultation with a faculty adviser. Courses selected should preferably include at least six units in the humanities (art, humanities, music, philosophy, and literature) and at least six units in the social sciences (anthropology, economics, history, political science, psychology and sociology), with the remainder from either category.
DEPARTMENTAL PROGRAMS

Brief discussions of each subject area as well as the particular curriculum for each will be found under the section headings which follow.

BACHELOR OF SCIENCE IN AEROSPACE ENGINEERING  
(ABET Accredited)

Aerospace engineering is concerned primarily with solving the problems of flight, and places special emphasis on the design and operation of all types of aircraft, rockets, satellites, and spacecraft. In recent years, aerospace engineers have become involved in the design of deep-submergence vehicles, modern surface ships, air cushion vehicles, and ground transportation systems.

Equipment used by students to gain experience with appropriate physical phenomena, experimental techniques, and the physical realization of theoretical studies and predictions includes digital and interactive graphics computers; engines and gas turbines; vibration, dynamics, and acoustics equipment; photoelastic polariscope and other equipment for stress analysis; production and tooling shop; reliability research apparatus; subsonic and supersonic wind tunnels; heat pump, air conditioning, and refrigeration units; tensile, fatigue, impact, and creep material testing machines; high-temperature gas heat transfer loop, convective transport laboratory; combustion tunnel; high-speed motion analysis photographic equipment; biomedical engineering lab facilities; and transducers, oscilloscopes, recorders, meters, and instruments of wide variety.

Required Curriculum

FRESHMAN YEAR

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*B’The fifteen units of required hum. and soc.sci. electives must contain six or more units of humanities and six or more units of social science selected from a list approved by the College of Engineering. The nine units of technical electives are selected, in consultation with an adviser, from upper-division offerings in engineering or other scientific or technical fields.

BACHELOR OF SCIENCE IN AGRICULTURAL ENGINEERING

Agricultural engineers work directly in the design, construction, application, and management of power units, machines, water distribution and disposal systems, buildings, and processing equipment for production of plants and animals. They develop systems for production, processing, packaging, transportation, and distribution of food and other agricultural products.

The agricultural engineering curriculum is offered through the Department of Soils, Water and Engineering in the College of Agriculture. The curriculum is based upon those fundamentals common to all types of engineering. It also develops the student’s background in the biological sciences. Specific courses in agricultural engineering are included to offer the student experience in the application of engineering to food and fiber production.

Required Curriculum

FRESHMAN YEAR

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**S.W.E. 120a-120b and 121a-121b are offered alternate years. Thus some students will take 121a-121b in their freshman year and 120a-120b in the sophomore year. S.W.E. 410, 412, 415, and 423 are offered alternate years also. Thus, some students will take 410 and 412 in their junior year and 415 and 423 in their senior year. Others will reverse this sequence.**

**Technical electives are twelve units of technical courses chosen to form a coherent program of study in relation to an area of special interest such as water resource development, irrigation, livestock housing, feed or food processing, energy or agricultural machinery. Courses will be selected to meet engineering science and design accreditation requirements. At least one technical elective must involve primarily systems analysis and/or engineering design.**

***Agricultural science electives will include one course each from the plant, soil, and animal science areas. Suggested courses include P.I.S. 100, A.N.S. 102, S.W.E. 200, 470, G.Bio. 105.***

BACHELOR OF SCIENCE IN CIVIL ENGINEERING
(ABET Accredited)

Civil engineering is primarily concerned with the larger elements of both the natural and man-made environment. The civil engineer designs, constructs, and operates the physical facilities necessary for such tasks as reducing air and water pollution, planning and building new communities, and providing water, power, and transportation systems. Students may elect to take a concentrated series of courses in structural engineering, geotechnical engineering, transportation engineering, hydraulic engineering, or environmental engineering. Fully equipped laboratories for instruction and research are available.
## Required Curriculum*

### FRESHMAN YEAR

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*Modification of this program may be permitted, but requires the approval of the student's adviser and department head.

**Elective courses are grouped as follows: humanistic and social science (twelve units selected without restriction from the approved list), and technical (21 units). Listings of acceptable technical elective sequences are available from course advisers. Within these sequences 12 to 15 of the required 21 units are specific and 6 to 9 are free. Selection of these electives should be made with advisers' approval.

## BACHELOR OF SCIENCE IN COMPUTER ENGINEERING

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 in larger systems, and apply digital techniques to solving a broad range of engineering problems. The curriculum includes a strong electrical engineering component, made up of almost all the required courses in 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.

Required Curriculum

FRESHMAN YEAR

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SOPHOMORE YEAR

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*The 12 units of technical electives will normally be 400-level courses in the Department of Electrical and Computer Engineering, and must be approved by the student's faculty adviser.
Due to the rapid pace of modern technology, the goal of the electrical engineering undergraduate curriculum is to educate immediately productive electrical engineers who are also qualified to pursue further educational opportunities. Consequently, the program emphasizes basic scientific knowledge, modern design techniques, and laboratory experiences that pinpoint design limitations.

The presence in the department of the Computer Science Research Laboratory, the Thin Films and Field Emission Laboratory, and the Microelectronics Laboratory, as well as research in fields, physical and plasma electronics, lightning processes, pattern recognition, modern control theory, and other specialities, maintains a modern viewpoint in the undergraduate program.

### Required Curriculum

#### FRESHMAN YEAR

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**The 24 units of technical electives must be upper-division courses in eng., math. or science. They are to be chosen by the student in consultation with a faculty adviser and must be approved by the faculty adviser. Not less than 15 credits must be in E.C.E. No more than one course from the list of eng. sci. electives may be used as a technical elective.**

**BACHELOR OF SCIENCE IN ENERGY ENGINEERING**

**Required Curriculum**

**FRESHMAN YEAR**

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**SOPHOMORE YEAR**

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**JUNIOR YEAR**

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**SENIOR YEAR**

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*Econ. 210 plus 13 elective units.

**21 units to be selected from areas of specialization that include (1) utility operations and power option: E.C.E. 321a, 461, Nu.E. 417 plus 9 units of tech. electives from specified list; (2) advanced energy conversion option: A.M.E. 331b, Nu.E. 415, 417, 445 plus 9 units of tech. electives from specified list; (3) building and industrial energy systems option: A.M.E. 331b, E.C.E. 461, Nu.E. 453 plus 12 units of tech. electives from specified list.

**Offered both semesters.**
BACHELOR OF SCIENCE IN ENGINEERING MATHEMATICS

The engineering mathematics curriculum is designed to give the student a deep understanding of mathematics to complement specific interests in engineering. Graduates of this curriculum working in industry may use their proficiency in analysis, statistics, computer science or numerical analysis to develop techniques needed to obtain meaningful solutions to engineering problems for which there is no standard solution. The program can be tailored to give each individual the desired concentration in particular areas of mathematics and engineering, the goal being breadth with selective depth. The engineering mathematics curriculum gives an excellent background for graduate work in applied mathematics and computer science as well as various areas in engineering.

**Required Curriculum**

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*Humanities and social science electives: 17 units to be chosen from a list approved by the college. Technical electives: 23 units to be chosen in consultation with an adviser.

** Those students interested in using technical electives to emphasize computer science should include C.Sc. 115, 227 and 237 their first three semesters. This change requires S.I.E. 320 to be moved to the junior year.
BACHELOR OF SCIENCE IN ENGINEERING PHYSICS

The engineering physics curriculum stresses basic scientific and engineering principles in order to prepare the student to solve engineering problems which involve either several areas of knowledge or basic new scientific developments. Modern complex devices and systems often involve several fields such as optics, mechanics, electronics, solid state, and nuclear radiation.

This curriculum helps bridge the gap between science and engineering. To reduce the scientific development to a practical application requires both physical understanding and engineering skill. The engineering physics curriculum prepares the student for graduate work in physics and engineering.

Technical electives should be upper-division units carefully chosen in conference with the adviser.

Required Curriculum

FRESHMAN YEAR

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BACHELOR OF SCIENCE IN INDUSTRIAL ENGINEERING  
(ABET Accredited)

The industrial engineer designs, analyzes, and implements systems integrating people, materials, information, and equipment. Professional industrial engineers practice in virtually every facet of our economy, including manufacturing, health-care delivery, computing, defense, transportation, and agriculture. The importance of manufacturing is reflected in the form of a manufacturing engineering option. The curriculum—which is based upon the engineering, mathematical, physical, computing, and social sciences—is directed toward the modeling of real world systems for the purpose of decision-making. The underlying philosophy of the program is the allocation of limited resources within the framework of the ecological, social, and economic outcomes.

### Required Curriculum

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### Second Semester

The table above outlines the required curriculum for the Bachelor of Science in Industrial Engineering program. Each year of study is divided into two semesters, with specific courses and units listed for each. The program is ABET accredited and focuses on integrating people, materials, information, and equipment to design, analyze, and implement systems relevant to various facets of the economy.
### SENIOR YEAR

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**Hum. and soc. sci. electives must be chosen from a list approved by the College of Engineering. Science electives must be chosen from a list available in the department office. Selection of these electives is made in consultation with the student’s faculty adviser.

**Technical electives, math. electives and 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 adviser.

### 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 heat power, mechanical properties of materials, and instrumentation. Students can specialize in a wide range of topics, which include power systems, thermal sciences, automatic controls, reliability and quality assurance, and mechanical design.

Equipment supporting mechanical engineering studies includes a digital computer with interactive graphics; internal combustion engines and a gas turbine; photoelastic polariscope and other equipment for stress analysis; microcomputers and microprocessors; production and tooling shop; low and high-speed wind tunnels; refrigeration and heat transfer loops; and instrumentation of a wide variety.

### Required Curriculum

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*Elective courses are chosen by the student in consultation with a faculty adviser. The thirty units of electives must contain fifteen units in the humanities and social sciences (no less than 6 units in each category). The remaining fifteen units are technical electives, which are to be selected from engineering and science courses. At least 9 units must be at the 400 level, with 6 of these in A.M.E. (exclusive of independent study, which can at most total 3 units). There can be no more than 3 units at the 100- or 200-level.

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**BACHELOR OF SCIENCE IN NUCLEAR ENGINEERING**

(ABET Accredited)

Nuclear engineering is concerned with the release, control, and utilization of all forms of energy resulting from nuclear reactions. This branch of engineering is deeply rooted in the physical sciences and mathematics and requires a broad-based interdisciplinary education.

The applications of nuclear energy are many, ranging from commercial nuclear power systems to the use of radioisotopes in science, industry and medicine.

The four-year curriculum gives the student a broad base in engineering science and mathematics. The first two years are similar to those for other engineering disciplines. The remaining two years are devoted to areas of particular interest to the nuclear engineer. With understanding of fundamental concepts, the student is prepared to cope with future advancements in the field.

Facilities available for laboratory experiments and research include: TRIGA nuclear reactor operating in the steady state or pulsed mode; 2 MeV Positive Ion Van de Graaff Accelerator operating in steady state, pulsed, or modulated source mode to produce charged particles and neutrons; 1.25 MeV Radiation Dynamics Electron Accelerator operating as a source of electrons or brehmsstrahlung; 500 curie Gamma Ray Irradiator serving as a source for materials and biological specimen irradiations. Also available is a wide variety of laboratories including those needed for radioactive material counting, radiochemical processing, nuclear materials and related equipment for evaluating performance and modification of materials in radiation fields.
# Required Curriculum

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*Elective courses are chosen by the student in consultation with a faculty adviser. The 27 units of electives must contain sixteen units in the humanities and social sciences, selected according to engineering college policy. Of the remaining eleven units, seven units are for technical electives selected from upper-division engineering, science, or mathematics offerings, and four units are for free electives.

**Offered both semesters.
BACHELOR OF SCIENCE IN SYSTEMS ENGINEERING
(ABET Accredited)

Systems engineering deals with the design and analysis of large-scale, complex, man/machine/software systems. It is an interdisciplinary activity which utilizes tools and techniques from the classical engineering disciplines, as well as from the mathematical, behavioral and physical sciences. Courses in classical engineering, math, and science are followed by systems engineering courses emphasizing the basic elements of probability and statistics, optimization and operations research, decision making, human factors and system theory. Since systems problems are often too complex to solve any other way, the use of the digital computer is stressed throughout the program and is reflected in the form of a computer software engineering option. Design emphasis is placed upon decision and control systems, delivery and distribution systems, and computing and information systems.

Required Curriculum

FRESHMAN YEAR

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Total 16

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*Hum. and soc.sci. electives must be chosen from a list approved by the College of Engineering. Science electives must be chosen from a list available in the department office. Selection of these electives is made in consultation with the student’s faculty adviser.

**Technical electives, math. electives and 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 adviser.

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### COOPERATIVE PROGRAM

The Cooperative Education Program is one which provides undergraduate and graduate students with an opportunity to gain valuable income and career-related work experience in industry, business or government service on a national basis.

Students must have finished their freshman year and have completed, or be in the process of completing, one full-time semester at the University of Arizona. Grade-point average requirements range from 2.0000 to 3.3000, depending upon the specific employer.

Those students who carefully plan their academic schedules will be able to participate in the co-op program and still graduate in the same time frame of 4½ to 5 years, which is typical for engineering students in general.

Complete information regarding the co-op program is available in Harvill 235.

### SUMMER TECHNICAL PROGRAM

The Placement and Career Services Office in the Nugent Building provides students seeking summer employment with the opportunity to interview with companies for the Summer Technical Program.

### RESEARCH

The college is exceptionally active in engineering research. In addition to teaching activities, almost every faculty member pursues some special area of investigation, either individually or in collaboration with others, and most graduate students are involved as assistants. The result is a wide variety of programs addressing pivotal problem areas of local, regional, and international importance. Typical of these are the current research programs in solar energy, microelectronics, interactive computational mechanics, biophysics technology, digital image analysis, nuclear reactor safety, plasma physics and nuclear fusion, and nuclear fuel cycles.

All projects are coordinated by the Engineering Experiment Station, which also provides research management services for the investigators, and promotes in-house as well as campus-wide interdisciplinary programs.
STUDENT PROFESSIONAL AND HONORARY SOCIETIES

The following student organizations are active in the various professional fields in the College of Engineering:

Scholastic Honorary Societies
- Society of the Sigma Xi—scientific research
- Tau Beta Pi—engineering only

Professional Organizations
- American Nuclear Society
- American Society of Agricultural Engineers
- American Society of Civil Engineers
- American Society of Mechanical Engineers
- American Institute of Aeronautics and Astronautics
- American Institute of Industrial Engineers
- Association For Computing Machinery
- Black Engineering Science Students Today
- Institute of Electrical and Electronic Engineers
- Society of Automotive Engineers
- Society of Reliability Engineers
- Society of Woman Engineers
- Theta Tau

Activity Club
- Engineers' Council

SUMMER
The University of Arizona College of Law is a member of the Association of American Law Schools and an approved law school of the American Bar Association. A rigorous course of professional education prepares students for service to the community in the private and public practice of law. To qualify for membership in the legal profession, a student must possess a broad educational experience and significant intellectual capacity, and must successfully negotiate a difficult course of study during which he or she is expected to master the principles of the law and of the legal system and to acquire professional techniques of lawyers.

Application forms and additional information pertaining to the program, as well as a College of Law Catalog, may be obtained from the College of Law.

ADMISSION REQUIREMENTS — Applicants for admission to the College of Law must have earned a bachelor's degree from an accredited college or university and have achieved a cumulative grade-point average which, when considered with the score on the Law School Admission Test (LSAT) and other relevant data, indicates a reasonable probability of success in the study of law. Applicants are also required to present evidence of their personal integrity and good character.

Applicants are initially evaluated according to a formula which combines the student's undergraduate academic record and score on the LSAT. It is not possible to fix any particular combination of grade average and LSAT score as the breaking point between admission and rejection. As a generalization, however, students with grade-point averages no higher than "B" will find difficulty in gaining admission, unless they receive a high score on the LSAT. Even those with a higher academic record will experience some difficulty if they have done poorly on the LSAT.

The admissions formula is not inflexibly applied, and careful consideration is given to any relevant factors which indicate that the applicant has considerable potential for law study.

APPLICATION PROCEDURE — First-year students are admitted only in the fall semester. All items necessary to complete the student's application must be sent to the College of Law and postmarked no later than March 1 for admission in late August. The following materials should be sent to the Admissions Office, College of Law, University of Arizona, Tucson, Arizona 85721, prior to March 1:

1. A completed application form.
2. Domicile Affidavit.
3. LSDAS Report.
4. $10.00 check or money order payable to the University of Arizona (not required of Arizona residents or students who attended an Arizona college or university).

LAW SCHOOL ADMISSION TEST — All applicants must take the Law School Admission Test. The test is given by Law School Admission Services (LSAS) several times a year at the University of Arizona and at other centers throughout the state and nation. Arrangements to take the test should be made as early as possible in the academic year prior to enrollment in the College of Law. In order to meet the March 1 deadline, the test must be taken no later than December. An application for the test may be obtained from any law school admissions office or university prelaw adviser, or by writing to Law School Admission Services, Box 2000, Newtown, Pennsylvania 18940, and requesting the Law School Admissions Bulletin. Please check the Bulletin for dates on which to apply for the test.

Scoring of the LSAT takes a minimum of six weeks and the score is sent to the student and law school at approximately the same time. A student may take the LSAT more than once; however, the scores are averaged for use in the initial evaluation formula. LSAT scores obtained prior to October, 1978, will not be accepted.
LAW SCHOOL DATA ASSEMBLY SERVICE (LSDAS) — All applicants must apply for the Law School Data Assembly Service Report no later than February 1. An application for this service is included in the Law School Admissions Bulletin. Official transcripts from each undergraduate institution attended must be sent directly to LSAS by the institution. It is wise to keep receipts for transcripts and LSDAS services as evidence of compliance with deadlines. Students planning to graduate in May should submit their entire transcripts to LSAS in December. Transcripts of graduate work should also be sent to LSAS. They will not appear on the report as part of the index, but will be attached to the back of all LSDAS reports sent to law schools. LSDAS reports are issued to the law school and applicant about six weeks after LSAS receives all transcripts and an applicant has taken the LSAT.

TRANSFER STUDENTS — Students who have done well at other law schools may be permitted to transfer to the University of Arizona in either the fall or the spring semester of their second year of law school. In order to be eligible for transfer, the student must have an undergraduate academic record which would qualify him or her to enter the University of Arizona College of Law as a beginning student. A transfer applicant must send the following items to the Admissions Office, University of Arizona College of Law, Tucson, Arizona 85721, prior to December 1 for application to the spring semester and prior to July 15 for application to the fall semester:

1. Completed application for transfer admission.
2. Domicile Affidavit.
3. An LSDAS report showing entire undergraduate career and the LSAT score.
4. A letter from the dean of the law school currently being attended stating that the candidate is presently in good standing and eligible to continue studies at that institution.
5. Transcripts of at least one full year (three quarters or two semesters) of law work. First-year students may not transfer in midyear.

If these minimum requirements are met, applicants will be judged as to whether a transfer would be in the best interest of the student and of the college. Third-year students will not be considered for transfer but may apply as transient or visiting students. No student who has been disqualified or placed on probation at another law school, or who has failed to maintain at least a "C" grade for all law work attempted, will be allowed to transfer to the College of Law.

Transfer students will not receive credit for work done at a law school which is not a member of the Association of American Law Schools or approved by the American Bar Association. To qualify for graduation, transfer students must do their final two semesters' work, comprising 27 units of credit, in residence at this University. In order to receive credit for residence, the student must be registered for a schedule of no fewer than ten units for the semester. In the event of failure to pass at least nine units of work, the student shall receive credit for residence in the ratio that the units passed bear to nine.

PART-TIME STUDENTS.

Special Students. A limited number of students without the qualifications required of candidates for the law degree may, at the discretion of the faculty, be allowed to audit a course or courses as special students. Applicants must have experience and educational background which indicate a strong probability that they will be successful in law study. They must also demonstrate some special need for legal training.

Students From Other Colleges. With the written approval of their advisers, graduate students may register for courses in the College of Law. Students desiring to do so will be required to obtain the prior approval of the instructor and of the Executive Committee of the College of Law.

Part-time students in the College of Law are not degree candidates, nor are they eligible for the Arizona bar examination. Law courses may not be used by part-time students as credit toward a law degree in the event that such students are subsequently admitted as degree candidates.
The College of Medicine offers a professional program leading to the M.D. degree and graduate programs leading to the Ph.D. degree in certain of the medical sciences. A combined M.D./Ph.D. program in which the two degrees are awarded concurrently is also available. Candidates for the Ph.D. degree are enrolled in the Graduate College of the University. For information beyond that summarized below, one should request a catalog from the Admissions Office, College of Medicine, University of Arizona, Tucson, Arizona 85724.

**PREMEDICAL REQUIREMENTS** — Applicants must meet the minimum requirement of ninety semester hours, including thirty hours at the upper-division level, in an accredited college or university. Successful completion of the following specific course work is required: two semesters or three quarters each of inorganic chemistry, organic chemistry, physics, general biology or zoology and English. Students should demonstrate the ability to handle scientific material effectively, irrespective of their majors.

**MEDICAL COLLEGE ADMISSION TEST** — All applicants must take the new Medical College Admission Test and arrange to have scores forwarded to this College. The test should be taken in the year preceding that in which the student hopes to enter medical school, or at the latest, within two years of application. For applications write: MCAT—The American College Testing Program, P.O. Box 414, Iowa City, Iowa 52243.

**APPLICATION TO THE FIRST-YEAR CLASS** — The College of Medicine is a participating member in the American Medical College Application Service (AMCAS). Each student need submit only one application if applying just to AMCAS schools. Requests for application material may be obtained from the Admissions Office of the College of Medicine. The application period is June 1 to November 1 of the year preceding that in which the applicant hopes to enter medical school. Those to be considered are requested to appear for a personal interview. Applicants will be notified of their status shortly after the close of the application period. Further details of the application procedure may be found in the College of Medicine Catalog.

**ADMISSION OF TRANSFER STUDENTS** — Applications are accepted for transfer into the clinical years of the College of Medicine curriculum from Arizona residents. Applicants must have completed at least two years of medical education. Transfer applicants must also submit evidence of having taken the MSKP Examination. Please contact the Admissions Office after November 1 for additional requirements and information. Openings are based on attrition.

**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 various aptitude and achievement tests, letters of recommendation, and the personal interview. Preference is given first to residents of Arizona and next to residents of Alaska, Montana, and Wyoming who are certified by the Western Interstate Commission for Higher Education (WICHE).

**ACADEMIC POLICY AND CURRICULUM** — All medical students are graded on an Honors-Pass-Fail basis. Students who are enrolled in other colleges of the University and who are taking College of Medicine courses will be graded by the same system as the rest of the University.

The curriculum of the College of Medicine is based upon a four-year program. For information concerning the pace of academic work, please consult the College of Medicine Catalog.
College of Mines

The College of Mines carries out its teaching, research, and public service functions in the areas of knowledge relating to the arts and sciences required to recover the earth's mineral and fuel resources and convert them to the use of humankind. Minerals and fuels are the nonrenewable resources which supply the materials and energy humankind has used to build its world. They are the basis of civilization and are essential to our economic well-being. As such, these minerals and fuels must be developed and used as wisely, safely, economically, and unobtrusively as possible. It is the purpose of the College of Mines to teach and to augment the technology required for the proper development of these nonrenewable resources. At the center of an extraordinary mineral-producing region, the college is ideally located to carry out its purpose.

The college is composed of the following academic departments: Department of Chemical Engineering, Department of Metallurgical Engineering, and Department of Mining and Geological Engineering. In addition, the Bureau of Geology and Mineral Technology is attached to the College of Mines. The Bureau is a service organization charged with developing, maintaining, and disseminating information to the people of the state of Arizona relating to mining, metallurgy, and the earth sciences generally. Its scientific investigations and public service activities are comparable to those conducted by geological surveys and mineral experiment stations in other states.

DEGREES

The following degrees are offered through the departments in the college: Bachelor of Science in Chemical Engineering, Bachelor of Science in Geological Engineering, Bachelor of Science in Metallurgical Engineering, Bachelor of Science in Mining Engineering, Master of Science, and Doctor of Philosophy. In addition, the college offers the following professional degrees: Chemical Engineer, Geological Engineer, Metallurgical Engineer, and Mining Engineer.

MAJORS

The undergraduate majors available in the College of Mines are chemical engineering, geological engineering, metallurgical engineering, and mining engineering. For the Master of Science and Doctor of Philosophy degrees, students may major in chemical engineering, geological engineering, metallurgy, mineral economics, and mining engineering.

COLLEGE REQUIREMENTS

ADMISSION — In addition to the general requirements for admission to the University, the College of Mines requires the following specific subjects: plane geometry, one unit; intermediate algebra, ½ unit; advanced algebra, ½ unit; trigonometry, ½ unit; chemistry, one unit; and physics, one unit.

A deficiency in chemistry or physics will be waived upon satisfactory completion of Chem. 103b or Phys. 103b. A deficiency in intermediate algebra, advanced algebra, or trigonometry will be eliminated by taking Math. 116, 117e, or 118, respectively. (Completion of Math. 117d will also eliminate a trigonometry deficiency.)

GRADE AVERAGE IN THE MAJOR FIELD — For graduation, a grade average of 2.0000 is required for all courses taken in the major field at the University of Arizona.
MAXIMUM UNITS PER SEMESTER — Students in the College of Mines may take no more than nineteen units per semester, except by special permission of the dean of the college. Permission to take more than nineteen units will be granted only to students showing unusual capacity for such a heavy academic load.

TOTAL UNITS REQUIRED — The minimum units required for a bachelor’s degree in the College of Mines is 133-138, depending upon the major field. Of these units, at least 25 percent must be university credit, with at least eighteen units of university credit in the major department. Each undergraduate curriculum is designed so that degree requirements can be completed in four years if the student earns sixteen to eighteen units per semester plus the necessary summer units where required. However, the curricula are flexible enough to permit the student to take only fifteen to sixteen units each semester if he or she wishes to extend the time required for graduation to 4 1/2 years. A student earning credit at a rate to ensure completion of requirements in 4 1/2 years and maintaining a satisfactory grade record will be considered by the college to be making normal progress toward a degree.

HUMANITIES—SOCIAL SCIENCE REQUIREMENTS — All candidates for bachelor’s degrees in the College of Mines must complete the equivalent of one semester’s worth of credit, as specified in each department’s required curriculum, in the humanities and social sciences. In general, at least six units should be in the humanities area and at least six should be in the social sciences, with the remainder from either category. Credit for a certain number of these courses may be established by examination, upon approval of the student’s adviser.

The purpose of such requirements is to provide breadth to the aspiring engineer both in humankind’s cultural development (the humanities) and social development (the social sciences). Inasmuch as engineering is practiced under public scrutiny and for the public good, it is appropriate that the engineering student’s education include intellectual exposure to and exchange with nonengineering faculty, students, and subject matter by taking humanities and social science courses.

Humanities courses include certain selections from art and music (history and appreciation), history, languages (courses beyond the first year), literature, humanities, Oriental studies, and philosophy.

Social science courses may be selected from certain offerings in anthropology, economics, geography, history, political science, psychology, sociology, and speech communication.

The courses to be submitted for the humanities—social sciences electives are selected from a college-approved list by the student in consultation with an adviser. A copy of the currently approved list is available in college and departmental offices.

ACCREDITED CURRICULA — All undergraduate curricula in the College of Mines are accredited by the Accreditation Board for Engineering and Technology (ABET), which is the official accrediting agency for the engineering profession throughout the United States.

Accreditation is granted to engineering programs only after a visit by a team of representatives approved by the professional societies appropriate for the departments being inspected (American Institute of Chemical Engineers and American Institute of Mining, Metallurgical and Petroleum Engineers for the College of Mines). Accreditation implies approval of curricula, faculty, and facilities, and assures the student of a quality education.
REQUIRED CURRICULUM LEADING TO THE DEGREE OF BACHELOR OF SCIENCE IN CHEMICAL ENGINEERING  
(ABET Accredited)

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*These courses are to be selected from the humanities and social science fields listed under "Humanities-Social Science Requirements" in this section. The selection requires departmental approval, and a minimum of six units in each area is required, with two courses from any department being strongly advised. They may be taken at any time, including summer, and by correspondence.

**A field trip is made in mid-January and is a required part of Ch.E. 304.

†Technical Electives would typically be selected from the following options: MANUFACTURING: Ch.E. 322, 413, 435; S.E. 406. MANAGEMENT: Ch.E. 322; S.E. 310, 410; Mgnt. 305, 373. BIOMEDICAL ENGINEERING: Ch.E. 418, 419, 485; Bioc. 460. ENVIRONMENTAL: Ch.E. 451; A.M.E. 453; C.E. 371, 479; Mt.E. 325. MATERIALS: Ch.E. 435, 470; Mgan. 331L, 424. MINERALS: Met. 401R, 403, 411, 423. PETROLEUM: Ch.E. 445; Geos. 151, 420, 422. SOLID-STATE: Ch.E. 413; E.C.E. 452, 457; Mt. 434. RESEARCH: Ch.E. 413, 461; Chem. 424; Math. 422a. PREMED: G.Bio. 103, 104 and 320 or 321; Cell. 103 or Mi. 103; Bioc. 462a-462b. ENERGY: Ch.E. 445, 465, 467, Mt.Ec. 584.
REQUIRED CURRICULUM LEADING TO THE DEGREE OF
BACHELOR OF SCIENCE IN GEOLOGICAL ENGINEERING
(ABET Accredited)

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SENIOR YEAR

Students must elect either the geotechnics or the mining and exploration option.

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*Mining and exploration option take Mn.E. 120.*

*Geotechnics option take Geos. 450.*

**REQUIRED CURRICULUM LEADING TO THE DEGREE OF BACHELOR OF SCIENCE IN METALLURGICAL ENGINEERING (ABET Accredited)**

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†Technical electives must be chosen in consultation with the student's adviser. Half of the technical electives must be taken in the department.


### REQUIRED CURRICULUM LEADING TO THE DEGREE OF BACHELOR OF SCIENCE IN MINING ENGINEERING (ABET Accredited)

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### SOPHOMORE YEAR

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PROFESSIONAL DEGREES

The requirements for the professional degree of Chemical Engineer (E. Chem), Geological Engineer (E. Geol), Metallurgical Engineer (E. Met) or Mining Engineer (E. Min) are:

1. The candidate must have earned a degree from the University of Arizona and must hold a bachelor’s or a master’s degree in engineering.
2. The degree may be granted no fewer than ten years after graduation in recognition of outstanding professional accomplishments and is not conferred merely to mark the termination of a prescribed period of industrial practice.
3. The faculty of the College of Mines shall be responsible for recommending candidates for the degree on the basis of professional achievement.
4. Award of a professional degree requires that a candidate be recommended by the College of Mines faculty to the Advisory Council of the University. The name of a candidate approved by the Advisory Council will then be included in the list of those candidates for degrees certified by the Registrar to the college faculties and the University faculty for final approval.

SPECIAL COLLEGE PROGRAMS

COOPERATIVE EDUCATION PROGRAM: — Many industrial and governmental organizations which employ engineers and scientists in Arizona and other states cooperate with the College of Mines in a five-year, work-study program which supplements formal classroom education. The general plan requires the student to finish all freshman courses with a satisfactory grade-point average, after which he or she will alternate work with study in semester and summer periods. A few high school graduates, showing exceptional academic promise and financial need, and being at least eighteen years of age, may be admitted to the work phase of the program prior to enrollment in the College of Mines.

Among the many advantages to the student are: acquiring as much as two years of work experience — both practical and professional — in the area of the major field, and earning enough money to finance a large portion of the college education.

Each student in the program must register for the work periods as well as for the semesters of regular course work. The registration fee for each work period is $5.00. This registration gives official student status, permitting the student to retain such University residence as would be assigned if the student remained in Tucson. In addition, the student may purchase activity and Artist Series tickets on the same basis as could any student enrolled for fewer than seven units.
Further information may be obtained by contacting the Cooperative Education office.

SCHOLARSHIP PROGRAM: — Besides the general financial assistance available through the University Office of Scholarships and Financial Aids, a large number of scholarships are available specifically to students enrolled in the College of Mines.

College of Mines scholarships, in general, are awarded primarily on the basis of scholastic achievement, character, and engineering promise, with financial need usually of secondary consideration. Some of these scholarships are open only to continuing students in the college, but many are available to those just entering. Stipends range from $150 to $4000 for one year. Inquiries concerning these scholarships should be addressed to the dean, College of Mines.

MINERAL ENGINEERING STUDENT EXCHANGE PROGRAM: — The University of Arizona has a compact with seven other western schools to support undergraduate studies in mineral engineering through the Western Interstate Commission for Higher Education (WICHE). Thus, if a student who is a resident of the states of Alaska, Idaho, Montana, New Mexico, Nevada, Utah, or Wyoming desires to pursue studies in mining engineering, metallurgical engineering, or geological engineering at the University of Arizona, and the desired curriculum is not offered in the home state, then that student is eligible to attend the University of Arizona without paying non-resident tuition, which otherwise would normally be assessed. Write to the dean of the College of Mines for more information.

OUT-OF-STATE MINERAL ENGINEERING PROGRAM: — The mineral industry, through the Minerals Industry Educational Foundation, Inc., has made available scholarships to the College of Mines to award to qualified out-of-state students who are seeking a career in mining engineering or metallurgical engineering. These scholarships are valued at $900 per year. If the student holding a Minerals Industry Educational Foundation Scholarship maintains a satisfactory grade average, he or she may retain the scholarship through four undergraduate years in the college.

ORGANIZATIONS

The following professional organizations have active student chapters sponsored by the college. The college encourages students to participate in these organizations through all four years of enrollment.

American Institute of Mining, Metallurgical and Petroleum Engineers
   Society of Mining Engineers
   The Metallurgical Society

American Institute of Chemical Engineers

American Society for Metals

Association of Engineering Geologists
College of Nursing

Professional nursing is a service which helps people achieve and maintain optimum health. It is demanding but rewarding. Rapid social changes require professional nurses to have a body of knowledge in pace with scientific advances which they apply to effective nursing care. They must possess problem-solving ability and discriminative judgment in recognizing the health needs of patients, their families, and the community, and in utilizing appropriate nursing intervention. The practice of nursing changes as continuously as the practice of medicine and related disciplines. Clinical nursing is based upon the natural and behavioral sciences, and students are encouraged to draw upon scientific principles from related courses to include psychological and social as well as physical care in their applied nursing courses.

The college is accredited by the National League for Nursing and the Arizona State Board of Nursing. Upon recommendation of the faculty, its graduates will be admitted to the licensing examination administered by the state board. Information regarding licensure may be obtained from the office of the dean.

DEGREES

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

The program which leads to the B.S. in Nursing prepares the graduate to begin practice as a professional nurse, and to undertake graduate study in nursing. The curriculum is composed of two years of preclinical courses, which are taken in the College of Arts and Sciences, followed by the clinical major. After having completed the preclinical phase of the program, students are admitted selectively to the College of Nursing to begin the nursing major in fall or spring. A minimum of 33 units of the nursing major must be university-credit course work.

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

REQUIREMENTS

Any entering freshman who meets University admission requirements as described in the Admission to the University section of this catalog may be admitted to the College of Arts and Sciences for the prenursing portion of the program.

Transfer students must meet the same University admission requirements. They may complete all freshman and sophomore courses as listed in the nursing program at another college or university, or may present a combination of transfer and University of Arizona courses for consideration for admission to the nursing major.

There is a selection process before any student can be accepted into the College of Nursing for the upper-division, nursing courses. For acceptance into the nursing major, students must have completed the prescribed freshman and sophomore courses, attained a grade-point average of 2.5000 on all courses taken in the freshman and sophomore years, and have removed any high school deficiencies. All transfer students must have a minimum 2.5000 average on all freshman and sophomore courses on both University of Arizona and transfer credits for consideration for admission to the college.
Since enrollment in the college is limited, completion of freshman and sophomore courses by entering freshmen or transfer students with the required grade-point average does not assure the student of admission to the major. Once admitted to the major, the student must be full time, attending five consecutive semesters. During these semesters the student must be enrolled for all required courses.

Students seeking acceptance to the College of Nursing for fall semester need to file the special application form, to be obtained directly from the college, by October 1 of the sophomore year and can expect to hear of their status by February 1. Students planning to enter the college in a spring semester must file this application by April 1 of the previous year and can expect to hear by July 1 regarding acceptance.

In addition to these requirements, registered nurses from diploma or associate degree schools of nursing must hold a current, valid license to practice nursing. For these applicants acceptance of transfer credits and the establishment of credit by examination will be considered on an individual basis. (See also Special Examination for Credit section of this catalog.)

Since clinical laboratories are in a variety of community settings, all students in the clinical nursing courses are required to provide their own cars for transportation to the areas where they are assigned for patient-care experience.

A candidate for the degree of B.S. in Nursing must fulfill the requirements both in number and kind of units as outlined in the catalog under which the student has chosen to graduate. The graduation average must be 2.0000 or better, with an average of 2.0000 or better for all work undertaken in the major field at the University of Arizona. (See also Graduate Requirements section of this catalog.)

HONORS

The college participates in the Honors Program.

REQUIRED CURRICULUM LEADING TO THE DEGREE OF BACHELOR OF SCIENCE IN NURSING

FRESHMAN YEAR

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SOPHOMORE YEAR

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*All students must complete Psyc. 100a-100b. At least nine units of the fifteen units in anth., psyc. or soc. must be in the same department.
"Humanities (6 units): All students in prenursing are required to complete either: (A) two semesters of Hum. 250a-250b (6 units); or (B) no fewer than 6 units of course work from the following groups: courses in literature, courses in history, courses in philosophy. A list of courses acceptable under option B is available in the College of Nursing. The humanities survey (250a-250b) constitutes a single, 8-unit sequence, but a student may elect only part of the sequence.

JUNIOR - SENIOR YEARS

Five consecutive semesters beginning either fall or spring.

**FIRST SEMESTER** — N.F.S. 310 (3); Nurs. 353 (6), 354 (2), 359 (3); Pcol. 372a (2)
   Total units—16

**SECOND SEMESTER** — Pcol. 372b (2); Nurs. 363 (11); Nurs. Elective (3)
   Total units—16

**THIRD SEMESTER** — Nurs. 373 (11), 375 (3), 379 (2)
   Total units—16

**FOURTH SEMESTER** — Nurs. 381 (6), 382 (6), 388 (2), 389 (2)
   Total units—16

**FIFTH SEMESTER** — Nurs. 387 (16)
   Total units—16

Total Minimum Units Required for Graduation—141
College of Pharmacy

The primary objective of the College of Pharmacy is to educate selected, highly-motivated students to become competent pharmacists capable of delivering pharmaceutical and other health-related services necessary for modern health care. These services, whether performed in a community, institution, or other setting, require the expertise of a drug specialist who is concerned with providing high-quality patient care, particularly as it relates to safe and rational drug therapy. These responsibilities provide unusual opportunities for humanitarian service and impose high standards of moral and professional integrity.

The curricula in pharmacy provide the basic science and professional courses, as well as social and behavioral science and humanistic courses, which are essential to patient care in a variety of health-care settings. The programs provide flexibility for the student interested in research, industrial practice of pharmacy, or preparation for graduate study. The College of Pharmacy is accredited by the American Council on Pharmaceutical Education.

DEGREES

The college offers the degree of Bachelor of Science in Pharmacy based upon five years of college work (two years of prepharmacy and three years in the College of Pharmacy) as outlined below. The Doctor of Pharmacy degree, a six-year program, is also offered as an optional first professional degree for a selected number of students. The curricula for both degrees are outlined below. Through the Graduate College, the Master of Science is available for majors in pharmacology, toxicology, and pharmacy; the Doctor of Philosophy, with majors in pharmaceutical chemistry, pharmacology and toxicology, and pharmacy is also available. In conjunction with the University of Arizona Health Sciences Center, the Southern Arizona Mental Health Center, and the Veterans’ Administration Medical Center in Phoenix, the college provides training applicable to Pharmacy Residency Certification. For the specific programs available in the departments of Pharmaceutical Sciences, Pharmacology and Toxicology, and Pharmacy Practice, consult the respective department headings elsewhere in this catalog.

REQUIREMENTS

ADMISSION — In addition to the general requirements for admission to the University, all applicants should have completed one unit of elementary algebra, one unit of plane geometry, one half unit of trigonometry, and one unit of advanced algebra. A deficiency in advanced algebra or trigonometry can be removed by taking Math. 117e or 118.

To be admitted to the college, a student must have completed the equivalent of 66 units of preprofessional work as outlined in the curriculum grid below. It is highly recommended that transfer students who are considering pharmacy as a major attend the University of Arizona for the second prepharmacy year to take advantage of the counseling provided by the college.

All applicants must take the Pharmacy College Admission Test (PCAT) and arrange to have scores forwarded to the College of Pharmacy. The PCAT must be taken no later than the February test date of the year in which the student applies for admission. For applications write: PCAT — the Psychological Corporation, 304 East 45th Street, New York, NY 10017.

First-year pharmacy students are admitted only in the fall semester. The deadline for receiving the items listed below is March 1. The College of Pharmacy admissions committee will consider only those applicants with complete applications. In order for an applicant’s admission credentials to be complete, the Admissions Office must receive the following items: (1) application form, (2) college transcripts for all course work completed prior to the March 1 deadline, and (3) a list of courses in which the student is currently enrolled or will be enrolled prior to admission to the college. The College of Pharmacy must also receive the following items (available upon request from the Admissions Office): (1) a completed Student Profile Questionnaire and (2) three completed Recommendation of Applicant forms. An on-site interview may be required. The committee selects from applicants who meet the admission requirements, those deemed to be well qualified for the study and practice of pharmacy, not to exceed the number that can be accommodated in the college. The committee considers not only the previous academic records of the applicants but also their aptitudes and personal qualifications for the practice of pharmacy.
**SCHOLASTIC REQUIREMENTS**— A student is expected to complete the appropriate courses by the end of each professional year, as outlined in the curriculum grid below. The student must maintain a cumulative grade-point average and a professional grade-point average (in pharmacy courses) of 2.0000 (C) or better and must complete a minimum of 14 units per semester.

A student shall be placed on probation if, at the end of any semester or any summer session during the three professional years, the student's semester, cumulative, or cumulative professional grade-point average is below the 2.0000 level. A student who has been placed on probation may be disqualified at the end of the next semester if the cumulative grade-point average or cumulative professional grade-point average is still below 2.0000. Any student disqualified under the above rule may be readmitted on probation only by petition to the College of Pharmacy faculty and subject to such conditions as the faculty may then impose.

**INTERNSHIP REQUIREMENTS**— After enrolling in the College of Pharmacy, a student may register as an intern with the Arizona State Board of Pharmacy, 1645 W. Jefferson St., Room 127, Phoenix, Arizona 85007. 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 DEGREES OF BACHELOR OF SCIENCE IN PHARMACY AND DOCTOR OF PHARMACY

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† Transfer students may substitute eight units of general biology.

*Lower-division social science elective—six units of introductory courses from any of the following areas: anth., psych., soc., pol., speech, hist.

**The equivalent of College Algebra (one-half unit advanced algebra and one-half unit trigonometry in high school) must be satisfactorily completed as a prerequisite.

***Humanities 250a or six units from College of Arts and Sciences accepted list or equivalent.
### FIRST PROFESSIONAL YEAR

*(Bachelor of Science and Doctor of Pharmacy)*

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### SECOND PROFESSIONAL YEAR

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### SUMMER SESSION

*(Doctor of Pharmacy)*

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*Eleven units of general electives required for B.S. program. Six units of general electives required for Pharm.D. program.

**Eight units of professional electives required for Pharm.D. program.

***Year-long course.

†Consult college before enrolling.

**ELECTIVES** — In addition to the lower-division social science electives and the humanities option required of all students during their prepharmacy curriculum, students in the College of Pharmacy are required to complete electives during their professional curriculum. All electives in the professional program must be taken after the student has been enrolled in the College of Pharmacy.

Eleven units of upper-division general electives are required for the Bachelor of Science program and six units are required for the Doctor of Pharmacy program. These electives may be chosen from upper-division (300 and 400 level) courses in the following departments:

Accounting
Anthropology
Biochemistry
Cellular & Developmental Biology
Chemistry
Computer Science
Ecology & Evolutionary Biology
Economics
Finance
General Biology
Health Related Professions
Management

Management Information Systems
Marketing
Microbiology and Medical Technology
Nutrition and Food Science
Pharmaceutical Sciences
Pharmacology and Toxicology
Pharmacy Practice
Psychology
Public Policy, Planning and Administration
Sociology
Speech Communication
Statistics

In addition to six units of general electives required by the Doctor of Pharmacy program, eight units of professional electives are required and may be chosen from upper-division (300-600 level) courses in the following departments:

Pharmaceutical Sciences
Pharmacy Practice
Pharmacology and Toxicology
Multidisciplinary courses offered by the College of Medicine (with approval)

THE ARIZONA POISON AND DRUG INFORMATION CENTER AND THE RUTH E. GOLDING CLINICAL PHARMACOKINETICS LABORATORY

The Arizona Poison and Drug Information Center and the Ruth E. Golding Clinical Pharmacokinetics Laboratory are operated by the College of Pharmacy. For a description of their unique, invaluable service and teaching functions, consult the general information section of this catalog.
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 is an opportunity to increase knowledge, to broaden understanding and to develop research capabilities. Consequently, the students' 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. Admission is granted only after approval of the candidate's previous academic record by the Dean of the Graduate College and the head of the department in which the candidate proposes to do the greater portion of the academic work. Each applicant with an undergraduate academic record containing "pass," "satisfactory," "credit," or similar entries for courses which have a substantial bearing on the field of specialization must also submit (i) a written evaluation by the instructor of each such course, or a letter grade, and (ii) scores on the aptitude test of the Graduate Record Examinations. 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 deficiencies may be satisfied, without graduate credit, after admission to a graduate degree program. Students whose preparation is such that they are temporarily unable to elect any work for graduate credit must register as

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.

UNCLASSIFIED GRADUATE STATUS — University of Arizona graduates or qualified Arizona residents (holding bachelor's degrees) who are not admitted to graduate degree programs may be admitted to Unclassified Graduate Status for the purpose of undertaking work to suit their needs. Also, graduate students who complete an advanced degree, subsequently register for additional course work without being admitted to another advanced degree program will be placed in Unclassified Graduate Status. Unclassified Graduate students may earn graduate credit as their qualifications and performance warrant; but no student may later apply toward an advanced degree more than six units earned as an Unclassified Graduate student.

ADMISSION OF FOREIGN STUDENTS — Nonimmigrants should request graduate application forms from the Graduate Student Admissions Office and departmental requirements and materials from the major department. It is frequently very difficult to evaluate properly a foreign student's preparation in terms of American requirements for advanced degree programs. Most graduates of foreign institutions are therefore admitted routinely as International Special Students with the understanding that they may be required to undertake certain work without graduate credit in order to make up deficiencies in preparation, and that no commitment can be made in any case regarding the time required to complete a course of study. The decision as to whether an international special student can qualify for graduate credit will be made after the close of the student's first semester of residence.

Foreign students must demonstrate proficiency in English as one of the conditions for admission. The University requires all foreign applicants whose native language is other than English and who have not completed at least two academic years of full-time study in the United States, English-speaking Canada, the United Kingdom, Australia, or New Zealand, unless that study has resulted in a bachelor's or higher degree, to take the Test of English as a Foreign Language (TOEFL). Results of the TOEFL are valid for two years, and scores will be sent to the University of Arizona when requested by the applicant, from TOEFL; Box 899-TR;
Princeton, New Jersey 08540; U.S.A. The scores for this examination must be submitted before
the student's application can be considered. New foreign students whose native language is not
English must also take a locally administered English test and must enroll for any further English
courses which may be recommended.

Foreign students on nonimmigrant visas are required by the University to have Student
Accident and Sickness Insurance coverage. Information and costs of this coverage are sent to
those foreign students who are accepted for admission. The cost of the insurance is included in
the amount of the financial guarantee. Insurance coverage is required for each term of enroll-
ment. Some students are exempted from the University of Arizona insurance plan only when
their government or sponsoring agency has submitted accident and sickness insurance plans
acceptable to the University of Arizona. In addition, foreign students on nonimmigrant visas
must certify that they possess adequate financial resources to support themselves while in resi-
dence at the University of Arizona. If sponsorship is through an organization or government
agency, the sponsor should inform the Graduate Student Admissions Office-F, in advance,
what the terms of support will be.

All foreign student applications, with the required credentials, should reach the Graduate
Student Admissions Office-F before May 15 for the fall term; September 15 for the spring term;
and April 1 for the summer sessions. If the University is to bill for tuition and fees, billing must
be through an embassy or an agent in the United States.

APPLICATION FOR ADMISSION — Application for admission to the Graduate College must be
made on forms furnished by the Graduate College. Completed application forms must arrive
before supporting transcripts come or processing will be seriously delayed. An applicant from
another institution should request that two sets of complete transcripts of all undergraduate
and graduate work done and degrees received be sent directly by the institution at which the
work was done to the Dean of the Graduate College of the University of Arizona. Both the ap-
lication and the transcripts must be on file at least one month prior to registration. Applicants
should also contact directly the department of their intended major to obtain departmental ap-
lication materials and requirements. Students who have been admitted to the Graduate
College, but who were not enrolled during the previous regular semester, must apply for read-
mission.

GRADUATE RECORD EXAMINATIONS — To supplement other evidence of preparation for
graduate work, the Graduate Council has authorized the use of the Graduate Record Examina-
tions. These examinations will not replace other records of achievement as a basis for
admission to the Graduate College, but they will offer additional evidence concerning the quali-
fications of students desiring to undertake graduate work.

A number of departments have specific requirements with regard to the Graduate Re-
cord Examinations, the Graduate Management Admissions Test, and other examinations.
Departmental headnotes in the Graduate Catalog should be consulted for further information.

It is strongly recommended that, in addition to providing transcripts of records of all pre-
vious academic work, each applicant for admission to the Graduate College take the Graduate
Record Examinations and submit a transcript of the scores. Applications for the examinations,
which will be administered locally as well as in other centers, should be sent, together with the
examination fee, to Graduate Record Examinations; Educational Testing Service; Box 1502;
Berkeley, California 94701; or Box 955; Princeton, New Jersey 08541. Application materials
are available in the office of the Graduate College and from the Educational Testing Service.

CANDIDACY FOR AN ADVANCED DEGREE — Admission to graduate study does not imply
admission to candidacy for an advanced degree and gives no right or claim to be so admitted.
Such candidacy is determined after the student has demonstrated, by work done at the Univer-
sity of Arizona, the ability to do work of graduate character with originality and independence.
Until admitted to candidacy a student should not count upon taking the final examination for a
degree at any set time.

GRADUATE CREDIT FOR SENIORS AND UNCLASSIFIED (NOT GRADUATE) STUDENTS — A
University of Arizona student of senior standing who is within 15 units of completing all require-
ments for graduation may register for graduate work if recommended by the head of the
department and approved by the Dean of the Graduate College. For such registration a petition
for graduate credit in excess of senior requirements must be filed with the dean at the time of
registration. This petition must be endorsed by the professor in charge of the course and the student's adviser. The dean will not approve a petition unless the senior has a grade point average of 3.0000 or better on all work already completed in the University, is proceeding toward graduation as directly as possible, and does not propose a total load to exceed sixteen units. The maximum number of units of graduate credit that may be earned by a senior in any semester is equal to the difference between sixteen and the number necessary to complete requirements for graduation.

An unclassified (not graduate) student at the University who holds the bachelor's degree may petition for permission to take courses for graduate credit. The petition must be filed at registration time, must be recommended by the instructor of the course and the head of the department concerned, and must be approved by the Dean of the Graduate College.

**GENERAL PREREQUISITES FOR MAJOR GRADUATE CREDIT** — The undergraduate major, or its equivalent, in any field of study is prerequisite to major graduate work in that field. In some cases, a field of concentration in the undergraduate work different from but suitably related to the graduate major may be acceptable. The minimum requirement in education is fifteen units, of which three may be in general psychology, anthropology, or sociology.

Deficiencies in undergraduate preparation must be satisfied by the completion of prescribed courses, for undergraduate credit.

**REGULAR GRADUATE CREDIT COURSES** — Regular courses numbered 500 and above are intended for graduate students; while approved 400-level courses, indicated by a GC in the course listing, may be taken for graduate credit by graduate students, and by undergraduates who have received prior, written permission of the Dean of the Graduate College. (See the *Departments and Courses of Instruction* section for classification of regular courses by number.) Courses at the 500 level are graduate; with prior written permission of the Dean of the Graduate College, exceptionally well-qualified seniors may enroll in 500-level courses. Courses numbered 600 and above are not open to undergraduates.

**OTHER COURSES FOR GRADUATE CREDIT** — In addition to the regularly scheduled campus offerings, the University offers a variety of special courses. Such courses are designated by numbers of four digits. The first digit, 4 or 5, indicates the type of course instruction. The last three digits are the same as the number of the regular campus offering unless there is no such counterpart.

All courses given by television for credit are designated by four-digit numbers beginning with 5. As many as eighteen units of credit in 5000 series courses may be applied to meeting the requirements for the master's degree, except that this limit is reduced by the number of units of transfer work offered. No course in the 5000 series may be applied toward meeting the requirements for the doctoral degree. Correspondence course are designated by four-digit numbers beginning with 4. No courses in the 4000 series may be used toward a graduate degree.

**TRANSFER OF GRADUATE CREDIT** — The University of Arizona accepts graduate credit by transfer from other accredited institutions. There may be offered toward a master's degree a whole number of transferred units not to exceed twenty percent of the minimum number of units required for the degree in question. Such transfer of credit may be established to apply toward an advanced degree only upon satisfactory completion of such additional courses as may be prescribed by the head of the corresponding department in the University. Furthermore, the application of transfer work toward meeting requirements for a master's degree will reduce the number of units of work in the 5000 series acceptable for the same program (see "Other Courses for Graduate Credit" above).

In any case, transfer of credit toward an advanced degree will not be made unless approved by the head of the major department, unless the grade earned was "A" or "B," and unless the credit was accepted or would be acceptable toward an advanced degree at the institution where the work was completed. Furthermore, transfer will be made of credit only; no account will be taken of the grades of transfer work in computing the student's grade-point average. Such transfer, which must be arranged by the student through the Graduate Degree Check Office, may be initiated at any time but will not become effective until the student has completed satisfactorily at least twelve units of graduate work at the University of Arizona. Credit for extension work offered by other institutions will not be accepted.
CORRESPONDENCE COURSES — Correspondence courses will not be accepted for graduate credit.

SCHOLARSHIP REQUIREMENTS — A high level of performance is expected of students enrolled for graduate credit. A student who does not appear to be making satisfactory progress in graduate work may be required to withdraw from the University. No student will be recommended for the award of an advanced degree unless he or she has achieved a grade-point average of 3.0000 or better (a) on all work taken for graduate credit and (b) on all work included specifically in the graduate study program. To meet condition (a) the grade-point average will be computed on all University of Arizona course work for which the student has enrolled for graduate credit, whether or not it is offered in satisfaction of requirements for an advanced degree, except for courses in which grades of "P" or "S" have been awarded. To meet condition (b) the grade-point average is computed in a like manner, but only on courses included in the approved graduate study program set up by the major department. Students who do not meet condition (b) may take additional work. Such additional work may be included with the major work in the computation of the grade-point average to meet condition (b), but only with the approval of the major department secured prior to taking the work in question.

PASS-FFAIL OPTION — This option is not available to graduate students except for: (a) admission deficiencies which the student has specific, prior, written approval to take on a "P-F" basis. (Only the department head or the departmental graduate adviser may give such approval, which must be on file in the Graduate College office before registration;); and (b) any undergraduate, nondeficiency course available for "P-F" grading; and (c) any course offered by the College of Law.

FULL-TIME STUDENT STATUS — Full-time status for graduate students is widely variable, depending upon assistantship and associateship duties and the constitution of the individual student's program. Students in doubt about their standing should check with the Graduate College.

MAXIMUM ENROLLMENT — The maximum enrollment allowed per semester for students registered in the Graduate College is sixteen units. Students are asked not to request permission to take more than this maximum.

SUPPLEMENTARY REGISTRATION — Each student who, during any academic term, is associated with the University in any capacity that makes use of University facilities or faculty time must register. During the fall and spring semesters a minimum of three units of course work will be required; during any summer term one unit of course work will be required. The minimum course-work-registration requirement may be met by registering officially for any single course or combination of courses for which the total number of units meets or exceeds the specific minimum.

Each student completing requirements for an advanced degree must be registered during the semester or summer term during which requirements are completed, or the previous semester or term if requirements are completed during an intersession. Students who have previously enrolled for all the regular courses required for their degrees and who still must register should enroll for supplementary registration (course number 930). Supplementary registration may be used concurrently with other enrollments to meet the unit registration requirement.

THESIS AND DISSERTATION WORK IN ABSENTIA — Under conditions approved by the head of the major department, a portion of the student's thesis or dissertation work may be done in absentia. Approval to do work in absentia must be sought prior to undertaking the work.

AUDITING OF COURSES BY GRADUATE STUDENTS — With the consent of the Dean of the Graduate College and the instructors concerned, students enrolled in the Graduate College may unofficially audit courses not included in their regular programs. It is not necessary to register for such courses, but an auditor's permit must be obtained from the dean. If courses are audited officially by registering as an auditor, the units are included in the student's unit load and the fees are the same as a registration for credit. For the purpose of reporting full- or part-time student status to outside agencies, however, only those courses taken for credit are counted. After the fourth week of classes, a change from credit to audit will be permitted only if the stu-
dent is doing passing work in that course, and receives the approval of the course instructor and the Dean of the Graduate College.

MAJOR FIELD FOR PROFESSIONAL DEGREE

Major work in pharmacy leading to a Doctor of Pharmacy degree is offered.

MAJOR FIELDS FOR MASTER’S DEGREES

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

- accounting
- addiction studies
- aerospace engineering
- agricultural economics
- agricultural education
- agricultural engineering
- agronomy & plant genetics
- anatomy*
- animal physiology
- animal science
- anthropology
- American Indian studies
- applied mathematics
- architecture
- art
- art education
- art history
- astronomy
- atmospheric sciences
- bilingual/bicultural education
- biochemistry
- botany
- business administration
- business education
- cellular & developmental biology
- chemical engineering
- chemistry
- civil engineering
- composition (music)
- computer science
- counseling & guidance
- creative writing
- dairy science
- dietetics
- distributive education
- drama
- ecology & evolutionary biology
- economics
- educational administration
- educational media
- educational psychology
- electrical engineering
- elementary education
- engineering mechanics
- English
- English as a second language
- entomology
- finance
- food science
- foundations of education
- French
- general biology
- genetics
- geography
- geological engineering
- geosciences
- German
- health education
- higher education
- history
- home economics
- home economics education
- horticulture
- hydrology
- industrial engineering
- journalism
- landscape architecture
- Latin American studies
- library science
- linguistics
- management
- management information systems
- marketing
- mathematics
- mechanical engineering
- metallurgy
- microbiology
- mineral economics
- mining engineering
- molecular biology
- music education
- musicology
- music theory
- nuclear engineering
- nursing
- nutritional sciences
- optical sciences
- Oriental studies
- performance (music)
- pharmacology
- pharmacy
- philosophy
- physical education
- physics
- physiology*
- planetary sciences
- plant pathology
- plant protection
- political science
- poultry science
- psychology
- public administration
- range management
- reading
- rehabilitation
- renewable natural resources studies
- Romance languages
- Russian
- school library science
- secondary education
- sociology
- soil & water science
- Spanish
- special education
- speech & hearing sciences
- speech communication
- statistics
- systems engineering
- toxicology
- urban planning
- water resources administration
- watershed management
- wildlife and fisheries science

* Applicants are not admitted directly to this degree program. The degree is awarded only in rare instances when individuals admitted to Ph.D. programs are forced to terminate early.
MAJOR FIELDS FOR SPECIALIST DEGREES

Major work leading to a specialist degree is offered in each of the following fields:

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

MAJOR FIELDS FOR DOCTORAL DEGREES

Major work and research leading to a doctoral degree are offered in the following fields.
(Except as noted, the degree is the Doctor of Philosophy.)

- aerospace engineering
- agronomy & plant genetics
- anatomy
- animal physiology
- anthropology
- applied mathematics
- arid lands resource sciences
- astronomy
- atmospheric sciences
- biochemistry
- botany
- business administration
- cellular & developmental biology
- chemical engineering
- chemistry
- civil engineering
- composition (music/A.Mus.D.)
- computer science
- conducting (music/A.Mus.D.)
- counseling & guidance*
- ecology & evolutionary biology
- economics
- educational administration*
- educational psychology*
- electrical engineering
- elementary education*
- engineering mechanics
- English
- English education
- entomology
- foundations of education*
- French
- general biology
- genetics
- geography
- geological engineering
- geosciences
- higher education
- history
- horticulture
- hydrology
- linguistics
- mathematics
- mechanical engineering
- metallurgy
- microbiology
- mineral economics
- mining engineering
- molecular biology
- music education (A.Mus.D.)
- music theory
- nuclear engineering
- nursing
- nutritional sciences
- optical sciences
- Oriental studies
- performance (music/A.Mus.D.)
- pharmaceutical chemistry
- pharmacology and toxicology
- pharmacy
- philosophy
- physics
- physiology
- planetary sciences
- plant pathology
- political science
- psychology
- range management
- reading*
- rehabilitation*
- renewable natural resources studies
- secondary education*
- sociology
- soil & water science
- Spanish
- special education*
- speech & hearing sciences
- speech communication
- systems engineering
- water resources administration
- watershed management
- wildlife and fisheries
- science

*Both Ph.D. and Ed.D. degrees are offered.

PROFESSIONAL AND 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.
Professional Degree

Doctor of Pharmacy (Pharm.D.)

Advanced Degrees

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.)

Educational Specialist (Ed.S.)
Doctor of Education (Ed.D.)
Doctor of Musical Arts (A.Mus.D.)

Master of Landscape Architecture (M.L.Arch.)
Master of Library Science (M.L.S.)
Master of Music (M.M.)
Master of Public Administration (M.P.A.)
Master of Science (M.S.)
Master of Teaching (M.T.)

Nursing Specialist (N.S.)
Specialist in Microbiology (Sp.M.)

Doctor of Philosophy (Ph.D.)
General Divisions of the University

DEPARTMENT OF PHYSICAL EDUCATION

The Department of Physical Education offers programs in physical education, dance, and recreation leading to bachelors' degrees. Minor programs are available in physical education and in athletic coaching. The latter minor is designed for individuals who wish to coach interscholastic sports at the secondary school level while teaching in a field other than physical education. Refer to the Departments and Courses of Instruction section of this catalog for the specific details concerning each of these programs.

Master of Arts and Master of Science degrees are available with a major in physical education. A minor in physical education is available for Ph.D. and Ed.D. students with majors in other disciplines. For information regarding graduate programs, please consult the Graduate Catalog.

The department offers a broad elective program in physical education activity course work which focuses on physical fitness and skill development. Students may choose from among more than forty different courses. Provision is made for those students with physical handicaps to participate in an adapted physical education program which has many diverse offerings.

ATHLETIC PROGRAMS

INTRAMURAL AND RECREATIONAL SPORTS PROGRAM — Competitive and informal programs of activity intended for students, faculty, and staff of the University are sponsored by the Department of Intercollegiate Athletics throughout the year. The intramural program includes competitive sport activities in twenty-four sports for men, twenty-two sports for women, and twelve sports on a corecreational basis. Men and women are encouraged to join dormitory, sorority, fraternity or independent teams or register individually in this competitive sports program.

Informal activity is provided by scheduling most of the sports facilities for specific hours of recreational use. Gymnasium, handball/racquetball and tennis courts, swimming pools, weight room and field space are available for individual participation in recreational pursuits. All students, faculty, and staff are encouraged to utilize the facilities when they are available.

Complete information regarding the program of intramural and recreational sports can be obtained by calling the office of the coordinator.

INTERCOLLEGIATE ATHLETICS — The Intercollegiate Athletics Department at the University of Arizona conducts a challenging program in eighteen sports for men and women. The University is a member of the NCAA, and both the men's and women's programs are conducted under NCAA rules and participate in NCAA championships. The University athletic program participates in two athletic conferences.

The women's program is a member of the Western Collegiate Athletic Association (WCAA) which includes, in addition to the University of Arizona, Arizona State University, California State University at Fullerton, California State University at Long Beach, San Diego State University, Stanford University, University of California at Los Angeles and the University of Southern California. The intercollegiate athletics program for women includes the following sports: basketball, cross-country, golf, gymnastics, softball, swimming and diving, synchronized swimming, tennis, track and field, and volleyball.
The men's athletics program competes in the Pacific-10 Conference. Its members include, in addition to the University of Arizona, Arizona State University, Stanford University, Oregon State University, University of California, University of California at Los Angeles, University of Oregon, University of Southern California, University of Washington, and Washington State University. The University of Arizona men's program participates in the following sports: football, basketball, baseball, track and field, cross-country, swimming and diving, golf and tennis.

The President of the University appoints an advisory committee on intercollegiate athletics, which consists of the Director of Athletics, associate directors for men and women, the faculty representative to the NCAA, members of the faculty, alumni members, and students.

OFFICE OF INTERDISCIPLINARY PROGRAMS

One of the major problems facing higher education is the initiation and development of effective interdisciplinary programs of education and research. The traditional disciplinary structure of the University is being altered in a diversity of ways, some involving informal cooperation of interested faculty, others resulting in the creation of centers, institutes and other organized units. The University of Arizona has responded to these needs by creating a number of interdisciplinary units: the Office of Arid Lands Studies, the Environmental Research Laboratory, the Optical Sciences Center, the Institute for Atmospheric Physics and others. The University has also developed interdisciplinary programs under the direction of University committees, some responsible to the Executive Vice President, others to the Dean of the Graduate College or the President.

The Office of Interdisciplinary Programs was established as an agency responsible for furthering the development of new activities. The Coordinator of Interdisciplinary Programs works with the Dean of the Graduate College and the Vice President for Research in fostering both educational and research projects. The following programs are administered by the Office of Interdisciplinary Programs: applied mathematics, biomedical engineering, history and philosophy of science, and statistics. Others, such as gerontology, are in various stages of development. Course listings for these programs may be found in the Departments and Courses of Instruction section of this catalog.

SCHOOL OF HEALTH-RELATED PROFESSIONS

The School of Health-Related Professions is an integral part of the Arizona Health Sciences Center, providing educational opportunities for students in the health-related professions. Close liaison exists with other colleges as a recognition of the interdisciplinary nature of the health field and an attempt to utilize valuable resources throughout the University.

DEGREES — The School offers the Bachelor of Science in Health Sciences degree with majors in health education, medical technology, and occupational safety and health, as well as a Master of Science degree with a major in addiction studies and a Master of Education with a major in health education.

REQUIREMENTS — Students are not admitted to the School of Health-Related Professions until they have achieved junior status (63 units of credit) and fulfilled the prerequisites for the particular program they wish to enter. Students may spend the first two years in the College of Arts and Sciences as a pre-health sciences major. They may also fulfill these prerequisites at another university or college or present a combination of University of Arizona credits and transfer credits for consideration for admission to the school.

Since all programs in the school have limited enrollments, the completion of minimum requirements does not guarantee admission to the school. All students must be accepted by a program in order to enter the school. Students are encouraged to call or write the school to
arrange a meeting with a faculty adviser to discuss an academic plan. Since many of the programs have a tight schedule for meeting prerequisites, students should establish contact with the school as early as possible.

Applications for admission to the School of Health-Related Professions are available from the Undergraduate Admissions Office, Administration Building, Room 322, The University of Arizona, Tucson, Arizona 85721. Admission deadlines are the second Friday in February for summer admission and the second Friday in September for spring admission. Due to course requirements, some programs may have only a fall admission.

SCHOOL OF MILITARY SCIENCE AND AEROSPACE STUDIES

The Reserve Officer Training Corps (ROTC) has been an integral part of the University of Arizona since 1920. The School of Military Science and Aerospace Studies consists of two separate departments, the Department of Military Science (Army) 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 Reserve Officers in the U.S. Army 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.

PROGRAMS — Both departments offer the regular Four-Year Program and the Special Two-Year Program. These are highly selective programs limited to students who can complete requirements for commissioning prior to age 30 for Army ROTC (may be waived). Air Force ROTC requires commissioning prior to age 26 for flying officer candidates or age 30 for nonflying officer candidates. The Army ROTC curriculum is in general military science, which includes subjects common to all branches of the Army. The Air Force ROTC curriculum is in military aerospace studies. ROTC course work is in addition to academic programs leading to a baccalaureate or higher degree. ROTC is coeducational and students in any academic major and department allowing free electives (which includes most departments in the University) can count ROTC units toward graduation.

The Four-Year Program consists of eight units of lower-division ROTC course work, completion of all prerequisites to entering upper-division ROTC course work, a six-week (Army) or four-week (Air Force) summer training camp, and twelve units of upper-division ROTC course work.

MILITARY SERVICE CREDIT — Credit toward graduation received for active military service (see "Evaluation of Military Training and Experience" in the Admission to the University section of this catalog) can be used in lieu of lower-division ROTC units in the Four-Year Program.

The Special Two-Year Program requires that applicants successfully complete a six-week summer basic training camp and meet all other prerequisites to entering upper-division ROTC course work prior to entering the ROTC program. This program is designed specifically for transfer students and other University students with less than three years remaining before graduation. The six-week summer training takes the place of the lower-division units in the four-year program and appropriate credit, not to exceed eight units, may be granted by the University for successful completion.

LOWER-DIVISION COURSES (Army ROTC's Basic Course/ Air Force ROTC's General Military Course [GMC]) — Two units of credit are given for each semester completed, and registration for one semester does not obligate a student for more than that semester. There is no military obligation incurred during lower-division course work. Only full-time University students who meet the department’s basic age requirements as stated above may enroll in these courses.
Note: The student may transfer from the ROTC unit of one service to the ROTC unit of another without loss of credit or standing in the Four-Year Program prior to starting upper-division work.

UPPER-DIVISION COURSES (Army ROTC's Advanced Course/Air Force ROTC's Professional Officer Course [POC]) — The upper-division ROTC student is required to sign a contract with the government to continue in the Army ROTC or Air Force ROTC until the completion of his or her military instruction and receipt of a commission, to devote the prescribed hours per week during such period of military instruction, and to pursue the courses of summer camp training during such period as prescribed by the Secretary of the Army and the Secretary of the Air Force. The student under such a contract must be a full-time student in the University until upper-division ROTC course work has been completed, unless the student is released from this requirement by the government. The Advanced/POC course covers two academic years at the University and one summer training camp normally between the junior and senior years (Army ROTC) or sophomore and junior years (Air Force ROTC). Students must have completed eight units of lower-division course work (or the six-week summer camp for two-year applicants) and have two years of full-time undergraduate and/or graduate instruction remaining at the University before they may enroll in these courses. They must have also passed the department’s mental and physical requirements and have been accepted by the department for upper-division ROTC course work.

UNIFORMS AND EQUIPMENT — The Departments of the Army and Air Force furnish, without cost to the student, uniforms, insignia, and instructional materials. A $25 deposit is required to cover damaged or lost items, and is refundable at the close of the year or upon withdrawal from the course.

FINANCIAL ASSISTANCE — Subsistence pay of $100 per month, tax free, for a maximum of twenty months during two academic years is paid to nonscholarship, upper-division students upon enlistment in the appropriate Reserve and signing the contract of service. Additionally, students receive pay for summer camp and travel pay to and from camp. Highly competitive scholarships are available which pay full tuition, cost of textbooks, incidental fees, laboratory expenses, and $100 per month during the academic year. High school seniors are eligible to apply for full four-year scholarships. Air Force ROTC offers 3½-, three-, 2½-, and two-year scholarships, and Army ROTC offers three-, two-, and one-year scholarships to students in the respective programs. Contact the respective department for details.

FLIGHT TRAINING PROGRAM — The Air Force offers a flight training program for physically qualified students who are classified in category IP (Pilot) and who are in their final years of the ROTC program. The actual flight training is paid for by the service. This program must be taken in addition to the normal academic curriculum and is conducted by a Federal Aviation Administration-approved flying school near the University.

MARINE CORPS PLATOON LEADERS PROGRAM — Students interested in this program or the Marine Woman Officers Candidate Program, please check with the Marine Corps Officer Selection Officer, who visits the campus during the school year, or write to the United States Marine Corps Officer Selection Officer, 317 N. Central Avenue, Phoenix, Arizona 85004.

DIVISION OF CONTINUING EDUCATION

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

ON-CAMPUS COURSES — Students may enroll in regular on-campus day or evening classes through the Division of Continuing Education. Students need not submit college or high school transcripts to register for credit courses; admission is automatic. The Continuing Education Announcement is published each semester regarding registration dates, times and locations. Credits earned may be used toward a degree at the University. To complete a degree all students must be admitted to a college within the University.

UNIVERSITY EXTENSION — University Extension serves the needs of individuals who find it difficult or impossible to take regularly scheduled classes on campus. The University has been given the mission of serving Pima, Santa Cruz and Cochise counties. The Sierra Vista/Fort Huachuca Program Center is open five days a week. Both graduate and undergraduate courses are offered off-campus and all courses receive regular University credit. In all cases, admission to the graduate college is required to receive graduate credit.

IND. N. NT STUDY THROUGH CORRESPONDENCE — Correspondence courses are designed to parallel, as nearly as possible, the same courses offered on campus. Neither age of the student nor place of residence is a deterring factor to the successful completion of an independent study program. All lessons and examinations are mailed to the instructor who grades and returns the lessons to the students. Tucson area students take examinations in the Independent Study Through Correspondence Office on campus. Students residing outside of the Tucson area take examinations in their local community under the auspices of an approved proctor. Students may earn a maximum of sixty credit hours toward a bachelor's degree through correspondence. Regularly enrolled on-campus students may register for correspondence courses with the approval of the college dean.

DISQUALIFICATION — Students disqualified from the University for disciplinary reasons may not register for credit courses of any nature through the Division of Continuing Education during their disqualification period. Those disqualified for scholastic reasons, however, may register for correspondence courses with the approval of the college dean.

Noncredit Programs

CONFERENCES AND SHORT COURSES — Working with colleges, departments and faculty, the conference department assists in planning regional, national and international conferences, short courses and seminars.

OPPORTUNITIES FOR WOMEN — Offers classes, support groups and counseling for women including programs for displaced homemakers (partially grant funded).

SPECIAL INTEREST — Offers classes, workshops of general interest to the public including a special program for children. Domestic Issues and National Issues Forums are sponsored by the department.

SPECIALIZED CLIENTELE — Works with colleges, departments, faculty and community members and organizations to develop workshops and seminars to meet specialized needs of a particular clientele.

CAREER AND TRAINING — Offers educational, vocational and personal counseling programs for adults with special emphasis on middle-aged and mature job and career changers. The programs are partially grant funded.

ELDERHOSTEL — Is part of the national Elderhostel network offering special low-cost academic programs for older adults.
OFFICE OF INTERNATIONAL PROGRAMS

The Office of International Programs coordinates all the University's academic programs abroad. The University operates a major summer program in Guadalajara, Mexico, as well as summer and semester programs in Rio de Janeiro, Brazil; London, England; France; Germany; Florence, Italy; Japan; Segovia, Spain; and Taiwan. The Office also serves as the source of information, assistance, and referral for University students wishing to participate in international programs sponsored by other institutions or organizations.

CREDIT EARNED IN UNIVERSITY OF ARIZONA STUDY ABROAD PROGRAMS—University of Arizona credit is awarded for courses offered through the Office of International Programs in which teaching is performed by University of Arizona faculty, including adjunct faculty employed by the University for the purpose of teaching such courses. Where teaching is performed by faculty at the foreign institution, credit is awarded by that institution and shall appear on the University of Arizona transcript as transfer credit with an accompanying notation indicating that it was earned in a University of Arizona program. For courses receiving transfer credit, grades will not be recorded or counted in the University of Arizona gradepoint, nor will such courses be counted toward satisfying the University residency requirement, unless by special permission of the Undergraduate or Graduate Council. For undergraduate course work, such credit may be counted toward meeting the requirement that eighteen of the final thirty units offered for a degree must be University credit, provided the student has previously taken at least thirty units of University credit (see "University Credit Requirement" under the Graduation Requirements section).

SUMMER SESSION

Each summer, the University offers a three-week pre session and two five-week summer terms. Students may register for a maximum of three units of semester credit during the pre session and six units during the five-week terms. Over 700 undergraduate and graduate courses are offered during the two terms. The summer program is coordinated by the Office of the Summer Session. The departmental academic programs are determined by the academic deans.

ADMISSION—Summer session enrollment is open to all regularly admitted students of the University. It is also open to students admitted at the undergraduate level for the summer session only.

For further information, please see the Summer Session Schedule of Classes, which is published each January.
Departments and Courses of Instruction

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 Curriculum Office, Administration Building, Room 116. Because the catalog designation of semesters of offering is subject to change, students should consult the Schedule of Classes for curricular planning of a particular term. Schedules for fall and spring classes are available from the Information Desk, Administration Building, 2nd Floor, in April and October, respectively. The Summer Schedule of Classes is available from the Office of the Summer Session, Administration Building, Room 116. For a complete statement of the student's responsibility in maintaining acquaintance with current University requirements, see the copyright page of this catalog.

EXPLANATORY NOTES

CLASSIFICATION OF COURSES (THE NUMBERING SYSTEM) — The number by which a course is designated indicates the level of the course. Courses numbered:

100-299 inclusive: Lower-division courses primarily for freshmen and sophomores.
100-199: Primarily introductory and beginning courses.
300-399: Advanced-intermediate-level courses. Not available for graduate credit.
400-499: Advanced-level courses. Acceptable for graduate credit with the prior approval of the Graduate College, except 400-level Individual Studies courses (491, 493, 494 or 499, with or without subscripts).
500-599 inclusive: Graduate courses. Open to exceptionally well-qualified seniors with the prior written approval of the course instructor and the Graduate College.
600-699 inclusive: Graduate courses. Not open to undergraduate students.
700-799 inclusive: Graduate courses limited to doctoral students.
800-899 inclusive: 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.

SEMESTER COURSES (SINGLE NUMBERS) — A course designated by a single number (as Economics 248) is one semester in length.

YEAR COURSES (DOUBLe NUMBERS) — A course designated by a double number (as Political Science 233a-233b) is continued through two successive semesters, the work of the first semester being prerequisite to that of the second unless otherwise indicated in the statement of prerequisites. Credit is awarded for the first half of the course except in a few instances when credit in the first half is contingent upon completion of the second half.

PREREQUISITES — A student registering for a course must meet the prerequisites or otherwise satisfy the instructor of his or her preparation to take the course. Prerequisites can be waived only at the discretion of the instructor or department involved.

ADDITIONAL COURSES — In addition to the courses listed in this catalog, courses offered for no credit through the Division of Continuing Education are listed in the catalog for that division.
CANCELLATION OF COURSES — The University reserves the right to cancel courses not elected by an adequate number of students.

FOREIGN LANGUAGE COURSES — In addition to courses taught in the language departments, sections of other University courses may be taught in a foreign language from time to time.

KEY TO SYMBOLS

The standard course description includes a variety of symbols indicative of essential information. The following is a standard course description with the individual symbols explained in the order in which they appear in that description.

406. Social Structure in Modern Societies (3) [Rpt./1 1984-85 GRD Critical review of modern theory and research on social structure and social organization in modern societies. 2R, 3L. P; six units of soc. or CR. (Identical with Hist. 406) Smith

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

GC — Graduate credit available. (Applies to 400-level courses only.)
I — Semester offered. I indicates fall semester; II, spring; S, summer.
1983-84 — Year in which course is offered. If no year designation is given, the course is offered each year.
GRD — GRD and CDT indicate that the course is available by examination. GRD indicates that the course is available by examination for a grade and credit, and CDT indicates that the course is available by examination for credit only. These options are not available for graduate credit.

Critical review...societies. — Course description.
2R, 3L — Class structure. R, L, and S indicate "recitation," "laboratory," and "studio." 2R, 3L indicates two hours of recitation and three hours of laboratory per week (based upon fifteen weeks). For courses consisting of lecture and recitation periods only, the number of class hours per week is the same as the unit value and is not specified in the course description.
P. — Prerequisites.
CR — Concurrent registration.
(Identical with Hist. 406) — Other departments which give credit for the same course. If no course description appears, please consult the crosslisted department.
Smith — Professor in charge.

Note: Not all of the above information may be noted in any individual course.

Symbols in other University Catalogs

Prefix Definition
4. Course offered by correspondence — no university or graduate credit.
5. Course offered by television — limited applicability toward advanced degree.
6. Course shorter in duration than normal semester or term — full university credit.
UNIVERSITY-WIDE “HOUSE-NUMBERED” 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. The exchange of ideas may involve written as well as oral communication. Research projects need not be required of course registrants.

GRADES AVAILABLE: (195, 295, 395, 495)—A, B, C, D, E, I, P/F, S/P, W.
(495, 595, 695, 795)—A, B, C, D, E, I, S/P, W. *

196, 296, 396, 496. Proseminar and 596, 696, 796. Seminar (Credit varies) The development and exchange of scholarly information, usually in a small group setting. The scope of work shall consist of research by course registrants, with the exchange of the results of such research through discussion, reports, and/or papers.

GRADES AVAILABLE: (196, 296, 396, 496)—A, B, C, D, E, I, P/F, S/P, W.
(496, 596, 696, 796)—A, B, C, D, E, I, S/P, W. *

197, 297, 397, 497, 597, 697, 797. Workshop (Credit varies) The practical application of theoretical learning within a group setting and involving an exchange of ideas and practical methods, skills, and principles.

GRADES AVAILABLE: (197, 297, 397, 497)—A, B, C, D, E, I, P/F, W.
(497, 597, 697, 797)—A, B, C, D, E, I, W.

*Special or regular grades may be used as departmental policy dictates; however, in any given instance, all registrants must be graded by the same system.

Individual Studies

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, and without subscripts, they are available for use by all departments at the course-number levels appropriate to the departments' academic programs.

Supplementary Registration: Graduate students who have completed the course requirements of their programs and will be taking examinations or completing courses or projects initiated at an earlier date should register for supplementary registration. Students completing requirements for advanced degrees must be registered during the semester or summer term in which requirements are completed, or during the previous semester or term if requirements are completed during an intersession. Students who have previously enrolled for all the regular courses required for their degrees may register for supplementary registration (course number 930, one to nine units). All graduate students using University facilities or faculty time must register for 930 if not registered for anything else.

191, 291, 391, 491, 591, 691, 791. Preceptorship (Credit varies) Specialized, advanced 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, advanced, or graduate work, on an individual basis, consisting of training and practice in actual service in a technical, business, or governmental establishment.

GRADES AVAILABLE: S/P, C, D, E, I, W.

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

GRADES AVAILABLE: A, B, C, D, E, I, W.
194, 294, 394, 494, 594, 694, 794. Practicum (Credit varies) The practical application, on an individual basis, of previously studied theory and the collection of data for future theoretical interpretation.

GRADS 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.

GRADS AVAILABLE: S/P, C, D, E, I, W.

900. Research (Credit varies) Individual research by graduate students, not related to a thesis or dissertation the student will write for an advanced degree.

GRADS AVAILABLE: S/P, C, D, E, I, W.

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

GRADS 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.

GRADS 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.

GRADS 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).

GRADS AVAILABLE: S/P, E, K, W.

925. Graduate Recitals (1 to 9) For graduate students in music performance.

GRADS AVAILABLE: S/P, E, K, W.

930. ** Supplementary Registration (1 to 9) For students who have completed all course requirements for their advanced degree programs. May be used concurrently with other enrollments to bring to total number of units to the required minimum.

GRADE AVAILABLE: K.

*Graduate students doing independent work which cannot be classified as actual research will register for credit under course number 599, 699, or 799.

**Credit received for this course is in addition to the units required for the advanced degree.

1For information on honors independent study courses (Honr. 299Ha-299Hb and 399Ha-399Hb-399Hc), see Honors in the Departments and Courses of Instruction section of this catalog.

ACCOUNTING

Professors Russell M. Barefield, Head, William B. Barrett, Dee L. Kleespie, Edward S. Lynn, Lyle H. McIff, Louis A. Myers, Jr.

Associate Professors Dan S. Dhaliwal, Jack O. Foltz, Taylor W. Foster, III, Don W. Vickrey

Assistant Professors William K. Salatka, Michael D. Shields, Ira Solomon, William S. Waller

Lecturers Loren B. Christenfeld, Patricia H. King, Julian R. Sayre, Joan W. Thompson

The accounting program prepares students for careers such as the independent practice of public accounting, controllership, and general accounting management. Graduate work in accounting is offered for those who wish more background for the positions described above and for those who wish to teach in colleges and universities. In many instances, a five-year program leading to a Master of Accounting degree will be desirable to achieve a student's objectives. (See the Graduate Catalog.)

Students who desire the Bachelor of Science in Business Administration with a major in accounting will follow the program of studies shown in the College of Business and Public Administration section of the catalog.

The department offers graduate instruction leading to the Master of Accounting degree and participate in the programs leading to the Master of Business Administration and Doctor of Philosophy degrees with a major in business administration. For admission and degree requirements, please see the Graduate Catalog.

200. Introduction to Financial Accounting (3) I II CDT Concepts involved in accounting for assets, liabilities, and owners' equity; financial statements.
ACCOUNTING 191


300a-300b. **Intermediate Accounting** (3-3) Theory and methodology involved in contemporary accounting for assets, liabilities, stockholders’ equity, net income, and funds; analysis and interpretation of financial statements. Credit allowed for this course or 553a-553b, but not for both. P, 210. Both 300a and 300b are offered each semester.

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 300, Mgmt. 275, Math. 123.

320. **Introduction to Federal Taxation** (3) I II Principles of federal income taxation, with emphasis on how individuals are taxed; additional topics. Credit allowed for this course or 556, but not for both. P, 210.

401. **Advanced Accounting I** (3) GC I II Theory and methodology involved in the preparation of consolidated financial statements and in accounting for partnerships. P, 300b or CR.

402. **Financial Accounting Standards** (3) GC II In-depth coverage of selected authoritative pronouncements and other special topics in financial accounting. P, 300b.

410. **Advanced Cost Accounting** (3) GC II Theoretical issues of process and standard costing, performance measurement, differential cost analysis, and other selected topics. P, 310.

422. **Advanced Federal Taxation** (3) GC I II Introduction to advanced topics; taxation of corporations and stockholders’ transactions in stocks; taxation of partnerships and fiduciaries, gift and estate taxation. P, 320, 401.

431. **Principles of Auditing** (3) GC II Qualifications, duties and responsibilities of the professional auditor; the standard short-form opinion; rules of professional conduct of the American Institute of Certified Public Accountants; internal control; audit programs. P, 300b, Mgmt. 375.

461. **Accounting Information Systems** (3) GC II The analysis, design and implementation of information systems, with special emphasis on accounting applications. P, M.I.S. 121; Acct. 310 or 551. (Identical with M.I.S. 461)

472. **Fund Accounting** (3) GC II Budgetary and financial accounting, control, and reporting for governments and other not-for-profit organizations. P, 210 or 272.

481. **Financial Accounting Theory** (3) GC I Topics in accounting theory and alternative accounting practices. P, 300b or 553b.

*Open only to students who meet the requirements for advanced standing as specified in the College of Business and Public Administration section of this catalog.

510. **Principles of Profit Planning and Control** (3) I The design and use of accounting information for managerial planning and control purposes. P, 310 or 551.

521. **Current Legislation and Tax Policy** (3) I The most recent legislation passed and proposed by Congress; the structure of the legislative and judicial processes; trends in tax legislation and insight into the causes for such trends. P, 320.

522. **Tax Planning and Practice** (3) I Selected topics of a tax-planning and tax-practice nature; extensive individual reading and research. P, 422.

523. **Estate Planning and Taxation** (3) II Advanced topics on gift and estate taxation; emphasis on the planning and structuring of financial activities to minimize the impact of income and wealth-transfer taxes. P, 422, Mgmt. 426 or CR.

526. **Corporate Taxation** (3) II Advanced topics in the taxation of corporations and of stockholders’ transactions in corporate shares. P, 401, 422.

527. **Tax Aspects of Real Estate Transactions** (3) II Gains and losses on sales and exchanges of property for tax purposes; capital and ordinary gains and losses, realignment, transfer by gift or at death, use in trade or business, installment sales, and depreciation recapture provisions. P, CR 320.

531. **Responsibilities of the Public Accountant** (3) I II A professional course for those who expect to pursue public accounting as a career. P, 431

550. **Financial Accounting Analysis** (3) I II Principles and procedures underlying basic financial accounting processes and their application in the preparation and analysis of financial statements. Advanced degree credit available for nonmajors only. Open only to students admitted to BPA graduate programs.
551. **Managerial Use of Accounting Data** (3) II Case studies and text readings focused on utilization of accounting data in determining the possible results of alternative executive decision. Advanced degree credit available for nonmajors only. Open only to students admitted to BPA graduate programs. P, 550, Econ. 500a or CR, Mgmt. 552 or CR.

553a-553b. **Financial Accounting** (3-3) S Theory and methodology of net income determination; accounting for assets, liabilities, and owners' equity. Credit allowed for this course or 300a-300b, but not for both. P, 210 or 551.

556. **Tax Factors in Business Decisions** (3) II Introduction to the federal taxation of income for all types of taxpayers and to the taxation of transfers of wealth, with emphasis on the effect of taxes on business decisions. Open only to students admitted to BPA graduate degree programs. Not open to accounting majors. Credit allowed for this course or 320, but not for both. P, 210 or 551.

572. **Financial and Fund Accounting Analysis** (3) I Principles underlying the accounting processes, controls, and reporting of profit-seeking and not-for-profit organizations. Advanced degree credit available for nonmajors only.


596. **Seminar**
   a. **Computers in Auditing** (3) I II (Identical with M.I.S. 596a)

610. **Contemporary Managerial Accounting Thought** (3) II Special topics in accounting theory and research. Of special interest to doctoral students. P, 510.

685. **Contemporary Financial Accounting Thought** (3) II Special topics in accounting theory and research. Of special interest to doctoral students. P, 582.

696. **Seminar**
   a. Auditing (1 to 3) I II
d. Theory (1 to 3) I II
   b. Managerial Accounting (1 to 3) I II
c. Taxation (1 to 3) I II

**ADDICTION STUDIES**
*(See Health-Related Professions)*

**AEROSPACE AND MECHANICAL ENGINEERING**

Professors Chuan F. Chen Head, Roger A. Anderson, Francis H. Champagne, Harvey D. Christensen, Arland A. Foster (Emeritus), Hussein A. Kamel, Dimitri B. Keccecioglu, Robert B. Kinney, Heliodore A. Marcoux (Emeritus), Donald M. McEligot, Edwin K. Parks, Karl M. Pattison (Visiting), Henry C. Perkins, Jr., Russell E. Petersen, Kenneth M. Ragsdell, Willard L. Rogers (Emeritus), Lawrence B. Scott, Jr., William R. Sears (Emeritus), Quentin R. Thomson (Emeritus), Martin L. Thornburg (Emeritus), Thomas L. Vincent, Paul H. Wirsching, A. Ralph Yappel (Emeritus)

Associate Professors Gregory R. Baker, Thomas F. Balsa, Edward B. Haugen (Emeritus), Kumar N. R. Ramohalli, Robert B. Roemer, Bruce R. Simon

Assistant Professors Kee-Ying Fung, Juan C. Heinrich, Edward J. Kerschen, Seth H. Lichter, Robert A. Peterson, John S. Phelps (Emeritus)

The department offers the degrees of Bachelor of Science in Aerospace Engineering, Bachelor of Science in Mechanical Engineering, 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.)

132. **Introduction to Engineering Design and Analysis I** (3) I Participation in engineering projects involving analysis, construction, operation, testing, design. 2R, 3L. P, Math. 117e, 118.

133. **Introduction to Engineering Design and Analysis II** (3) II Engineering problem solving; application of mathematical methods to engineering analysis and design. P, CR Math. 125b, Phys. 103a.

232. **A.M.E. Dynamics** (3) I II Dynamics of particles and rigid bodies as applied to mechanical systems; introduction to mechanical vibrations. P, C.E. 214, CR Math. 254.

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


333. **A.M.E. Instrumentation** (3) I II Basic principles of lab. practice and instrumentation. 2R, 3L. P, 331a, 340a, E.C.E. 208.


402. **Production Engineering** (3) I II Economic production principles; design relationship of materials and production processes; tooling, quality control, and packaging. 2R, 3L. P, C.E. 214.


406. **Engineering Quality Control** (3) (Identical with S.I.E. 406)

408. **Reliability Engineering** (3) GC I Times-to-failure, failure-rate, and reliability function determination for early, useful and wearout lives; equipment reliability prediction and configuration optimization; spare part provisioning. P, Math. 223.

409a-409b. **Engineering Design** (3-3) 409a: Role of design in engineering; strength design factors, stress analysis, application of Mohr’s circle of stress and strain; deflection analysis and introduction to failure and fatigue theory. P, 232, C.E. 217. 409b: Springs, bearings, gears, brakes and design project.

410. **Aerospace Design** (3) I II Creative participation of student groups in the advanced design of a modern aerospace vehicle system. 2R, 3L. P, 409a, 461, CR 434.

412. **Probabilistic Design** (3) GC I II Design (static and dynamic) with loads, materials and geometry as random phenomena; probability, reliability, distributions of variables; statistical algebras, design synthesis, optimization. P, 409a, C.E. 217.

413a-413b. **Reliability and Quality Analysis** (3-3) GC 413a: Probability theory and statistical models in reliability, life testing, and design; descriptive and mathematical statistics, basic graphical and analytical data analysis techniques. 413b: Monte Carlo methods in reliability analysis, polynomial curve fitting and linear models, Bayes estimation, decision analysis in engineering design, stochastic processes in design. P, Math. 223.

414. **Mechanical Engineering Design** (3) I II Engineering design process steps, idea generation techniques, major design project. P, 409a, 340b.

415. **Mechanical Engineering Design Implementation** (3) GC II Construction, testing and evaluation of prototype design; design iteration to arrive at final system configuration. 2R, 3L. P, 415.

417. **Clinical Engineering** (3) GC II (Identical with E.C.E. 417)

418. **Physiology for Engineers** (4) GC I (Identical with Psio. 418)

419. **Physiology Laboratory** (2) GC I (Identical with Psio. 419)


<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>430.</td>
<td><strong>Mechanical Vibrations</strong> (3)</td>
<td>GC I Free and forced vibrations of simple mechanical systems; effects of damping; introduction to multidegree of freedom systems. P, 232.</td>
</tr>
<tr>
<td>435.</td>
<td><strong>Introduction to Experimental Structural Mechanics</strong> (1 to 3)</td>
<td>II Introductory experiments and projects in areas of photoelasticity, strain gage applications, dynamics, vibration, programmable minicomputers, microcontroller and computer graphics. P, 310, 333, CR 409a.</td>
</tr>
<tr>
<td>436.</td>
<td><strong>Finite Element Methods of Structural Analysis</strong> (3)</td>
<td>GC I Matrix algebra, computers, 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. P, 409a.</td>
</tr>
<tr>
<td>450R.</td>
<td><strong>Unit Operations in Metal Processing</strong> (3)</td>
<td>GC I (Identical with Met. 450R)</td>
</tr>
<tr>
<td>450L.</td>
<td><strong>Metal Processing Laboratory</strong> (1)</td>
<td>GC I (Identical with Met. 450L)</td>
</tr>
<tr>
<td>453.</td>
<td><strong>Air Conditioning Engineering</strong> (3)</td>
<td>GC I Analysis and design of systems and components for control of temperature, humidity, air cleanliness and acoustic; applications to residential and commercial buildings. P, 340b, CR 331a. (Identical with Nu.E. 453)</td>
</tr>
<tr>
<td>455.</td>
<td><strong>Power Systems Laboratory</strong> (1)</td>
<td>GC II Studies of investigations involving thermal power systems and energy conversion devices. 3L, P, CR 333.</td>
</tr>
<tr>
<td>456.</td>
<td><strong>Introduction to Turbo-Machines</strong> (3)</td>
<td>GC I Theory of energy transfer in turbo-machine components; application to pumps, turbines, and compressors. P, 331b, 340b.</td>
</tr>
<tr>
<td>458.</td>
<td><strong>Wind Energy Conversion Systems</strong> (3)</td>
<td>GC I Aerodynamic theory of vertical and horizontal axis propellers and windmills; optimal design of blades and electrical components; lab. and field measurements of operating systems. 3R, 3L Field trips. P, 331a, E.C.E. 208</td>
</tr>
<tr>
<td>460.</td>
<td><strong>Aerodynamics</strong> (2)</td>
<td>GC II Basic equations and their approximation; potential flow theory; fundamentals of airfoil and wing theory; axisymmetric flows; application to aerodynamics of wings and bodies. P, 361, 432.</td>
</tr>
<tr>
<td>461.</td>
<td><strong>Gasdynamics</strong> (3)</td>
<td>GC II Thermodynamics review; equations for one-dimensional flow, wave propagation and acoustics; incompressible flow; shock waves; simple two-dimensional flows; friction and heat addition. P, 331a, 340a.</td>
</tr>
<tr>
<td>462.</td>
<td><strong>Aerodynamics Laboratory</strong> (1)</td>
<td>I Low-speed and high-speed wind tunnel testing; aircraft flight tests. P, 333, 361, 461.</td>
</tr>
<tr>
<td>463.</td>
<td><strong>Dynamics of Space Flight</strong> (3)</td>
<td>GC I Spacecraft dynamics; orbital and attitude maneuvers, lunar and interplanetary transfer, reentry. P, 232.</td>
</tr>
<tr>
<td>465.</td>
<td><strong>Current Problems in Energy and Power</strong> (1 to 4)</td>
<td>GC II (Identical with Nu.E. 465)</td>
</tr>
<tr>
<td>466.</td>
<td><strong>Stability and Control of Aerospace Vehicles</strong> (3)</td>
<td>GC I Static and dynamic stability of rigid and non-rigid vehicles; automatic control of aircraft, missiles and space craft. P, 361.</td>
</tr>
<tr>
<td>467.</td>
<td><strong>Solar Energy Engineering</strong> (3)</td>
<td>GC I (Identical with Nu.E. 467)</td>
</tr>
<tr>
<td>469.</td>
<td><strong>Energy Engineering Laboratory</strong> (3)</td>
<td>GC II (Identical with Nu.E. 469)</td>
</tr>
<tr>
<td>477.</td>
<td><strong>Environmental Impact of Energy-Related Systems</strong> (3)</td>
<td>GC II (Identical with C.E. 477)</td>
</tr>
<tr>
<td>485.</td>
<td><strong>Biomechanical Engineering</strong> (3)</td>
<td>GC II Applications of statics, dynamics, solid mechanics, fluid mechanics, thermosciences, and control systems to physiological systems and medical problems. P, 232, 331a, 340a.</td>
</tr>
<tr>
<td>495.</td>
<td><strong>Colloquium</strong></td>
<td>s. Senior Colloquium (1)</td>
</tr>
</tbody>
</table>
505. Modern Control Theory (3) II 1984-85 Controllability and stability for linear and nonlinear systems; observer design, qualitative methods of optimal control and game theory applied to control system design. P. 405. (Identical with E.C.E. 505)

506. Advanced Quality Control and Reliability (3) II (Identical with S.I.E. 506)

508. Advanced Reliability Engineering (3) II Extension of 408; prediction of reliabilities of complex systems; maintainability; reliability and availability of maintained systems; advanced spare parts provisioning; safety. P. 406.

510. Airplane and Helicopter Design (3) I Helicopter and airplane design and analysis; optimization of takeoff, climb, specific range, endurance; energy methods. P. 408.

512. Advanced Probabilistic Design (3) II Continuation of 412; probabilistic design projects from industry; analytical research of probabilistic design theory; study and evaluation of topics from research papers and reports. P. 412.

518. Reliability Testing (3) II Replacement and nonreplacement tests; mean time between failure and reliability confidence limits; sequential testing; sampling; accelerated, sudden death, and suspended items testing. P. 408.

520a-520b. Fundamentals of Fluid Mechanics (3-3) 520a: Fundamental equations of motions; surface tension, kinematics of vorticity, integral solutions; irrotational flows; simple viscous flows. P. 331b, CR 532a. 520b: Small-disturbance inviscid flow theory; vorticity dynamics; low Reynolds number flow; vorticity dynamics; boundary layers. P. 408.


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


538. Finite Element Analysis in Nonlinear Solid Mechanics (3) I Finite element methods, including material nonlinearity (elastic, plastic, viscoelastic); geometric nonlinearity (finite deformations), numerical solution methods, and nonlinear programs. P. 436.

539. Advanced Structural Mechanics (3) II Advanced problems in structural analysis using the finite element method; and is o p tematization of complex systems; nonlinear static and material systems; application to other disciplines. P. 436. (Identical with E.M. 539)


542. 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. 442, CR 532a, computer programming ability.


545. Combustion Generated Air Pollution (3) II Pollutant formation in combustion processes and methods of control: diffusion models for atmospheric dispersion, including plume rise calculations. P. 381a, 340a. (Identical with Ch. E. 545)

546. Nature of Turbulent Shear Flow (3) I 1984-85 Physical phenomena in turbulent shear flows; experimental techniques; observations and physical consequences; prediction methods; recent advances. P. 542 or 560.

553. Aerodynamics of Propulsion (3) I 1983-84 Interior ballistics of rocket motors; ramjets, turbojets, turbofans, detonation wave theory; combustion chamber instability analysis; nozzle design. P. 461.

556. Combustion Gasdynamics (3) II 1983-84 Aerothermochemistry; fluid mechanics, thermodynamics, chemistry of propulsion and air pollution; reaction kinetics, combustion stability, detonation; singular perturbations in deflagrations. P. 532a, 461.

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

DEPARTMENTS AND COURSES OF INSTRUCTION


567. Advanced Solar Engineering, (3) II (Identical with Nu.E. 567)

569. Energy Use: Analysis and Management (3) I (Identical with Nu.E. 569)

585. Advanced Biomechanics (3) II 1984-85 Fluid mechanics of the circulatory system; application of mechanics to soft and hard tissues, such as blood, blood vessels, muscle, skin, bone, tissue structure, properties and rheology; peristalsis and urodynamics. (Identical with Ch.E. 585)

615. Hydrodynamic Stability (3) I Introduction to linear stability theory in fluid mechanics; the Orr-Sommerfeld equation, behavior of eigen solutions, stability limits, extensions to problems in two component systems. P, 520a-520b, 532a-532b.

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

695. Colloquium
   a. Research Conference (1) I II

696. Seminar
   g. Graduate Seminar (1) I II

AGRICULTURAL BIOCHEMISTRY AND NUTRITION
(See Nutritional Sciences)

AGRICULTURAL ECONOMICS

Professors Jimmye S. Hillman, Head, Robert C. Angus, Robert S. Firch, Roger W. Fox, Maurice M. Kelso (Emeritus), William E. Martin, Thomas M. Stubblefield
Associate Professors Dennis C. Cory, James C. Wade
Assistant Professors David L. Barkley, Eric A. Monke, Paul N. Wilson

The department's program is designed to relate agricultural problems and issues in contemporary society to their underlying economic explanations. Through the choice of elective courses the major in agricultural economics may build programs in: agricultural business to prepare for careers in the management of farms, ranches and farm-related firms; economic development for careers in rural area development and foreign agricultural development; resource economics for careers in the management of public resources of land and water; preparation for graduate study for careers in business, teaching and research.

The following degrees are offered: Bachelor of Science in Agriculture with a major in agricultural economics and Master of Science with a major in agricultural economics. The Doctor of Philosophy degree with a major in economics and an emphasis in agricultural economics is administered by the Graduate Faculty in Economics, which is composed of the faculties of the Departments of Economics and Agricultural Economics.

The major: A minimum of eighteen units in aec. including 403, 404, 439, 464, and six additional units at the 400 level. Additional required courses include Econ. 201b, 300 or 361, 330 or 332, Math. 119, 123, three units of acct., and three units of computer applications.

Students in agricultural economics follow the agricultural business curriculum (see College of Agriculture) with the following additions: six units of basic agricultural courses (Group II); three units of phys., atmo., geos. (Group III); four units of biological or physical sci. electives (Group III); and six units of social sci. and hum. (Group IV). The business core is not required. Students who have majors in other departments and who choose an agricultural business curriculum will also be assigned an adviser in the Department of Agricultural Economics.

213. Introduction to Agricultural Marketing (3) II Basic economic principles and marketing methods for agricultural crops, livestock, and livestock products. Field trip. F, three units of econ. Firch
215. **Agricultural Business Management** (3) I Applying economic principles in decision making for the farm or ranch firm; analytical techniques and management control; problems in organization, management, and operation of an agricultural business. 2R, 3L. Field trips. P, three units of econ. Wilson

217. **Resource and Environmental Economics** (3) I Relationship between man and use of natural resources and environmental systems, with emphasis on the economic implications of alternative environmental, energy and land-use policies. P, Econ. 201a. (Identical with Econ. 217) Cory

231. **Agricultural Input Marketing and Sales** (3) II Economics of agricultural input markets, agricultural input selling process, sales organization and management. P, Econ. 201a.

242. **World Food Economy** (3) II World resources of agriculture; population and food supply; economics of hunger, world trade and agricultural policies. P, Econ. 201a. Monke.

253. **Economics of Beef Cattle and Swine Production and Marketing** (3) I The economic forces that determine the production and marketing of beef cattle and swine, including such institutional forces as federal land policy, transportation rates. Field trip. P, one course in econ. Stubblefield

313. **Economics of Futures Markets** (2) II Futures market participants, evolution, functions, performance, and regulation, with emphasis on hedging uses of the futures market for agricultural commodities. P, Econ. 201b. (Identical with Econ. 313 and Fin. 313) Firch

403. **Marketing and Price Analysis** (3) GC II Market functions, costs, price forecasting, and regulation in the movement of agricultural products. Advanced degree credit available for nonmajors only. P, 439, Econ. 300. Monke.

404. **Production Economic Analysis** (3) GC I Application of production economics principles and analytical techniques to the solution of agricultural economics problems. Advanced degree credit available for nonmajors only. P, Math. 117e, Econ. 300. Wade

414. **Rural Area Development** (3) GC I Identification of current U.S. nonmetropolitan problems, economic principles useful in analyzing these problems, and possible program alternatives for rural area development. P, Econ. 201b or Geog. 305. (Identical with Geog. 414) Barkley

439. **Economic Statistics** (3) GC I II Application and interpretation of statistical measures to problems in economics. Advanced degree credit available for nonmajors only. P, Math. 117e. (Identical with Econ. 439) Angus

440. **Forest Resource Economics** (3) GC II (Identical with Ws.M. 440)

450. **Agricultural Business Capital Management** (3) GC I Applying business principles to problems confronting farm-ranch and incorporated agribusiness firms in the acquisition, allocation, control and transfer of capital resources. 2R, 3L. Field trips. P, 215, or Econ. 300 and three units of acct. Wilson

464. **Agricultural Policy** (3) GC 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. Advanced degree credit available for nonmajors only. Hillman

470. **Economics of Outdoor Recreation** (3) GC II (Identical with N.R.R. 470)

471. **Problems in Regional Development** (3) GC I II (Identical with Geog. 471)

476. **Natural Resource Economics** (3) GC II Economic principles useful in analyzing problems and policies of natural resource use, development and conservation. P, Econ. 201b. (Identical with Econ. 476, W.R.A. 476, and Ws.M. 476)

477. **Economic Issues in Land Use Planning** (3) GC I Evaluating the economic efficiency of alternative land use control programs, including zoning, eminent domain, development taxation, and transferable development rights. P, Econ. 201a-201b. Barkley

480. **Forest Policy and Administration** (3) GC II (Identical with Ws.M. 480)

500. **Research Methodology in Agricultural Economics** (3) II Study of the research process in agricultural economics as an efficient means for acquiring reliable knowledge for problem solutions. Martin

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

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

513. **Agricultural Price and Marketing Analysis** (3) II Market organization, efficiency, and functions in a dynamic economy. (Identical with Econ. 513) Firch


539. **Statistical Methods** (2) I II (Identical with Agri. 539)
198 DEPARTMENTS AND COURSES OF INSTRUCTION


AGRICULTURAL EDUCATION

Professors Floyd G. McCormick, Head, Clinton O. Jacobs, Kenneth S. Olson
Associate Professor Phillip R. Zurbrick
Lecturer Glen M. Miller

The program of study in agricultural education prepares students for agricultural teaching careers at secondary and community college levels, for positions in agricultural extension and for educational and public relations work related to agriculture in federal and state agencies, business, commerce and industry. Employment in these positions requires agricultural experience, preparation in basic sciences and technical agriculture, knowledge of the principles and techniques of the teaching-learning process, and the ability to work with people.

The degree of Bachelor of Science in Agriculture with a major in agricultural education is available through the agriculture, agricultural science or agricultural business curriculum. The department offers programs of study leading to the degrees of Master of Science and Master of Agricultural Education.

Degree requirements: Students will meet the minimum requirements for the Bachelor of Science in Agriculture degree under the selected curriculum. In addition, they will take the following courses according to their area of emphasis: (1) Agricultural Teaching. 221, 301, 338a, 385, 389, 396a, 397a, 397b, 409; Ed.P. 311; S.W.E. 100a-100b, 200; A.Ec. 215; An.S. 134 or 430. (2) Agricultural Extension. Agri. 422; S.Ed. 417; A.Ec. 231; A.Ed. 221, 301, 388, 439, 438, 497s; remaining units chosen from 448 or 499. Agricultural Winter School courses may be used when approved by the adviser.

Students who do not plan to teach may meet department requirements by completing a minimum of 18 credits in agricultural education and education. Students registering for courses 388 and 389 must have a cumulative grade point average of 2.000 or better and approval of the head of the department.

221. Introduction to Agricultural Teaching and Extension (1) I Objectives, nature, and scope of vocational and extension education in agriculture; types of programs; qualifications of personnel; career opportunities. Field trip. McCormick

301. Youth Leadership Development (2) I Characteristics of leadership and techniques of group dynamics, planning and promoting youth organizations in agriculture, conducting meetings, and directing programs. P, 338a or CR. Jacobs

338a. The Teaching of Agriculture (4) II (Identical with S.Ed. 338a)

385. Methods in Teaching Agricultural Mechanics (2) II Problems and procedures in teaching mechanics and operative skills; conducting demonstrations; providing space and teaching facilities. 1R, 3L, P. 338a or CR. Zurbrick

388. Supervised Field Experience in Extension Education (1 to 8) [Rpt./8 units] II Supervised observation and teaching agricultural extension education in the field. P, six units of a.ed. (Identical with H.E.E. 388)

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

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

397. Workshop
a. Applications in Agricultural Mechanics (3) I
b. Operations in Agricultural Mechanics (3) II P. S.W.E. 100a.
c. Fabrications in Agricultural Mechanics (2) II

409. Principles of Vocational Education (2) II (Identical with S.Ed. 409)

**Philosophy and Principles of Extension Education** (2) GC II Social and economic significance of extension education in agriculture and home economics. P, twelve units of ag. or h.e.c. (Identical with H.E.E. 438)

**Extension Education Methods** (2) GC I Objectives, criteria and procedures for developing and evaluating effective working relationships; the communication process, methods and techniques for efficient use of individual and mass media. P, six units of a.ed. or ed. (Identical with H.E.E. 439)

**Extension Program Planning and Evaluation** (3) GC II (Identical with H.E.E. 448)

**Workshop**

a. Curriculum Development (1 to 3) [Rpt./3] GC II
b. Occupational Experience Program (1 to 3) [Rpt./3] GC II
c. Youth Leadership Development (1 to 3) [Rpt./3] GC II
d. Continuing Education in Agriculture (1 to 3) [Rpt./3] GC I

e. Program Planning and Evaluation (1 to 3) [Rpt./3] GC I
f. Instructional Realia (1) [Rpt./3 units] 1 3L P. CR 396a.
g. * Human Motivation in Extension Programs (1 to 2) [Rpt./2] (Identical with H.E.E. 497m)
h. * Youth Development through 4-H Programs (1 to 2) [Rpt./2] (Identical with H.E.E. 497n)
i. * Recent Advancements in Extension (1 to 2) [Rpt./2] (Identical with H.E.E. 497p)
j. * Public Relations in Extension (1 to 2) [Rpt./2] GC (Identical with H.E.E. 497k)
k. Senior Workshop in Extension (2) [Rpt./3 units] GC II P. 438. (Identical with H.E.E. 497s)

**Workshop**

a. * Extension Communications (1 to 2) [Rpt./2] (Identical with H.E.E. 597a)
b. * Extension Credibility and Accountability (1 to 2) [Rpt./2] (Identical with H.E.E. 597c)
c. * Extension Supervision and Administration (1 to 3) [Rpt./2] (Identical with H.E.E. 597d)
d. Principles of Extension Training (1 to 3) [Rpt./2] (Identical with H.E.E. 597t)
e. * Evaluation in Extension Education (1 to 3) I (Identical with H.E.E. 597u)
f. * Volunteer Staff Development in Extension (3) I (Identical with H.E.E. 597v; which is home)
g. Administration of Extension Programs (1 to 3) I (Identical with H.E.E. 597x)

*Offered only through the Cooperative Extension Service Winter School.

**Advanced Agricultural Education** (2) I Problems in organizing and conducting programs of instruction in vocational and extension education. P, eight units of a.ed. or ed.

**Investigations and Studies in Agricultural Education** (3) I Study and analysis of research literature, methods, techniques and procedures for conducting investigations; selecting a problem and developing plans for a study. P, nine units of a.ed. or ed. Zutlick

**Program Planning and Evaluation** (2) II Developing programs and evaluating results in agricultural teaching and extension; situation analysis, objectives, policies, content, procedures, and evaluative criteria. P, six units of a.ed. McCormick

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**AGRICULTURE**

Several courses offered within the College of Agriculture are applicable to broad subject matter areas. Therefore, they are offered by the College rather than by a specific department. Courses are taught by faculty within the College. For specific questions, see the Associate Dean and Director of Resident Instruction.

**World Agriculture: Resources, Food, People** (2 to 3) I World relationships of population, resources, technology of food production and distribution; humanitarian and political motivation for development assistance in the agricultural sector. Matlock

**Community Communications Media** (3) I Characteristics of balanced communications serving education and information programs, participating experience utilizing newspapers, radio, television, and newsletters. Graham

**Alternative Futures in Energy and Environment** (3) I GC Energy and environment status and future alternatives, interaction of food-fiber production and natural resource use, with emphasis on student discussion of diverse views. Caldwell

**Remote Sensing in Agriculture** (3) GC I 1984-85 Remote sensing imagery applications and techniques in inventory, monitoring and analysis of imagery in the areas of soils, entomology, watershed hydrology and other agricultural fields. 2R, 3L. Field trips. P, photointerpretation experience.

**Workshop**

a. Recent Advances in Agricultural Science (1) [Rpt./4] GC S
200 DEPARTMENTS AND COURSES OF INSTRUCTION

509. Information Sources for Agricultural Scientists I Information systems and retrieval techniques, with particular reference to concepts, uses and limitations; emphasis on abstracts, indexes, alerting services, journals and government documents. McDaniel/Caldwell/Follott

A student should also take a third related unit, taught during the last five weeks of the semester and selected from among the following options:

- 539a. Analysis of Variance I II P, 539.
- 539r. Regression Analysis I I P, 539.
- 539s. Sample Surveys I I P, 539.

540. Design and Analysis of Experiments III Design principles for complete and incomplete block designs, analysis of factorial experiments, split plot designs, analysis of covariance, analysis of series of experiments, orthogonal polynomials and multiple regression. P, 539a. Kuehl

609. Scientific Communication and Research Funding Methods I 1983-84 Techniques and limitations of written, oral, and visual scientific communication; procedures and policies for research funding sources.

AGRICULTURAL ENGINEERING
(See Soils, Water and Engineering)

AGRONOMY AND PLANT GENETICS
(See Plant Sciences)

ALCOHOL STUDIES
(See Health-Related Professions)

AMERICAN INDIAN STUDIES

Committee on American Indian Studies

Professors Robert K. Thomas, Director, Vine Deloria, Jr. (Political Science), N. Scott Momaday (English), James Officer (Anthropology)
Associate Professors Lawrence C. Evers (English), LaVerne Jeanne (Linguistics)
Assistant Professors Thomas M. Holm (Political Science), Alice Paul (Elementary Education), Leslie Silko (English)
Lecturer Emory Sekaquaptewa (Anthropology)

The minor in American Indian studies consists of at least twenty units selected by the student in consultation with the chairperson of the committee in charge and approved by the student’s major professor. Prelaw students interested in legal problems of American Indians may combine prelaw and American Indian policy courses in the Department of Political Science with the minor in American Indian studies.

A Master of Arts with a major in American Indian studies is also available. For admission and degree requirements, please see the Graduate Catalog. For information concerning the concentration in American Indian policy studies, see also the Department of Political Science.

102. Linguistics for Native American Communities I S (Identical with Ling. 102)
203a-203b. Elementary Navajo Language (4-4) (Identical with Ling. 203a-203b)
ANATOMY

205a-205b. Native Peoples of the Southwest (2-2) (Identical with Anth. 205a-205b)
207a-207b. Elementary Papago Language (3-3) (Identical with Ling. 207a-207b)
210. Native Languages of North America (3) I (Identical with Ling. 210)
334. Politics and the American Indians (3) II (Identical with Pol. 334)
404. Sociology of the Southwest (3) GC I (Identical with Soc. 404)
415a-415b. Southwestern Indian Arts (3-3) GC (Identical with Anth. 415a-415b)
416. Contemporary Indian America (3) GC II (Identical with Anth. 416)
423. Peoples of Mexico (3) GC II (Identical with Anth. 423)
437. Issues in Indian Education (3) GC II (Identical with Ed.F.A. 437)
438. The Indian in the Literature of the Americas (3) II 1984-85 (Identical with Engl. 438)
445a-445b. Structure of an American Indian Language (3-3) [Rpt./2] GC (Identical with Ling. 445a-445b)
449a. Folklore (3) (Identical with Engl. 449a)
456. Southwest Studies I (3) GC (Identical with Sw.C. 456)
457. Southwest Studies II (3) GC (Identical with Sw.C. 457)
461. Race and Ethnic Relations (3) GC I II (Identical with Soc. 461)
477a. Ethnic Literature (3) (Identical with Engl. 477a)
482. Hopi Language in Culture (3) GC II (Identical with Anth. 482)
484a-484b. Development of Federal Indian Policy (3-3) GC (Identical with Pol. 484a-484b)
487. Race and Public Policy (3) GC I (Identical with Pol. 487)
502a-502b. Dynamics of Indian Societies (3-3) Philosophies, institutions and characteristics of tribal life in North America. 502a: American Indian lifestyles prior to European contact. 502b: Impact of European immigration on tribal groups of North America. (Identical with Anth. 502a-502b)
596. Seminar m. Studies in the Oral Tradition (3) [Rpt./9 units] I II (Identical with Engl. 596m, which is home)

ANATOMY

Professors Bryant Benson, Head, Jay B. Angevine, Jr., Philip H. Krutzsch
Associate Professors C. Ward Kischer, Albert V. LeBouton, Bruce E. Magun
Assistant Professors David E. Blask, Mary J. C. Hendrix
Lecturers William D. Barber, Norman E. Koelling

The Department of Anatomy offers work leading to the Master of Science and Doctor of Philosophy degrees. For admission and degree requirements, please see the Graduate Catalog.

401. Human Gross Anatomy (3) II Survey of the gross structure of the human body. 1R, 6L. Open to pharmacy students only. (Identical with Pcol. 401)
495. Colloquium a. Introduction to the Neurosciences I (2) GC (Identical with Med. 495a, which is home)
555. Cancer Biology (3) II (Identical with M.Mic. 555)
603. Microscopic Structure (1 to 3) II Selected concepts of structural organization at light and electron microscopic levels of the anatomy and development of the cells, tissues, and organs of vertebrates. P, 601, 602.
604. Gross Human Anatomy (2 to 6) [Rpt.] II Study in depth of the gross human anatomy of selected areas or systems. P, 601, 602.
605. Neurosciences (6) Phase II Essentials of mammalian neural development, structure and function. P, Chem. 103b, 104b, 243b, 245b; Phys. 102b; G.Bio. 101b; Cell. 410. (Identical with Psio. 605)
610a-610b. Anatomical Techniques (1 to 4) (1 to 4) Introduction to special techniques and procedures of analytical anatomy. P, 601, 602, and consent of department.
616. Introduction to Anatomical Literature (1) [Rpt.] A problem-oriented, bibliographic approach to basic anatomical references. Primarily for those students planning a career in anat. and wishing to prepare themselves for further grad. study. 3L.

896. Seminar
b. Biological, Structural and Functional Interactions (1) [Rpt.] II Open to majors only. P. Chem. 103b, 104b, 243b, 245b, Phys. 102b, G.Bio. 101b.

801. Human Gross Anatomy (1 to 7) I No grade is given until the full seven units are completed.

802. Microscopic Anatomy (5)

805. Neurosciences (6) I (Identical with Psio. 805)

896. Seminar
a. Embryology (1 to 6) I II

ANIMAL PHYSIOLOGY

Committee on Animal Physiology (Graduate)

Professors Robert B. Chiasson, Chairperson, Mac E. Hadley, Donald E. Ray, Raymond E. Reed, Frederick B. Roby, J. Glenn Songer, Gerald H. Stott (Emeritus), Jack Wilmore
Associate Professor Ronald W. Hilwig
Assistant Professors Ronald Allen, Victor Convertino, Roger M. Enoka, Lynn A. Joens, William Schurg
Lecturer Thomas N. Wegner

The interdepartmental graduate program in animal physiology offers the opportunity for study toward the Master of Science and Doctor of Philosophy degrees. For admission and degree requirements, please see the Graduate Catalog.

596. Seminar
a. Animal Physiology (1) [Rpt.] I II

ANIMAL SCIENCES

Associate Professor R. Spencer Swingle
Assistant Professors Ronald E. Allen, Sue DeNise, William A. Schurg
Lecturers Gary R. Amundson, Thomas N. Wegner

The curriculum prepares students for careers with livestock and poultry, farms, ranches, feedlots, dairies, agribusiness firms, banks and industries serving these enterprises. By the selection of different electives a student may also prepare for graduate work, agricultural communications, government service or race track management.

The degree of Bachelor of Science in Agriculture with a major in animal sciences is available through the agriculture, agricultural business or agricultural science curriculum. The department also offers programs leading to the Master of Science degree.

The major. In addition to the requirements of the College of Agriculture, the following courses are required: 180, 413, 415R, 430, 436 (students in the race track management option may substitute N.F.S. 458 for 436); and three courses selected from 440, 472, 473, 474, 475, 476, and 477 or 478. 102 is recommended but not required for all freshmen. A minimum graduation average of 2.0000 is required for all courses taken in animal sciences. M.I.S. 111 is required for all majors in animal sciences. All students enrolling in the agriculture or agricultural sciences curriculum must take P.I.S. 100 and S.W.E. 200. Also, majors in the agriculture curriculum must choose an option in business, production, science or race track management.
**Business option:** In addition to the courses listed under the major, the student must take Acct. 200a and four courses from the following: Acct. 213, 215, 313, 450; Fin. 201, 251; Mgmt. 320, 330; Mktg. 361.

**Production option:** In addition to the courses listed under the major, the student must take An.S. 305; Pl.S. 268 or 272 or R.N.R. 202 or Ra.M. 305; V.Sc. 403 or 405; and three courses from the following: A.Ec. 153, 213, 215; Acct. 204 or 200a; Fin. 201; Mgmt. 320, 330.

**Science option:** In addition to the courses listed under the major, the student must take Chem. 241a-241b and either 243a-243b or 322 and 323; G.Bio. 104; Math. 119 or 123 or 125a or 263; Phys. 102a.

**Race track management option:** In addition to the courses listed under the major, the student must take 142, 295r, 342, 344, and 440.

102. **Animal Industry (3)** I II A comprehensive view of the livestock and poultry industries, including the way the science of biology is used in modern livestock practice. 2R, 3L. Not open to students with more than seven units of an.s.

134. **Feeds and Feeding (3)** II Selection, evaluation, and use of feeds for specific purposes; balancing rations for livestock and poultry. Not open to students with credit or CR in 430 or 436.

142. **Breeds and Registry Associations (2)** I Breeds of horses and dogs used in racing; their history, formal breed associations, and registry rules.

180. **Science of Meat and Meat Products (3)** I II Techniques used in meat processing, with special reference to structure and composition of the various meats. Student has option to select a processing or selection-identification lab. 2R, 3L. Field trip. (Identical with N.F.S. 180)

213. **Animal Genetics (3)** I Principles of inheritance as applied to domestic animals. P, four units of bio. (Identical with W.F.Sc. 213)

270. **Introductory Horse Science (2)** I The feeding, management and training of horses.


295. **Colloquium** 

305. **Live Animal and Carcass Evaluation (3)** I Evaluation of meat animals and their carcasses as related to economic importance; the study of breeds and selection of breeding animals based upon visual appraisal and performance. 1R, 6L. Field trips.


397. **Workshop** 
a. Livestock Judging (1 to 3) [Rpt./4 units] I II P, 305.

412. **Environmental Physiology of Domestic Animals (3)** GC II Physiological responses and adaptations of domestic animals to their internal and external environment; how the responses and adaptations relate to productivity and management. P, 430; V.Sc. 250, 400a or 400b.

413. **Principles of Animal Breeding (3)** GC II Basic concepts involved in the improvement of economically important traits of livestock through application of genetic principles. Field trips. P, 213 or G.Bio. 321 or Pl.S. 228; Math. 117e.


415L. **Physiology of Reproduction Laboratory (1)** GC I Practice in semen collection and storage, artificial insemination, and hormone assay. P or CR, 415R.


436. **Applied Animal Nutrition (4)** GC II Application of principles of nutrition to the feeding of livestock and poultry, nutrient composition and characteristics of feeds, nutrient requirements and diet formulation. 3R, 3L, P, 430.

204 DEPARTMENTS AND COURSES OF INSTRUCTION

463. **Food Analysis** (3) GC II 1984-85 (Identical with N.F.S. 463)

472. **Dairy Herd Management** (3) GC I Proper milking, efficient housing, and health management of dairy cattle; marketing milk from the farm; milk production costs. Field trip. P, 430.

473. **Swine Production** (2) GC I The production, feeding and management of swine in intensive production systems. Field trip. P, 430.

474. **Sheep Production** (2) GC II The production, feeding and management of sheep on the farm and ranch. 1R, 3L. P, 430.

475. **Poultry Production** (3) GC II Application of biological principles to modern poultry production. Field trips. P, 430.

476. **Horse Production** (3) GC II Production, feeding, management, reproduction, and business aspects of modern horse management. 2R, 3L. Field trips. P, 415R, 430.

477. **Beef Cattle Production** (2) GC I The production, feeding, and management of beef cattle prior to finishing. Field trip. P, 430.

478. **Feedlot Beef Production** (2) GC II Feeding and management systems of beef cattle in the feedlot. All-day field trips. P, 430, 436.

480. **Composition and Structure of Meat** (2) GC II 1983-84 The detailed structure, growth and biochemical constitution of muscle and its conversion to meat. Field trip. P, 180 and Chem. 103b, 104b. (Identical with N.F.S. 480)

596. **Seminar**
a. Animal Sciences (1) [Rpt./3] I II

601. **Bioenergetics** (2) I (Identical with N.F.S. 601)

609. **Nutritional Biochemistry Techniques** (3) I (Identical with N.F.S. 609)

622. **Mineral Metabolism** (2) I 1983-84 (Identical with N.F.S. 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 metabolic and abnormal metabolic disorders; modes of action of feed stimulants. P, 430, 436; Chem. 241a, 243a.

**ANTHROPOLOGY**


Associate Professors Ellen B. Basso, Constance Cronin, Mary Ellen Morbeck, Susan U. Philips, J. Jefferson Reid, Alice E. Schlegel, Richard A. Thompson, Carlos Velez-Ibanez, Norman Yoffee, Stephen L. Zegura

Assistant Professor E. Wesley Jernigan


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: cultural anthropology, physical anthropology, archaeology, and linguistic anthropology, as well as specialized training for field research. Special programs in museum studies, cultural resource management, and forensic anthropology draw upon the extensive resources of the Arizona State Museum. The Bureau of Applied Research in Anthropology is a
The 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 Center for Health Sciences 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 requires a minimum of 36 units of anthropology, eighteen of which must be in upper-division courses. All majors must take 100, 102, 200, 235, 265, and 276, which provide the student with basic training in all four subdisciplines. The student may then select one of three programs: (1) a general program which requires one upper-division course in each of the four subdisciplines plus two additional upper-division courses (a minimum of six courses); (2) a special program which requires three upper-division courses in each of two subdisciplines (a minimum of six courses); or (3) a topical or areal specialization approved by the undergraduate adviser (a minimum of six upper-division courses).

The supporting minor may be chosen from any department or program within the University.

Honors: The department participates in the Honors Program.

100. **Introduction to Physical Anthropology and Archaeology** (3) I & II Basic concepts and methods used by physical anthropologists and archaeologists.

102. **Introduction to Cultural Anthropology and Linguistics** (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. **Biological Anthropology** (3) I & II Fossil evidence for human evolution, evolutionary theory, genetics, our primate heritage, human growth and development, human variation and human adaptability. Credit is allowed for this course or 100, but not for both.

170a-170b. **Introduction to Asian Civilizations** (3-3) (Identical with Or.S. 170a-170b)

171. **Ancient Civilizations of the Near East** (3) I (Identical with Or.S. 171)

172. **Islamic Civilization: Traditional and Modern Middle East** (3) I (Identical with Or.S. 172)

200. **Cultural Anthropology** (3) I & II Contemporary theories and methods in use among cultural anthropologists. P. 102.

205a-205b. **Native Peoples of the Southwest** (3-3) Nontechnical discussion of the lifeways of the ancient and modern people of the Southwest. 205a: Prehistoric people. 205b: Present-day Indian groups. 205a is not prerequisite to 205b. (Identical with A.IN.S. 205a-205b)

235. **Principles of Archaeology** (3) I & II History of archaeological research; survey of concepts and methods for the study of prehistoric cultures. P. 100 or 110.

240a-240b. **Introduction to Classical Archaeology** (3-3) 1983-84 (Identical with Clas. 240a-240b)

265. **Human Evolution** (3) I Neontological and paleontological approaches to human evolution and variation, nonhuman primate studies, bio-molecular and anatomical variation, bio-cultural responses to environmental stress. P. 100 or 111.

276. **The Nature of Language** (3) I & II An introduction to the basic concepts of linguistics and their implications for the study of culture and society. P. 100 and 102. (Identical with Ling. 276)

301. **Paranormal Anthropology** (3) I Investigation of psychic phenomena found in societies throughout the world from an anthropological perspective.

304. **Introduction to Archaeological Fieldwork** (3) I & II Practical excavation, class discussion, mapping, and the preliminary stages of artifact analysis. 2R. 6L. Field trips.

305. **Cultural Change** (3) I & II Cultural change from the anthropological perspective with focus on case studies. P. 200.

307. **Ecological Anthropology** (3) I Cultural adaptation, with emphasis on the systematic interaction of environment, technology, and social organization among hunter-gatherers, nomadic herders, and peasant farmers.

308. **Family in the Modern World** (3) I Introduction to the cross-cultural analysis of family systems in contemporary society.

310. **Culture and the Individual** (3) I & II Cultural and psychological dimensions of human development and human behavior. (Identical with Soc. 310)

315. **World Ethnography** (3) I The comparative study of selected societies of the world through extensive use of the media.

335. **Archaeological Interpretation** (3) I Survey of modern methods and theories in archaeology, with emphasis on current archaeological problems being investigated throughout the world. P. 235.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>337</td>
<td>Studies in Modern Material Culture (3)</td>
<td>II 1984-85 Studies relating contemporary behavior and material culture will be planned, implemented and evaluated to test methods of archaeological interpretation in modern societies and to develop new nonreactive methods of social science research. P, three units of soc. sci.</td>
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<tr>
<td>342</td>
<td>Field Training in Archaeology (8)</td>
<td>S Eight-week course in archaeological methods, theory, and field techniques, including practical experience in excavation, observation, recording, care of specimens, lab. analysis, and interpretation. Registration limited. Contact department for application, which must be returned by April 1.</td>
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<tr>
<td>364</td>
<td>Primatology (3)</td>
<td>I Comparative primate biology, behavior, ecology and evolution. P, 100 or 111 or 265.</td>
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<tr>
<td>366</td>
<td>Human Variation and Microevolution (3)</td>
<td>II Measurement and analyses of the origins, structure, and function of the human phenotype in terms of genotype-environment interactions in modern human populations. P, 265.</td>
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<tr>
<td>384</td>
<td>Sociology of Latin American Societies (3)</td>
<td>II (Identical with Soc. 384)</td>
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<tr>
<td>400</td>
<td>Processes of Culture Change (3)</td>
<td>GC II Intensive investigation of specific theories and varieties of culture change. P, 200.</td>
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<tr>
<td>401</td>
<td>Ancient Mesopotamia (3)</td>
<td>GC I 1984-85 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. (Identical with Hist. 401 and Or.S. 401)</td>
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<tr>
<td>402</td>
<td>Kinship and Social Organization (3)</td>
<td>GC I Principles in the comparative study of social systems; types of social structure. P, 200, or nine units of soc. (Identical with Soc. 402)</td>
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</tr>
<tr>
<td>404</td>
<td>Sociology of the Southwest (3)</td>
<td>GC I (Identical with Soc. 404)</td>
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<tr>
<td>405</td>
<td>Urbanization (3)</td>
<td>GC I Cross-cultural survey of the study of urban areas, including development of the field, research findings, and theory.</td>
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<tr>
<td>406</td>
<td>Political Anthropology (3)</td>
<td>GC II 1984-85 Comparative political structure and process; segmentary systems, evolution of the state; ideologies and bureaucracies in cross-cultural perspective; Third World and modern politics.</td>
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<tr>
<td>407</td>
<td>Peasant Communities (3)</td>
<td>GC I Comparative analysis of traditional and contemporary peasant communities. (Identical with Soc. 407)</td>
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<tr>
<td>408</td>
<td>Applications of Anthropology (3)</td>
<td>GC II Methods and results in the use of cultural anthropology in the solution of practical problems of human adjustment to changing conditions in the United States and in underdeveloped areas of the world.</td>
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<tr>
<td>409</td>
<td>Economic Anthropology (3)</td>
<td>GC II Analysis of production, exchange, distribution, consumption, property, economic surplus, inheritance, and types of economic structure. P, 200, or twelve units of econ. (Identical with Econ. 409)</td>
<td></td>
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<tr>
<td>410</td>
<td>Perspectives in Anthropology (3)</td>
<td>GC II Designed specifically for nonmajors to provide an introduction to the concepts and methods of anthropology.</td>
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<tr>
<td>411</td>
<td>Anthropology of Religion (3)</td>
<td>GC 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)</td>
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<tr>
<td>413</td>
<td>Ethnology of the Southwest (3)</td>
<td>GC II Culture history and economic, social, and religious institutions of the living people of the Southwest. P, 200.</td>
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<tr>
<td>414a-414b</td>
<td>Indians of the Southwest (3-3)</td>
<td>GC S History, arts and crafts, economics, social institutions, religions, and mythology of the present-day Indians of the Southwest.</td>
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<tr>
<td>415a-415b</td>
<td>Southwestern Indian Arts (3-3)</td>
<td>GC 415a: Prehistoric utilitarian and aesthetic arts. 415b: The art of the modern Indians of the Southwest. 415a is not prerequisite to 415b. (Identical with A.In.S. 415a-415b)</td>
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<tr>
<td>416</td>
<td>Contemporary Indian America (3)</td>
<td>GC II The historical development and contemporary significance of the reservation system in the life of the Native American of the United States. (Identical with A.In.S. 416)</td>
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<tr>
<td>417</td>
<td>Cultures of Ancient Mexico (3)</td>
<td>GC S Archaeological and ethnohistoric survey of the civilizations of ancient Mexico from earliest times to the period of the Spanish Conquest. Field trips. Fee.</td>
<td></td>
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<tr>
<td>418a-418b</td>
<td>Scientific Illustration-Photography (2 to 4 - 2 to 4)</td>
<td>GC (Identical with G.Bio. 418a-418b)</td>
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</tr>
<tr>
<td>419</td>
<td>Mexican American Culture (3)</td>
<td>GC I Historical background, cultural institutions, identity problems, social relations, and expectations of people of Mexican ancestry in the United States. (Identical with M.A.S. 419)</td>
<td></td>
</tr>
<tr>
<td>420</td>
<td>Contemporary American Culture (3)</td>
<td>GC II Diverse perspectives on American values as expressed in organization of kinship, space, bureaucracies, media, ethnic groups, religious sects and movements.</td>
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</tbody>
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422a-422b. Pre-Columbian Art (3-3) GC (Identical with Art 422a-422b)

423. Peoples of Mexico (3) GC II Cultural background and contemporary economic, social, and religious life of the Indian and mestizo populations of Mexico. (Identical with A.In.S. 423 and M.A.S. 423)

424. Gender and Social Identity (3) GC II Theories of sexual equality and inequality, plus an overview of sex roles and sex status in different types of societies and in different areas of social organization. (Identical with W.S. 424)

425. Ethnology of South America (3) GC I Comparative study of culture and history of South American indigenous peoples, including contemporary situation and Latin American policies toward them. P, 200.

427. Religion and Mythology of Mesopotamia (3) GC II 1983-84 Readings in translation of Sumerian and Babylonian myths and rituals stressing anthropological techniques in the interpretation of Mesopotamian cosmology. P, 100. (Identical with Or.S. 427 and Reli. 427)

428. Anthropology of Law (3) GC II 1984-85 Issues in the anthropology and history of law, focusing on the nature of law in its social context; selected case studies. (Identical with Or.S. 428)


430. Peoples of the Pacific (3) GC II Populations and cultures of Polynesia, Micronesia, and Melanesia; variability of these "natural laboratory" settings in an ecological framework.

433. Advanced Scientific Illustration (4) GC S (Identical with G.Bio. 433)

434. Quantitative Research Design (3) GC I Basic techniques of quantitative description and inference; topics in the statistical analysis of anthropological data.

435. Principles of Archaeological Fieldwork (3) GC II Introduction to the principles of archaeological fieldwork, with emphasis on method and theory of survey and excavation. 2R, 3L. P, 235.


438. Zoarchaeology (3) GC I Animals in relation to man, with emphasis on past cultures, especially in the Southwest; morphology of animal skeletons; identification and interpretation of fragmentary remains.


440a-440b. Laboratory in Zoarchaeology (3-3) GC 1984-85 Fragmentary animal remains in archaeological interpretation. 440a: Diagnostic morphological features; role in cultural interpretation. 440b: Analytical techniques; lab. analysis; report preparation. 1R, 6L.

441. Organization of Museums (3) GC I Survey of the history, structure, and function of museums.

442. Processing of Museum Materials (3) GC II Principles and techniques of museum registration procedures, treatment and storage of specimens, and the use of museum collections in research, the classroom, and the community. 2R, 3L. P, 441.

443. The Archaeology of Pre-Classical Greece (3) GC (Identical with Clas. 443)

444. Presentation of Museum Collections (3) GC I Method and theory in museum exhibit design. P, 441.

446. Museum Conservation Methods (3) GC I Basic procedures in the preservation, repair and restoration of archaeological and historical collections.

449a. Folklore (3) (Identical with Engl. 449a)

450. Social Stratification (3) GC I II (Identical with Soc. 450)

451. Archaeology of North America (3) GC 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.

452R. Archaeology of the Southwest (3) GC I Development of culture in the prehistoric Southwest from the late Pleistocene to the historic period. Field trip.

452L. Archaeology of the Southwest (3) GC II The nature of archaeological data recovered in the Southwest, with emphasis on their potential for the drawing of both cultural and chronological inferences. P, 452R.

453. Mesoamerican Archaeology (3) GC I Development of culture in Mexico and Central America from the early hunters and gatherers through the conquest of the Aztecs and Mayas by the Spanish. (Identical with M.A.S. 453)
208 DEPARTMENTS AND COURSES OF INSTRUCTION

454. Andean Archaeology (3) GC II Development of culture in the Andean countries of South America from hunters and gatherers of the terminal Pleistocene through Inca civilization.


456. Old World Prehistory (3) GC II Man's cultural development in the Old World, as revealed by prehistoric archaeology, from earliest cultural evidence through the development of agricultural villages.

457. Prehistoric Mesopotamia (3) GC I 1983-84 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 Or.S. 457)

459. Historical Archaeology (3) GC II Survey of the basic data and methods of research in the material culture of modern history. The New World from first European contacts to the 20th century. (Identical with Hist. 459)

461. Race and Ethnic Relations (3) GC I II (Identical with Soc. 461)

462. Introduction to Quaternary Ecology (3) GC I (Identical with Geos. 462)

464a-464b. Introduction to Dendrochronology (3-3) GC (Identical with Geos. 464a-464b)

466. Paleoanthropology (3) II Evidence for human and nonhuman primate evolution including laboratory study of fossil casts and modern skeletal biology. P, 265 or consult dept. before enrolling.

468. Human Osteology (3) GC I Human osteology for the archaeologist and physical anthropologist; techniques of in situ and laboratory identification, preservation and measurement. P, consult dept. before enrolling.

470a-470b. Human Adaptability (3-3) GC Study of human adaptability focusing on physiological plasticity, growth, nutrition, population ecology, demography, epidemiology and paleopathology. P, 265 or consult dept. before enrolling. 470a is not prerequisite to 470b.

471. Introduction to Indic Civilization (3) GC I (Identical with Or.S. 471)

473. Primate Anatomy (4) GC I 1983-84 Comparative primate functional anatomy from an anthropological viewpoint including extensive laboratory dissection and study of behavior, ecology, and evolution. P, 265 or consult dept. before enrolling.

474R. Ethnobotany (3) GC II (Identical with G.Bio. 474R)

474L. Ethnobotany Laboratory (1) GC II (Identical with G.Bio. 474L)

476. Language in Culture (3) GC II Survey of the nature of the interrelationships between language and other cultural phenomena. P, 276. (Identical with Ling. 476)

478. Nonverbal Communication (3) GC II 1984-85 Survey of nonverbal communication among humans (posture, gesture, facial expression, gaze direction and eye contact), with attention to the biological and cultural factors that determine form and meaning of such communication.

480. Historical Comparative Linguistics (3) GC I Types and mechanisms of linguistic change; language and dialect formation; determination of prehistorical relationships; reconstruction of proto-languages and cultures, and their origins in time and space. P, 276. (Identical with Ling. 480)

481a-481b. Archaeology of Syria-Palestine in the Bronze and Iron Ages (3-3) GC (Identical with Or.S. 481a-481b)

482. Hopi Language in Culture (3) GC II A conversational introduction to Third Mesa dialect of Hopi, with emphasis on cultural context and covering essentials of Hopi language structure. (Identical with A.In.S. 482)

484a-484b. Akkadian Linguistics (3-3) GC 1984-85 Introduction to the standard literary language of the Babylonians and Assyrians. (Identical with Or.S. 484a-484b)

485. Social Organization of India and Pakistan (3) GC I (Identical with Or.S. 485)

486. Comparative Community Development (3) GC I (Identical with Soc. 486)

487. Poverty and Health (3) GC II (Identical with Nurs. 487)

489. Anthropology and Education (3) GC I II (Identical with Ed.F.A. 489)

495. Colloquium
   a. Bilingual Health Communication (3) GC II (Identical with Nurs. 495a)
   b. Workshop
      a. Physical and Forensic Anthropology I (2) GC I Consult dept. before enrolling.
      b. Physical and Forensic Anthropology II (2) GC II Consult dept. before enrolling.


502a-502b. Dynamics of Indian Societies (3-3) (Identical with A.In.S. 502a-502b)

514. Late Quaternary Geology (3) I 1984-85 (Identical with Geos. 515)

524. Theoretical Population Genetics (3) I (Identical with Ecol. 524)
561. **Paleo-Indian Geochronology (3)** I Chronological development of Paleo-Indian occupation of the New World; site discovery, case studies, development of theories on origins and impact of early man on the environment. (Identical with Geos. 561)

580a-580b. **Anthropological Linguistics: Field Methods (3-3)** 580a: Experience in gathering and analyzing language data from an informant. 580b: Experience in making cross-cultural analyses. 580a is not a prerequisite to 580b

581. **Quaternary Palynology (4)** II (Identical with Geos. 581)

584a-584b. **Readings in Akkadian (3-3)** 1983-84 Readings in selected literary, religious and economic texts designed not only to improve language mastery but to use those documents in elucidation of specific topics in Mesopotamian culture. P, 484a-484b. (Identical with Or.S. 584a-584b)

583. **Sociolinguistics (3)** I Contributions of the ethnography of communication, language variation studies, and conversational-discourse analysis to the interdisciplinary development of sociolinguistics. (Identical with Ling. 583)

588. **Clinical Anthropology (3)** I II (Identical with Nurs. 588)


600a-600b. **Foundations of Cultural Anthropology (3-3)** An intensive introduction to social and cultural anthropology, with emphasis on theories and concepts of culture, society, and the individual. Open to majors only.

604. **Educational Administration in Anthropological Perspective (3)** I (Identical with Ed.F.A. 604)

635a-635b. **Foundations of Archaeology (3-3)** An intensive introduction to archaeology. 635a: Major problems in the culture sequence. 635b: Methods and concepts. Open to majors only.


642. **Advanced Field Course in Archaeology (8)** S Eight-week course in advanced archaeological methods, theory, and field techniques, including practical experience in excavation, observation, recording, care of specimens, lab. analysis, and interpretation. Registration limited. Contact department for application, which must be returned by April 1.

645. **Early Civilizations (3)** II Comparative analysis of early civilizations from both the Old World and the New World, with emphasis on regularities in cultural development. P, 457, 456, 454 or 650.

650. **Ancient Civilizations of Mesoamerica (3)** 1983-84 Comparative study of cultural development in Mesoamerica, with emphasis on agricultural beginnings, settlement pattern and urbanization, hieroglyphic writing, and calendrical systems.


679. **Language and Ethnography (3)** II Theories of language and language usage in relation to the analysis of nonlinguistic cultural phenomena and the production of ethnographic descriptions. P, six units of ling.

696. **Seminar a. Archaeology (1 to 3) I II b. Cultural Anthropology (1 to 3) I II c. Linguistics (1 to 3) I II d. Physical Anthropology (1 to 3) I II e. Museology (1 to 3) I II

**APPLIED MATHEMATICS**

**Committee on Applied Mathematics**

Professors Bruce R. Barrett (Physics), Rabi N. Bhattacharya (Mathematics), James M. Cushing (Mathematics), Donald G. Dudley (Electrical and Computer Engineering), Paul C. Fife (Mathematics), Hermann Flaschka (Mathematics), Richard H. Gallagher (Civil Engineering), Wilfred M. Greenlee (Mathematics), Joseph F. Gross (Chemical Engineering), Robert L. Hamblin (Sociology), David L. Hetrick (Nuclear and Energy Engineering), Frederic A. Hopf (Optical Sciences), Bobby R. Hunt (Systems and In-

Associate Professors Gregory R. Baker (Mathematics), David P. Dobkin (Computer Science), Robert L. Gall (Atmospheric Sciences), Barry C. Ganapol (Nuclear & Energy Engineering), Eugene H. Levy (Lunar & Planetary Laboratories), Olgierd Palusinski (Electrical and Computer Engineering), William M. Schaffer (Ecology and Evolutionary Biology)

Assistant Professor Kee-Ying Fung (Aerospace & Mechanical Engineering), Juan C. Heinrich (Aerospace & Mechanical Engineering), Chris K. Jones (Mathematics), Edward J. Kerschen (Aerospace & Mechanical Engineering), Randall Richardson (Geosciences), Timothy W. Secomb (Arizona Research Laboratories)

The Committee on Applied Mathematics encourages interdisciplinary research and advanced study in applied mathematics. Its programs allow graduate students with diverse backgrounds to sharpen their analytical skills and apply them to their own disciplines. Simultaneously, it encourages mathematics majors and others with substantial analytical talents to apply their skills to exciting scientific and important applied problems. Development of the program is partially a response to an increasing need in industry and government for graduates skilled in the techniques of applied mathematics. Likewise, it recognizes a continuing need in the physical sciences and engineering, as well as a growing need in the biological and social sciences for scientists skilled in mathematical analysis and modeling.

The committee offers programs leading to the Master of Science and Doctor of Philosophy degrees with a major in applied mathematics. For admission and degree requirements, please see the Graduate Catalog.

ARABIC
(See Oriental Studies)

ARCHITECTURE


Associate Professors Harry der Boghosian, Robert W. Dvorak, James L. Larson (Adjunct)

Assistant Professors Dennis Doxtater, Sandra D. Lakeman, Robert L. Nevins

Lecturer Richard Ebeltoft

Undergraduate Program: The College of Architecture offers a five-year curriculum leading to the first professional degree, the Bachelor of Architecture. The electives program enables the student to develop concentrations in science and technology, social science and humanities, business and management, or art as these disciplines relate to architecture or allow for development of breadth in general education. For requirements for the Bachelor of Architecture, see the College of Architecture section of this catalog.
Architectural Design Courses (201, 202, 301, 302, 401, 402, 451, and 452): The design courses deal with buildings, design methods, building consequences and student development and maturation. The design sequence begins with 201, an introductory course for all students enrolled in the College of Architecture. Early experiences are involved with an overview of design fundamentals, methods and vocabulary. Intermediate and advanced design courses deal with the technical and environmental factors that influence architectural form, with the 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 for exhibition and archives unless previous arrangements are made with the faculty member responsible for the course.

101. Architecture and Society (3) I An overview of architecture and its relationship to society through a study of its history, its contemporary forms and its future; designed for nonmajors.

112. Graphic Communication I (3) I II Overview of the principles of architectural drawing; lectures on various types of graphic communication, supplemented by studio exercise; experience in orthographic projection, perspective, and shade and shadow.

114. Introduction to Architectural Theory (3) II A broad introduction to the historical, physical and cultural forces that affect the formation of buildings and physical environments. Lectures with slides examine current and recurring problems and principles.

118. Structure in Architecture (2) I II An introduction to the role of structure in architecture; to the principles of structure, and to the behavior of structural elements, subsystems and systems.

201. Fundamentals of Architectural Design (6) Introduction to design of buildings and exterior space, with attention to human factors, horizontal systems of circulation, natural siting and site analysis, climatic analysis and passive methods of control, rudimentary structural forms and basic materials. P, 112, 114, 118, admission to professional phase, min. 2.0000 gpa.

202. Architectural Design (6) Design of buildings and exterior space with horizontal and vertical organization and systems of circulation, urban and suburban sites, active environmental control methods, advanced structural forms and materials (e.g., steel and concrete). P, 201, 222a.

222a-222b. Graphic Communication II (3-3) 222a: Techniques used to study and communicate architectural ideas, concepts, and space; conceptual diagramming, freehand perspective and sketching, shade and shadow, reflections, reproduction techniques and model building. 222b: Rendering techniques and media for use in finished architectural presentation. Lecture and studio. P, 112 and admission to professional phase.

228a-228b. Elements of Structure (3-3) The study of forces in static equilibrium, the internal response of structural members to such forces, and the design of structural components in wood and steel. P, 118, admission to professional phase.


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.

244. Architecture Since 1945 (3) I Reflections of traditional, modern, contemporary and post-modern movements and trends.

270. Introduction to Architectural Computing (3) I II Computing as found in architectural firms using interactive time-sharing systems, including text editing and analysis of buildings; emphasis on major problems confronting architects in day-to-day activities and programming techniques to solve these problems.

301. Synthesis in Architectural Design (6) Design of buildings with emphasis on principles of order, space and place making, and integration of building systems; synthesis of space, light, structure, environmental control systems and building code and zoning ordinance constraints. P, 202, 222b.

302. Enclosure Systems in Architectural Design (6) Continued building design with emphasis on the design of alternative means of enclosing architectural space; synthesis of the relationships of elements used in making the interface between natural and built environments. P, 301.

324a-324b. History of Architecture: Classic through Baroque (3-3) Critical survey of the history of architecture covering ancient, classical, medieval, and revival periods up to 1750. P, Hist. 101a-101b, 104a-104b, or Hum. 250a-250b and admission to professional phase (for majors). Nonmajors may petition to enroll.
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; field experience. 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.

338a-338b. **Elements of Structural Systems** (3-3) The design of structural components in concrete; structural framing systems and their responses to the forces of gravity, wind, and earthquakes; factors involved in the choice of a structural framing systems in architecture. P, 228b.

343. **Watercolor Techniques for Architects** (2) Techniques of watercolor communication utilized in architecture.

344. **Architecture in Mexico** (2) I Survey of architectural development in Mexico during the prehispanic, Spanish colonial and contemporary periods, with emphasis on design ideas from each period.


402. **Complex Functions in Architectural Design** (6) Design of large-scale, multi-use buildings and building complexes, with emphasis on the integration of diverse functions and activities, urban spaces and advanced building technologies with concern for human experience. P, 401.

403. **Solar Utilization in the Built Environment** (3) GC I Survey of solar energy utilization principles, methods and case studies focused upon building and site planning design.

412. **Advanced Graphics** (3) GC I Advanced graphics, with specific emphasis on photographic techniques for use in portfolio preparation; general review of professional public relations presentation techniques. 2R, 6L. P, 222b, 302.

413. **Architecture and the Arid Region** (2) GC I Studies of the relationship between architecture and the climatic characteristics of arid regions with emphasis on passive cooling techniques. P, 302.

414. **History of Architecture: American Architecture** (2) GC II Developments in American architecture from the colonial to the early modern period. P, six units of art hist. or arch. hist. Nonmajors may petition to enroll.

422. **Process and Synthesis in Design** (3) GC II Traditional and contemporary models of concept formation in design, including a study of their underlying assumptions and values. P, 302.

424a-424b. **History of Architecture: 19th and 20th Century** (3-3) Developments in architecture in the past 150 years in Europe and America. Lectures with slides. P, 324a-324b.

428. **Field Methods in Environmental Psychology** (3) GC II (Identical with Psyc. 428)

429. **Pre-Design Services** (3) GC I Principles and operations of gathering, analyzing, interpreting, translating and presenting information and ideas pertinent to architectural design. P, 302.

433. **Lightweight Construction Techniques** (3) GC II Survey of lightweight construction techniques, including pneumatics, tensile membranes, three-dimensional cable nets, grid shells and flexure stiff plates.

439. **Construction Documents** (3) GC II Content, intent, functions and practice of preparing documents needed for various construction delivery systems. 2R, 3S. P, 302.

444. **Site Planning** (2) GC II Studies relating to design determinants for development of outdoor space. P, 302.

449. **Construction Quality Assurance** (3) GC II Theory and practice of specifying, text editing and cost forecasting; both manual and automated. P, 270 or M.I.S. 111. Nonmajors may petition to enroll.

451. **Topics in Architecture** (6) GC Studio work in one of the following: building design, community design, design development, historic preservation, design technologies, economics and politics in architecture, housing design, design in arid regions, and energy-conscious design. Offerings are limited by faculty availability, and all topics may not be offered each year. Other topics may be introduced. P, 335, 336, 338b, 424b, 402.

452. **Senior Project** (6) GC Studio-based project related to one of the topics in 451. The program for the senior project must be completed and approved prior to enrollment. P, 451.

459. **Ethics and Practice** (3) GC I Standards and values of architectural services and professional project and practice management. P, 270 and 402.

463. **Introduction to the Delivery Process and Economics of Housing** (3) GC I The architect’s role in the development of housing as related to economic considerations and the overall housing industry’s delivery process. Field trips.

470. **Computer Applications in Architecture** (3) GC II Applying computer technology to the architecture profession. P, 302.
ART 213

473. **Introduction to the Conservation of Cultural Resources** (3) GC 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.

474. **Environmental Planning** (2) GC I A lecture survey dealing with the origins and implications of the physical manifestations of communal ordering systems. An analytic vocabulary is developed with which current and historic settlement patterns are visually compared to discover spatial attributes as a dimension of human experience. P, 302 and 424b.

483. **Architectural Aspects of Urban Settlements** (3) GC II An overview of current architectural issues relevant to the design of human settlements, with an emphasis on environmental and resource utilization aspects. Field trips. P, 302.

497. **Workshop**
   - Community Design for Non-Designers (3) GC I Field trips. Open to nonmajors only. (Identical with L.Ar. 497i)

596. **Seminar**
   - Readings in Architecture (2) [Rpt.] III Open to majors only.
   - Interdisciplinary Environment-Behavior-Design (3) I (Identical with Idis. 596u, which is home)

597. **Workshop**
   - Architecture (3 to 8) [Rpt.] I II Open to majors only.

**ARID LANDS RESOURCE SCIENCES**

**Committee on Arid Lands Resource Sciences (Graduate)**

Professors Jack D. Johnson, *Chairperson*, Robert B. Bechtel (Psychology), Daniel D. Evans (Hydrology and Water Resources), C. John Maré (Veterinary Science), Paul S. Martin (Geosciences), Richard W. Reeves (Geography), Ervin H. Zube (Renewable Natural Resources)

Associate Professors Timothy J. Finan (Anthropology), James C. Wade (Agriculture Economics)

Assistant Professor Charles F. Hutchinson, *Coordinator*, (Geography)

The Committee on Arid Lands Resource Sciences offers a program of graduate study leading to a Ph.D. degree. The program is designed for students whose educational goals are not found in the degree programs offered in traditional departments. The program is interdisciplinary and allows the student to select areas of study from within a variety of social, physical, and biological sciences.

The interested student should request additional information from the coordinator of the program. For admission and degree requirements, please see the *Graduate Catalog*.

**ART**


Assistant Professors Jackson G. Boelts, Sam Scott, Gayle E. Wimmer

The Department of Art is a division within the Faculty of Fine Arts and offers course work leading to the following degrees: Bachelor of Fine Arts with majors in studio art and art education, and Bachelor of Arts in Art with a major in art history. The graduate degrees of Master of Fine Arts and Master of Arts are also available. For admission and degree requirements, please see the *Graduate Catalog*. 
The major in studio art is for students planning professional careers in art. At least eighteen units of art must be taken in residence at the University of Arizona. In addition to the group units required, as described under “Bachelor of Fine Arts” in the Faculty of Fine Arts section of this catalog, students must meet the requirements listed in A, B, or C below.

A. Emphasis in drawing and painting, sculpture, printmaking, ceramics, metalwork, fibers, or an approved combination: 75 units, including (1) 101a-101b, 103, 104, 205, 280, 287, and any two of the three art hist. surveys (117, 118, 119); (2) twelve units of art electives; (3) 24 units of upper-division studio courses; and (4) twelve units of upper-division art hist. courses.

B. Graphic design emphasis — 75 units, including (1) 101a-101b, 103, 104, 205, 265, 266, 280, 287, and two of the three art hist. surveys (117, 118, 119); (2) nine units of art electives; (3) 27 units of upper-division courses in one of the following areas: graphic design (365, 368, 464, 465 (twice), 468, and six units of art hist.), or illustration (364, 365, 368, 369, 466, 469, and six units of art hist.).

C. Photography emphasis — 75 units, including (1) 101a-101b, 103, 104, 141, 205, 244, 280, 287, and any two of the three art hist. surveys (117, 118, 119); (2) 24 units of studio courses, to be selected from 341 (twice), 441 (twice), 444, 445, 446, 447, 596p, and 5971; (3) six units of upper-division art hist. (including at least three units of photohistory) and six units of art criticism (including 481), or 12 units of upper-division art hist. (including at least three units of photohistory); and (4) six units of art electives.

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 twelve units of art must be taken in residence at the University of Arizona. In addition to the group units required, as described under the Bachelor of Fine Arts in the Faculty of Fine Arts section of this catalog, the following major area of study requirements must be met: 101a-101b, 103, 104, 205, 280, 230, 431, any two of the three art hist. surveys (117, 118, 119), 24 units of studio art courses of which 12 units must be upper-division, six units of upper-division art hist., and six units of upper-division art electives. The candidate for the degree with this major must also complete the following education courses: Ed. P. 311, S. Ed. 329, 330, 3381, 345, 493a, 494, and three to six units of general academic electives. A teaching minor is not required, but those students anticipating employment in areas where a teaching minor might be advantageous should consult with their adviser. The student should also consult with his or her adviser regarding any possible changes in certification requirements and consequent adjustments to degree requirements. Minimum total units required for the degree with this major — 127.

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, nine units of art (six units specifically in the history of art) must be taken in residence at the University of Arizona. In addition to the group units required, as described under the Bachelor of Arts in the Faculty of Fine Arts section of this catalog, the following requirements must be met: 101a, any two of the three art hist. surveys (117, 118, 119), eighteen units of art hist., and seven units of elective art courses — fourteen units of the last two areas shall be upper-division courses. A minor of twenty units is also required (see Faculty of Fine Arts section of this catalog). Minimum total units required for the degree with this major — 125.

Studio Courses

101a-101b. Introduction to Studio Art (3-3) Visual perception and principles of composition presented through various drawing techniques. 6S. 101b: P or CR, 101a. Both 101a and 101b are offered each semester.

103. Color and Composition (3) I II Problems in two-dimensional design, with emphasis on color mixing, interaction and control. 6S. P, 101b.

104. Three-Dimensional Design (3) I II Study of volume, mass, and space relationships through modeling, casting, carving, and construction. 6S.
141. **Beginning Photography** (3) [Rpt./2] I II Familiarization with basic photographic processes and aesthetics. 2R, 2S. Field trips. (Identical with R.T.V. 141)

171. **Beginning Jewelry and Metalsmithing** (3) [Rpt./1] I II Introduction to the fundamentals of jewelry and metalwork processes. 6S.

173. **Beginning Ceramics** (3) I II Introduction to the basic clay processes of hand construction, potter’s wheel, surface decoration and glaze application. 1R, 4S. P, 104.

176. **Introduction to Fibers** (3) I II Structural development of fibers into woven forms, using the frame loom; fiber as a fine arts medium. 6S.

188. **Beginning Design in Wood** (3) I II Design and fabrication of wood products, both utilitarian and sculptural. 6S.

205. **Beginning Drawing** (3) I II Drawing from the model and other subjects to develop pictorial and perceptual skills. 6S. P, 101b.

244. **Beginning Non-Silver Photography** (3) I Fundamentals and techniques of various non-silver processes including blueprint, gum bichromate and xerography. 2R, 2S. Field trips. P, 141.

251. **Printmaking** (3) [Rpt.] I II Studio in relief, intaglio, and planographic media, including mixed techniques and color processes. 6S. P, 103, 205.

265. **Beginning Graphic Design** (3) I II Introductory study of principles, tools, and techniques of advertising layout. 6S. P, 101a.

266. **Beginning Illustration** (3) I II Exploration of techniques, styles and media for illustration. 6S. P, 103, 205, 265.

271. **Jewelry Fabrication** (3) [Rpt./1] I II Design and creation of jewelry forms by construction methods. 6S. P, 171.

272. **Metalsmithing** (3) [Rpt./1] I II Raising and forging techniques as applied to the production of holloware and flatware in nonferrous metals. 6S. P, 171.

273. **Intermediate Ceramics** (3) [Rpt.] I II Continuation of form investigation, using hand construction and wheel; studio problems in clay and glaze formulation, kiln firing and ceramic history. 1R, 4S. P, 173.

278. **Tapestry Weaving** (3) I II Development of woven tapestry in both large and miniature scale; work with cartoon as well as spontaneous methods. 6S. P, 176.

279. **Loom Weaving** (3) I In-depth exploration of the harness loom, using 2, 4, 6, and 8 harness weaves; loom- and weaver-controlled weaves and pattern drafts. 6S. P, 176.

280. **Beginning Painting** (3) I II Elementary course in composition and in the methods and techniques of painting. 6S. P, 101b.

285. **Beginning Watercolor Painting** (3) I II Introductory course to watercolor painting exploring basic techniques and materials. 6S. Field trips. P, 101b.

286. **Intermediate Design in Wood** (3) I II Continued design and fabrication of wood products, both utilitarian and sculptural. 6S. P, 186.

287. **Sculpture** (3) I II Composition in various sculpture techniques. 6S. P, 104, 205.

303. **Color Theory for Painters** (3) I II Theories of color and applications; mixing and use of paint. P, 280 or 285.

305. **Figure Drawing** (3) [Rpt./6 units] I II 6S. P, 205.

314. **Intermediate Photography** (3) [Rpt./2] I II Principles and processes of photography. 2R, 2S. P, 141, acceptance of portfolio by Portfolio Committee.

352. **Basic Lithography** (3) [Rpt./1] I II Techniques of image-making and printing from lithographic plate or stone; emphasis on drawing and concept. 6S. P, 305.

364. **Production Problems in Graphic Design** (3) I II Preparation of visual material for reproduction by various printing processes. 6S. P, 265, 266, and acceptance of portfolio by Portfolio Committee.

365. **Intermediate Graphic Design** (3) I II Further exploration of design as a communications tool. Solutions to realistic promotional programs are executed from rough to comprehensive stage. 6S. P, 103, 205, 265, acceptance of portfolio by Portfolio Committee.

368. **Rendering Techniques** (3) [Rpt./1] I II Drawing and rendering techniques with various media in the creation of editorial and advertising illustration. 6S. P, 265, 266, acceptance of portfolio by Portfolio Committee.

369. **Advertising Illustration** (3) [Rpt./1] I II 6S P, 265, 266, acceptance of portfolio by Portfolio Committee.

370. **Centrifugal Casting for Jewelry and Metalwork** (3) [Rpt./1] I II Introduction to lost-wax, centrifugal casting. 6S. P, 171.

372. **Enameling** (3) [Rpt./1] I II Introduction to enameling on metal. 6S. P, 171.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Description</th>
<th>Units</th>
<th>Notes</th>
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<tr>
<td>376</td>
<td>Fiber Sculpture</td>
<td>Building of fiber structures via coiling, twining, crochet, and knotting; investigation of the self-supportive fiber form.</td>
<td>6S, P, 176.</td>
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<tr>
<td>377</td>
<td>Experimental Weaving</td>
<td>Tubular weaves, wedging, elastic warps and non-loom weaves, with emphasis on primitive loom adaptations.</td>
<td>6S, P, 176.</td>
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<tr>
<td>380</td>
<td>Intermediate Painting</td>
<td>(3) Rpt./6 units I II 6S, P, 103, 280, 305.</td>
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<tr>
<td>405</td>
<td>Advanced Figure Drawing</td>
<td>(3) Rpt. GC I II 6S, P, six units of 305.</td>
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<tr>
<td>409</td>
<td>Special Problems in Drawing</td>
<td>(3) Rpt. GC I II Individual exploration and development of visual concepts through drawing, accompanied by individual and class critiques.</td>
<td>P, six units of 405.</td>
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<tr>
<td>414</td>
<td>Nonsilver Photography</td>
<td>(3) Rpt./2 GC II Familiarization with alternative processes of photographic printing. 2R, 2S.</td>
<td>P, 441, acceptance of portfolio by Portfolio Committee.</td>
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<tr>
<td>454</td>
<td>Graphic Processes</td>
<td>(3) Rpt./2 GC I Graphic and photomechanical methods for the artist. 2R, 2S.</td>
<td>P, 251.</td>
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<tr>
<td>466</td>
<td>Color Photography</td>
<td>(3) Rpt./2 GC I II Exploring conceptual and practical aspects of color picture-making with an emphasis on darkroom skills and the development of personal imagery.</td>
<td>2R, 2S.</td>
<td>P, 441, acceptance of portfolio by Portfolio Committee.</td>
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<tr>
<td>457</td>
<td>Mixed Media Book</td>
<td>(3) Rpt./1 GC I II Investigation of the book as a format for presenting visual material; the process of making simple books. Contemporary bookmakers will be presented.</td>
<td>2R, 2S.</td>
<td></td>
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<tr>
<td>465</td>
<td>Portfolio Preparation</td>
<td>(3) Rpt./1 GC II Final approach to completion of portfolio. Student’s portfolio is critiqued in areas of order, style, and degree of presentation to bring it to a professional level.</td>
<td>6S, P, nine units of graphic design courses and approval of portfolio by Portfolio Committee.</td>
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<tr>
<td>466</td>
<td>Editorial Illustration</td>
<td>(3) Rpt./1 GC I Problems in editorial and book illustration. 6S, P, 9 units of illustration courses and approval of portfolio by Portfolio Committee.</td>
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<tr>
<td>468</td>
<td>Graphic Design Studio</td>
<td>(3) Rpt./1 GC I Classroom experience in a professional designer capacity with studio solutions to graphic design problems submitted from campus and community. 6S, Field trips. Consult dept. before enrolling.</td>
<td>P, nine units graphic design courses, acceptance of portfolio by Portfolio Committee.</td>
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<tr>
<td>469</td>
<td>Experimental Illustration</td>
<td>(3) Rpt./2 GC I Experimentation, interpretation and problem-solving through illustration. 6S, P, 368, 369, acceptance of portfolio by Portfolio Committee.</td>
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<tr>
<td>471</td>
<td>Advanced Jewelry and Metalsmithing</td>
<td>(3) Rpt./1 GC I II Advanced study of the various materials and methods in the construction of jewelry and metalwork.</td>
<td>6S, P, twelve units of metalwork.</td>
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<td>473</td>
<td>Advanced Ceramics</td>
<td>(3) Rpt. GC I II Individual studio research and instruction, with emphasis on personal creative development.</td>
<td>1R, 4S, P, 273.</td>
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<td>476</td>
<td>Advanced Fibers</td>
<td>(3) Rpt. GC I II Individual interpretations of concept into finished fiber works. P, 176; three of the following: 278, 279, 376, 377.</td>
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<tr>
<td>477</td>
<td>Design on Fabric</td>
<td>(3) Rpt. GC I II Surface design application on fabric, including silkscreen printing, block printing and direct dye application techniques (canning, batik, dye-drawing).</td>
<td>6S.</td>
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<tr>
<td>480</td>
<td>Advanced Painting</td>
<td>(3) Rpt. GC I II 6S, P, six units of 305, six units of 380.</td>
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<tr>
<td>483</td>
<td>Combining Media</td>
<td>(3) Rpt. GC I 1983-84 and group projects, including collages, constructions, image sequences, and elements from other art forms (sound, language, movement, etc.).</td>
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<tr>
<td>486</td>
<td>Advanced Design in Wood</td>
<td>(3) Rpt./4 GC I II S Advanced design and fabrication of wood products, both utilitarian and sculptural.</td>
<td>6S, P, 286.</td>
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<tr>
<td>505</td>
<td>Special Problems in Figure Drawing</td>
<td>(3) Rpt./4 GC I II 6S. P, 405.</td>
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</tbody>
</table>
509. **Graduate Problems in Drawing** (3) [Rpt.] I II Individual exploration in drawing media and visual concepts, with individual and class critiques. P, 409.

505. **Graduate Graphic Design Problems** (3) [Rpt./1] I II Two- and three-dimensional design considerations with emphasis on conceptualization and presentation. 6S. Field trips. P, acceptance of portfolio by Portfolio Committee.

507. **Graduate Illustration** (3) [Rpt./1] I II Exploration of any optical material or phenomenon as a possible solution to illustration problems. 6S. P, 466, acceptance of portfolio by Portfolio Committee.

509. **Graduate Painting** (3) [Rpt./4] I II 6S. P, six units of 405, six units of 480.

565. **Intermedia Studio** (3) [Rpt.] I 1983-84 Individual and group projects incorporating elements of vision, sound, dance, drama, literature; access to camera, tape recorder is helpful. Field trips.


580. **Graduate Jewelry and Metalsmithing** (6 to 10) [Rpt.] I II Graduate study in all phases of jewelry and metalwork. 12 to 20S.

582. **Graduate Studio in Ceramics** (6 to 10) [Rpt./30 units] I II Studio research and instruction with emphasis on personal creative development. 12 to 20S. Field trips. P, 473.

586. **Graduate Fiber Studies** (6 to 10) [Rpt.] I II Graduate experimentation in all aspects of fiber work, with emphasis on the development of a personal style within the medium. 12 to 20S. P, 476.

588. **Graduate Problems in Sculpture** (3) [Rpt./6] I II Personal response to form and composition using a variety of technical means including welding, casting, carving and nontraditional techniques. 6S. P, 487.

**Art History Courses**

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-19th Century** (3) I II The art and architecture of Western civilization, Renaissance through the 19th century.

119. **Survey of Modern Art** (3) I A survey of major movements and artists from post-Impressionism to recent times.

219. **American Art** (3) I II Survey of American painting and sculpture from the 17th to the 20th century.

224. **Introduction to the History of Photography** (3) I 1983-84 Technical and aesthetic considerations from 1839 to the present.

310. **Classical Art** (3) I II 1983-84 Stylistic analysis of the emergence of classical art and architecture from Minoan Crete to the transformation of the classical spirit in the Hellenistic world — 800 to 32 B.C. P, two of the surveys (117, 118, 119), or six units of hist. (Identical with Clas. 310)

411. **Etruscan and Roman Art and Architecture** (3) GC The origin and development of Italian art and architecture from Etruscan beginnings through the Republic to the late Empire. P, two of the surveys (117, 118, 119), or six units of ancient hist. (Identical with Clas. 411)

412a-412b. **Medieval Art** (3-3) GC412a: I Arts of the nomadic invasions of Western Europe and Hiberno-Saxon, Merovingian, and Carolingian art. 412b: I 1983-84 Survey of Ottonian, Romanesque, and Gothic art from A.D. 1000 through 1250. 412a is not prerequisite to 412b.

413a-413b-413F. **Renaissance Art in Italy** (3-3-6) GC Painting, sculpture and architecture in Italy. 413a: I 13th-15th centuries. 413b: I High Renaissance to 1600. 413F: S Art of Florence, 13th-15th centuries. Offered in Florence only. P, six units of hist. or art hist. 413a is not prerequisite to 413b or 413F.

414a-414b. **Netherlandish Art** (3-3) GC 414a: I 1983-84 Development of painting in the Netherlands and France from the 14th through the 16th centuries. 414b: I 1982-83 Painting, sculpture, and architecture in Holland and Flanders. P, six units of hist. or art hist. 414a is not prerequisite to 414b.
218 DEPARTMENTS AND COURSES OF INSTRUCTION

415a-415b. Spanish Art and Architecture (3-3) GC 1984-85 415a: History of Spanish art and architecture from cave painting through the Gothic. P, six units of hist. or art hist. or Hispanic study. 415b: Painting, sculpture and architecture in Spain from the Renaissance to the present. P, two of the surveys (117, 118, 119), or six units of hist. or Span. literature. 415a is not prerequisite to 415b.

417a-417b. 19th-Century European Art (3-3) GC Painting and sculpture. 417a: From the French Revolution to about 1850. 417b: From about 1850 through Impressionism. P, six units of hist. or art hist.

418a-418b. 20th-Century Art (3-3) GC Painting and sculpture. 418a: From the French Revolution to about 1850. 418b: From about 1850 through Impressionism. P, six units of hist. or art hist. 418a is not prerequisite to 418b.

417a-417b. Pre-Columbian Art (3-3) GC 1984-85 417a: Art of the high cultures of Mesoamerica, with the focus on architecture, sculpture, painting and crafts prior to European contact. 417b: Pre-Columbian art of Central and South America, with particular attention to the Andean area. 417a is not prerequisite to 417b. (Identical with Anth. 417a-417b)

424a-424b. History of Photography (3-3) GC 424a: From its invention to 1895; impact of photography on the art and culture of the 19th century. 424b: As an art medium from 1895 to 1965. P, six units of art hist. 424a is not prerequisite to 424b.

426a-426b. German Art (3-3) GC Painting, graphics, architecture and sculpture. 426a: German Renaissance. 426b: Baroque, Classical, Romantic, and Modern Germany. P, six units of hist., art hist., or Ger. 426a is not prerequisite to 426b. (426b is identical with Ger. 426b)

511. Methods of Art History (3) Major intellectual approaches to the visual arts developed within the past 150 years. Field trips. Open to majors only.

512. Early Christian and Byzantine Art and Architecture (3) An historical analysis of artistic changes from paleo-Christian time through the last stages of the Byzantine style. P, two of the surveys (117, 118, 119), or six units of hist.

515a-515b. Mexican Art and Architecture (3-3) 1984-85 Ibero-American art and architecture from the beginning of colonialism to the present. 515a: Gothic and Cathedral periods. 515b: Baroque, Neoclassical and modern periods. P, six units of hist., art hist. or L.A.s. (Identical with M.A.S. 515a-515b)


693. Internship a. Art Museum Training (1 to 6) [Rpt./12 units] I II Open to students concentrating in museum studies only. P, twelve units of grad. art hist. courses. b. Curatorial Training for Archives of Photography (1 to 6) [Rpt./12 units] I II Open to students concentrating in museum studies only. P, 511, twelve units of grad. art hist. courses. c. Archivist Training for Collection of Photography (1 to 6) [Rpt./12 units] I II Open to students concentrating in museum studies only. P, twelve units of grad. art hist. courses. d. Internship in Photography: Preservation/Cataloging (1 to 6) [Rpt./12 units] I II Open to students concentrating in museum studies only. P, 511, twelve units grad. art hist. courses.

Art Education Courses


338. The Teaching of Art (3) I II Carries credit in ed. only. (Identical with S.Ed. 338)
430. Visual Arts in Elementary Education (3) GC II Emphasis on perceptual development and art learning objectives in relation to cultural values; introduction to art elements, principles, and media through studio participation. 2R, 2S, P, Ed.P. 301 or 311.


433. Art in Society (3) GC II Analysis and interpretation of influences, attitudes, and concerns involving the relationship of art and artists to contemporary society.

434. Environmental Aesthetics (3) GC I Critical analysis and interpretation of visual forms, their content and varying styles, in the everyday, man-made environment.

435. Art and Visual Perception (3) GC II Theories of visual perception in relation to the pictorial process and the study of vision as a perceptual system: the eye, color, space, illusion, perceptual learning, current research.

633. Issues and Recent Research in Art Education (3) I The identification of problems in art education at various curricular levels; examination of related research with possible implications for practice. P, S.Ed. 493a (in art), or teaching experience.

ASTRONOMY

Professors Peter A. Strittmatter, Head, J. Roger Angel, Jacques M. Beckers (Adjunct), Bart J. Bok (Emeritus), George V. Coyne, Walter S. Fitch, William F. Hoffmann, J. R. Jokipii, Frank J. Low, Aden B. Meinel, George H. Rieke, Elizabeth Roemer, Thomas L. Swihart, Rodger L. Thompson, William G. Tifft, Ray J. Weymann, Neville J. Woolf

Associate Professors William J. Cocke, Andrzej G. Pacholczyk, John S. Scott, Raymond E. White

Assistant Professor Charles J. Lada, James W. Liebert

The department offers the degrees of Bachelor of Science and Bachelor of Arts with a major in astronomy, Master of Science and Doctor of Philosophy.

The major for the B.S. is designed for students who plan to pursue graduate studies in astronomy or a related science. The requirements for the major are thirty units of upper-division courses in astronomy, physics and mathematics, including Astr. 400a-400b; other courses are to be selected in consultation with the departmental adviser.

Entering freshmen should take a mathematics class (Math. 117e and/or 118, or 125a), followed by Astr. 271 and Phys. 110. The supporting minor should be physics, although other minors may be selected with the consent of the adviser. A double major in astronomy and physics is also possible. It is recommended that the language requirement be fulfilled in French, German or Russian.

The major for the B.A. is oriented toward students with interests in science education, such as high school or junior college teaching, planetarium work, library science, and journalism. The requirements for the major are 35 units, including 120, 271, 272, 400a, Phys. 230 and three additional upper-division units of physics; six units in the history or philosophy of science. The remaining units should be mostly upper division and must be courses chosen from the sciences, mathematics, engineering, history or philosophy of science. The minor need not be in the sciences.

With foresight in course selection, a student could maintain the option of obtaining either the B.S. or the B.A. degree into the senior year.

Honors: The department participates in the Honors Program.

100. * Essentials of Astronomy (3) I II A survey of astronomy, with attention to its interdisciplinary aspects and its relationships to other sciences. Planetarium work and some night-time observing sessions and field trips supplement class lectures. Primarily for nonscience majors.

105. The Universe and Humanity: Origin and Destiny (3) I II (Identical with Pty.S. 105)

106. Survey of the Solar System (4) I II (Identical with Pty.S. 106)

110a-110b. * Introductory Astronomy (4-4) A broad introduction to traditional and modern astronomy combining class lectures, planetarium and lab. work, and night-time observing and field trips. 110a: P, one semester high-school algebra. 110b: P, 100 or 110a.

*Credit will be allowed for only one of the following: 100 or 110a.
120. **Philosophical and Historical Aspects of Astronomical Thought** (3) 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.


272. **Introduction to Observational Astronomy** (3) II Observational applications of coordinate systems and time; basics of astronomical instruments; photodetectors; measuring equipment and reduction techniques. Practice in observing. 2R, 3L. P, Math. 125a.

311. **Classical and Solar System Astronomy** (3) II Coordinate systems and time; orbits and ephemerides; atmospheres, surfaces, and interiors of planets and satellites; the small bodies; the Sun; origins. P, CR Phys. 410.

400a-400b. **Theoretical Astrophysics** (3-3) GC Stars, interstellar matter, galaxies, radio sources, cosmology. P, Math. 253, six units upper-division phys.

403. **Introduction to the Solar System** (3) GC I (Identical with Pty. S. 403)

404. **Man’s Exploration of the Solar System** (3) GC S (Identical with Pty. S. 404)

500. **Observational Stellar Astronomy** (3) II 1983-84 Basic observational spectroscopy and photometry, the stellar distance scale, stellar masses and diameters, variable stars, interstellar matter, star clusters and galactic structure, with emphasis on observational methods, data, and basic theories.

502. **Introductory Astronomical Instrumentation and Technique** (3) I 1984-85 Survey of instrumentation and techniques applicable to astronomical problems; noise sources, mechanical and optical technology, spectrum analyzers, polarimetry, image analyzers, video and electronic techniques.

515. **Gaseous Nebulae and the Interstellar Medium** (3) II 1984-85 Ionization equilibrium; heating and cooling of HI and HII regions; determination of physical conditions from emission-line spectra; dark and reflection nebulae; interstellar grains.


535. **Stellar Structure** (3) II 1983-84 Virial theorem; gas spheres in hydrostatic equilibrium; polytropes; convective and radiative equilibrium; equations of state; opacities; nuclear reaction rates; stellar model computation; stellar atmospheres and evolution. Strittmatter

540. **Basic Properties of Galaxies** (3) II 1984-85 Classification, mass determination, photometric properties, dust and gas content, stellar content, systems and clusters, distance scales, galactic dynamics. Tifft/Strittmatter

545. **Stellar Atmospheres** (3) I 1983-84 Radiative transfer, gray atmosphere, opacity, line formation, non-LTE, curves of growth, stellar hydrodynamics.

551. **Satellite and Planetary Perturbation Theory** (3) II (Identical with Pty. S. 551)

556a-556b. **Electrodynamics of Conducting Fluids and Plasmas** (3-3) 1984-85 (Identical with Pty. S. 556a-556b)

575. **General Relativity and Cosmology** (3) II 1984-85 General relativity, with applications to cosmology and stellar structure; formation of stars and galaxies. Cocke/Weymann


**ATMOSPHERIC SCIENCES**


Associate Professors Robert L. Gall, Kenneth C. Young

The department offers the degrees of Bachelor of Science, Master of Science, and Doctor of Philosophy with a major in atmospheric sciences.

*The major:* 30 units in Atmo. The following courses are required: Math. 125a-125b, 223, 253, 461 or Agri. 539; S.I.E. 170; Phys. 110, 116, 121; Chem. 103a-103b 104a-104b; Atmo. 300, 350, 421, 441a-441b, 451, 471, 472.

In conjunction with the Institute of Atmospheric Physics, the Department of Atmospheric Sciences offers opportunities for study and research in the atmospheric sciences.
101a-101b. The Atmospheric Environment (4-4) Exposition of the atmosphere about us and its interaction with human activity; atmospheric evolution and pollution; weather and climate and their inadvertent and inadvertent modification; local and severe storms. Course includes demonstrations and lab. exercises. Credit will not be given for both 101a-101b and 171.

171. Introduction to Meteorology and Climatology (3) I II Basic elements that constitute the weather, including fronts and cyclones, precipitation processes, the wind systems of the world, severe storms, and weather modification. Credit will not be given for both 101a-101b and 171. (Identical with Geog. 171)


300. General Meteorology (3) I Survey of physical and dynamic meteorology, recommended for students wanting a more quantitative approach to meteorology than provided in 171. P, Math. 123.

350. Atmospheric Measurements (3) I Theory and practice in the use of meteorological instruments; lab. and field demonstrations and practices. 2R, 3L. Field trip. P, Phys. 103a-103b, or 116 and 121.

421. Physical Climatology (3) GC II Heat and water balances of the earth-atmosphere system viewed from both the local and global scales; paleoclimatology and theories of climatic change; man’s impact on climate. P, 171.

427. Bioclimatology (3) GC II Description and analysis of the environmental boundary layer and its interaction with animal and plant life, Models are developed for energy and mass transfer in this region. P, 171. (Identical with Ws.M. 427)

441a-441b. Dynamic Meteorology (3-3) GC Thermodynamics and its application to planetary atmospheres, hydrostatics, fundamental concepts and laws of dynamic meteorology. P, Phys. 121; Math. 253 or 254.

451. Physical Meteorology (3) GC I Introduction to atmospheric physics, including atmospheric radiation, fluid mechanics, aerosol physics, cloud physics, and atmospheric electricity. P, Phys. 121; Math. 253 or 254.

471. Synoptic Analysis (3) GC I Principles of meteorological analysis, including surface and upper-level charts, cross-sections, kinematic analysis, structure of the troposphere and tropospheric systems, thermodynamic diagrams. 1R, 6L. P, CR 441a, or 300.

472. Weather Forecasting (3) GC II Techniques for weather forecasting and actual forecasting experience; advanced synoptic analysis. 1R, 6L. P, 471.


544. Physics of the High Atmosphere (3) II 1983-84 (Identical with Pty.S. 544)

561. Radar Meteorology (3) II 1984-85 Propagation, scattering, and attenuation of microwaves in the atmosphere and the use of radar for observing clouds, precipitation, thunderstorms, tornadoes and other meteorological phenomena.

575. Atmospheric Aerosols (3) I 1983-84 Physics, mechanics, and optics of individual atmospheric aerosol particles. Topics include formation dynamics, nucleation and growth, coagulation, scattering and absorption of radiation.


595. Colloquium
a. Atmospheric Measurement Techniques (1 to 3) II 1984-85


641. Theoretical Meteorology (3) I Methods of solution of the hydrodynamic equations; identification and analysis of acoustic, gravity, Kelvin-Helmholtz, inertial, Kelvin, barotropic and baroclinic waves. P, 441b.


656a-656b. Atmospheric Optics and Radiation (3-3) 1984-85 Theory of atmospheric radiative transfer processes; specific methods for solving relevant equations; applications to problems in radiative transfer and optics. P, Phys. 420. (Identical with Opti. 656a-656b)
Principles of Atmospheric Remote Sensing (3) II 1984-85 For remote sensing applications, mathematical methods are developed to infer the physical properties of the atmosphere. Techniques using optical and microwave frequencies are examined for their information content. P, 656b; Math. 253. (Identical with E.C.E. 683)

BIOCHEMISTRY

Professors John H. Law, Head, Herbert E. Carter, Michael A. Cusanovich, Leslie S. Forster (Chemistry), Darrel E. Goll (Nutrition and Food Science), David J. Hartshorne (Nutrition and Food Science), Mark R. Haussler, Victor J. Hruby (Chemistry), Richard G. Jensen, Henry Koffler, David W. Mount (Molecular and Medical Microbiology), John A. Rupley, Gordon Tollin, Michael A. Wells, Henry I. Yamamura

Associate Professors Don P. Bourque, William J. Grimes, F. Raymond Salemme

Assistant Professors Nancy W. Downer, John W. Little, Marc E. Tischler, Howard D. White

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 Arts, Master of Science and Doctor of Philosophy degrees with a major in biochemistry.

The major for the B.S.: Chem. 103a-103b, 104a-104b, 241a-241b, 245a-245b, 325, 326, 480a-480b; Math. 125a-125b, 223; Phys. 103a-103b; G.Bio. 105a or 320, 105b; Bioc. 462a-462b, 463, 494, 496a and ten upper-division units in bio., chem., math., or phys.

The major for the B.A.: Chem. 103a-103b, 104a-104b, 241a-241b, 243a-243b, 325, 326, 480a; Math. 117e, 118, 125a; Phys. 102a-102b; G.Bio. 105a or 320, 105b; Bioc. 462a-462b, 463, 496a and six upper-division units in bio., chem., math., or phys.

Honors: The department participates in the Honors Program.

460. General Biochemistry (4 to 5) GC I Fundamentals of biochemistry, including proteins, nucleic acids, enzymes, carbohydrates and lipids and their metabolic relationships. 5 unit option includes additional lectures relevant to mammalian biochemistry. Open to nonmajors only. P, Chem. 241b. (Identical with Chem. 460)


463. Biochemistry Laboratory (2) GC II Introduction to experimentation with biochemical systems, processes and compounds of biochemical importance. 1R, 5L. P, 460 or CR 462a-462b.

496. Proseminar
   a. Biochemistry (1) [Rpt. / 1] II Open to majors only. P, 462a or CR.

501. Medical Biochemistry (5) I Comprehensive treatment of general biochemistry, oriented towards human biology, with emphasis on basic concepts; protein and nucleic acid chemistry and metabolism, enzymology, metabolism of lipids and carbohydrates, metabolic regulation and closely related topics. P, Chem. 103b, 104b, 241b, 245b; Phys. 102b.

504. Intermediate Medical Biochemistry (5) I An intermediate treatment of several areas of general biochemistry including metabolism and nutrition, genetics and membranes. Designed to build on the student's prior knowledge of biochemistry. Consult dept. before enrolling. P, 462a-462b.

561a-561b. Introduction to Biochemical Literature (1-1) Designed to supplement 462a-462b with a more detailed consideration of subject matter of lectures. Primarily for those students planning a career in bioc. and wishing to prepare themselves for future grad. study. P, CR 462a-462b. 561a is not prerequisite to 561b. (Identical with Chem. 561a-561b)


569a-569b. Structure and Function of Biological Membranes (3-3) 1984-85 Physical and chemical properties of membranes and membrane components, photosynthesis, vision, cell surface phenomena and biosynthesis of membranes and membrane components. P, 462b. (Identical with Chem. 569a-569b)


617. Steroid Chemistry and Biochemistry (3) I 1984-85 (Identical with N.F.S. 617)

681. Introduction to Biochemical Research (1 to 2) I II Supervised research experiences in the labs. of individual faculty members. 3 or 6L. Open only to first-year majors. P, CR 561a-561b.

696. Seminar
a. Biochemistry I (1 to 3) I
b. Biochemistry II (1 to 3) II

800. Research (1 to 16) Yr.

801. Medical Biochemistry (5)

804. Intermediate Medical Biochemistry (5) I

**BIOLOGY**

Four departments (Cellular and Developmental Biology, Ecology and Evolutionary Biology, General Biology, and Microbiology) teach and do research in biology. They share a common core of courses. Details of their programs may be found under their respective listings.

**BIOENGINEERING**

Committee on Biomedical Engineering

Biomedical engineering can be defined as a multidiscipline in which physical scientists and engineers interact with life scientists and physicians to solve problems ranging from basic biomedical engineering research to applications in clinics and health care delivery systems. The University Committee on Biomedical Engineering coordinates an option available to students in the Colleges of Engineering and Mines (Chemical Engineering).

Upper-division undergraduate students may select biomedical engineering courses and projects as technical electives in all engineering departments. Graduate students working toward the Master of Science or Doctor of Philosophy in an engineering department may select courses and research topics in biomedical engineering as part of their minor programs. No biomedical engineering degree is offered. Courses available in biomedical engineering are offered through engineering departments and include A.M.E. 485, 585; E.C.E. 411, 415, 417, 515; Ch.E. 485, 586; and Psio. 418, 419. Additional courses in biomedical engineering are being developed, and supporting course work in the life sciences is also available. Collaborative research projects permit the student to participate in interdisciplinary associations which can enhance progress in the fields of biology, medicine, and engineering. Individual programs are determined by the student and an engineering departmental adviser.

For additional information contact Dr. J. F. Gross (Chemical Engineering) Chairperson, Committee on Biomedical Engineering, or Dr. K. C. Mylrea (Electrical and Computer Engineering) Director, Clinical Engineering.
224 DEPARTMENTS AND COURSES OF INSTRUCTION

BLACK STUDIES

Committee on Black Studies

Professors Clifford J. Lytle (Political Science), John V. Mering (History)
Associate Professor John E. Crow (Political Science), Chairperson
Chair, Committee on Women’s Studies, Myra Dinnerstein

The minor in Black Studies consists of at least twenty units selected by the student in consultation with the chairman of the committee in charge and approved by the student’s major professor.

160. Minority Relations and Urban Society (3) I II (Identical with Soc. 160)
220. Introduction to Black Studies (3) I Introductory survey of the literature, history, culture and social issues affecting Black Americans.
230. The History of Black America (3) I (Identical with Hist. 230)
252. American Ethnic History (3) II (Identical with Hist. 252)
330. Minority Groups and American Politics (3) I (Identical with Pol. 330)
347. The Old South (3) I (Identical with Hist. 347)
348. The South Since the Civil War (Identical with Hist. 348)
429. Cultures and Societies of Africa (3) GC II (Identical with Anth. 429)
435. The Coming of the Civil War, U.S. 1845-1861 (3) GC I (Identical with Hist. 435)
436. Civil War and Reconstruction, U.S. 1861-1878 (3) GC II (Identical with Hist. 436)
437. Black Literature in the Americas (3) II I983-84 (Identical with Engl. 437)
450. French Literature of Black Africa and the West Indies (3) GC I 1984-85 (Identical with Fren. 450)
461. Race and Ethnic Relations (3) GC I II (Identical with Soc. 461)
468. Government and Politics of Africa (3) II (Identical with Pol. 468)
477c. Ethnic Literature (3) (Identical with Engl. 477c)
483. Urban Economics (3) GC II (Identical with Econ. 483)
487. Race and Public Policy (3) GC I (Identical with Pol. 487)
495. Colloquium
b. Studies in Black America (3) GC I II (Identical with Hist. 495b, which is home)

BUSINESS ADMINISTRATION

Committee on Business Administration

Professors Richard O. Mason (Management Information Systems), Chairperson, William B. Barrett (Associate Dean, Academic Affairs), Gerald D. Bierwag (Finance and Real Estate), James C. Cox (Economics)
Associate Professor Averill M. Law (Management Information Systems)
Assistant Professors Margaret A. Neale (Management), Melanie R. Wallendorf (Marketing), William S. Waller (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 degrees are offered. For admission and degree requirements, please see the Graduate Catalog.
BUSINESS AND CAREER EDUCATION

Professors Herbert J. Langen, Head, Richard A. Kidwell
Instructor Sally N. Clark
Lecturer William H. Antrim

The department offers technical and professional courses for the preparation and certification of teachers of business education (office or distributive), and for the preparation of noncertificated office administration personnel. All basic service courses are open to any student, regardless of major.

The degree of Bachelor of Science in Education is available with a major in business education. A major and minor are offered in business education (office or distributive) for the Master of Education degree. A minor in business education is offered for doctoral programs.

The major in business education requires 44 units of course work selected from one of three areas of specialization: (a) a teaching program for office education, (b) a teaching program for distributive education, or (c) a nonteaching program for office administration. Business education majors must include Econ. 201a-201b as part of the social science requirement.

Required courses for the office education specialization include Acct. 200, B.C.Ed. 108, B.C.Ed. 276, 373 or 473, 389, and 482. Additional courses will be selected from departmental offerings or, with adviser’s approval, from the College of Business and Public Administration. Students may select in the office education program either a 24-unit major with an approved teaching minor, or a 44-unit teaching major with no minor.

Required courses for the distributive education specialization include Acct. 200, B.C.Ed. 106 or 108, 482, 485; and Mktg. 361, and 455 or 458. A minimum of six additional units must be taken in each of the areas of marketing, management and finance.

Required lower-division courses for the office administration specialization include arts-and-sciences courses as outlined in the secondary education program, plus the following basic courses not included in the major: Acct. 200 or 272, B.C.Ed. 106 or 108, M.I.S. 111 or B.C.Ed. 174, and Math. 117e and 160. The 44-unit major consists of 15 to 25 units from b.c.ed., including 373 or 473, and 493a (6), and 20 to 29 units selected from three or more departments in the College of Business and Public Administration. In addition, a twelve-unit core of education and/or career-related courses will be developed in consultation with an adviser from this department.

Candidates for any one of the above three specializations should register in the College of Business and Public Administration during the freshman and sophomore years but are to be advised by this department.

The teaching minor in business education includes a minimum of 24 units, selected in consultation with an adviser from the department. In addition, a specific methods course is required.

Service Courses

The following courses are offered as a service to the University community:

106. Basic Typing (3) I II CDT For students with no knowledge of touch typing or with insufficient typing experience to meet the prerequisite for 108.

108. Advanced Typing (3) I II CDT Designed to build superior typing speed and develop skills in all forms of business communications. P, typing speed of 40 w.p.m. or two yrs. of h.s. typing.

174. Beginning Shorthand (3) I CDT Shorthand theory and fundamentals; beginning dictation and transcription. P, 106 or typing speed of 40 w.p.m.

175. Intermediate Shorthand (3) II CDT Continuation of 174. P, 174 or shorthand speed of 60 w.p.m.

177. Electronic Calculators and Microcomputers (2) I Application and solution of quantified business problems using various electronic calculators and microcomputers.
Advanced Shorthand (3) II CDT Review of shorthand theory; English, punctuation, and spelling; development of dictation and transcription; emphasis on mailable letters and other correspondence. P, 175 or ability to take dictation at 90 w.p.m. for five minutes.

Office Services (3) II Functions of service departments of the office; word processing, reprographics, calculating machines, special purpose typewriters, filing. P, 108.

Regular Courses

Teaching Business Courses (3) I (Identical with S.Ed. 338b)

Introduction to Business Communications (3) I II Introduction to writing clear and concise sentences and paragraphs in basic office communications.

Records Management (3) I II Systems of filing; storage and transfer of office records; management aspect of establishing filing systems and evaluating filing efficiency.

Foundations of Business Education (3) II Curriculum construction in business and distributive education; objectives, history, and philosophy of training for vocational office and distributive education; planning for effective instruction and career development.

Office Procedures and Problems (3) GC II Effective procedures in handling routine office duties; creativity in planning for innovation in the solution of office problems; emphasis on preparation for advancement to administrative positions.

Office Administration (3) GC I Analysis of functions of office departments, their organization and administration; development and use of office manuals, selection, training, and promotion of office employees; quality and quantity of office production.

Professional Written Communication (3) GC II Principles and practice of the communication process in today’s business and professional communities.

Word Processing Concepts (3) GC II S Basic concepts of information/word processing with emphasis on proper utilization of people, procedures, and equipment.

Teaching Vocational Office and Distributive Education (3) GC I Development of vocational and career education; the organization and methods of teaching office and distributive education programs. (Identical with S.Ed. 482)

Development and Instruction of Adult Vocational Education Programs (3) GC I Organization, administration, promotion, curriculum construction, teaching methods, and evaluation of instruction in adult education programs. (Identical with S.Ed. 483)

Organization and Supervision of Vocational Education Programs (3) GC I The organization, administration, and supervision of vocational education programs, including a study of vocational curricula, funding, reporting, training, personnel, coordination, and evaluation, with primary emphasis on reimbursed vocational business education programs. (Identical with S.Ed. 484)

Cooperative Vocational Education Programs (3) GC II The role of the teacher-coordinator in the coordination, teaching, guidance, public relations, and administration of work-experience programs. (Identical with S.Ed. 485)

Microcomputers in Education (3) GC I II S (Identical with Ed.F.A. 487)

Internship
a. Directed Work Experience or Observation (1 to 6) [Rpt./1]

Workshop
h. Teaching Data Processing/Word Processing (3) [Rpt./3] GC S

BUSINESS ECONOMICS
(See Economics)

CELLULAR AND DEVELOPMENTAL BIOLOGY

Professors Neil H. Mendelson, Head, H. Vasken Aposhian, Wayne R. Ferris, Konrad Keck, James W. O'Leary, Peter E. Pickens
The Department of Cellular and Developmental Biology offers the Bachelor of Science, Master of Science, and Doctor of Philosophy degrees with a major in cellular and developmental biology.

The major: 102, 103, 104, 320, 395a, 410a-410b, 413, 415, 456; Chem. 103a-103b, 104a-104b, 241a-241b, 243a-243b; Phys. 102a-102b or 103a-103b, 180a-180b; Math. 125a-125b, 223. With the assistance of a major adviser, the student must select a minimum of thirty units, including the above courses and at least eight units of upper-division cell. courses. Majors are strongly advised to include Chem. 480a-480b in their program.

The minor: The department has a structured split minor involving chemistry, physics, and mathematics.

Honors: The department participates in the Honors Program.

102. Fundamentals of Ecology and Evolution (4) I II (Identical with Ecol. 102)
103. Biology of Cells (4) I II (Identical with Micr. 103)
104. Organismic Biology (5) I II (Identical with G.Bio. 104)
110. Cell Biology (5) I II
320. General Genetics for Majors (4) I II (Identical with G.Bio. 320)
395. Colloquium
   a. Current Subjects in Cell Biology (1) I Open to majors only.
404. Contemporary Biology and Human Affairs (3) GC II Advances in biomedical research will be reviewed and their ethical, social and legal implications discussed. P, one course in bioc. or bio.; botany not acceptable.
410a-410b. Advanced Cell Biology (3-3) GC Regulation at the cellular and molecular levels; gene expression; nature, function, and integration of organelles and ultrastructural components of the cell. P, 103 (for majors), Chem. 243a or 480a. (410a is identical with G.Bio. 410a.)
412. Radioisotopes in Biology (3) GC I Advanced techniques in the application of radioactive tracers to problems of molecular biology; kinetics of labeling, fractionation procedures; detection systems and processing of data. 2R, 3L. P, Chem. 103b, 104b, Phys. 102a-102b.
413. Advanced Cell Biology Laboratory (2) GC I Modern lab. techniques for genetic and molecular analyses of mammalian cells in culture. 6L. P, CR 415.
428R. Advanced Microbial Genetics (3) GC II Modern concepts of microbial genetics: basic genetic theory, the molecular architecture, biosynthesis and genetic regulation of bacterial cell structure, control of growth and cell division. P, 103, Micr. 328, G.Bio. 320 or 321. (Identical with G.Bio. 428R and Micr. 428R)
428L. Advanced Microbial Genetics Laboratory (2) GC II Individual research projects within the framework of microbial genetics, with emphasis on the genetic system of Bacillus subtilis. P, CR 428R. (Identical with G.Bio. 428L and Micr. 428L)
460. Plant Physiology (4) GC I Introduction to water relations, photosynthesis, respiration, growth and development of higher plants. 3R, 3L. P, Chem. 241a, 243a. (Identical with Ecol. 460)
463. Introduction to Neurobiology (3) GC I Physiology and anatomy of invertebrate and vertebrate nervous systems. P, eight units of bio. (Identical with Ecol. 463)
464aR-464bR. Human Physiology (3-3) GC (Identical with G.Bio. 464aR-464bR)
464aL-464bL. Human Physiology Laboratory (1-1) GC (Identical with G.Bio. 464aL-464bL)
228 DEPARTMENTS AND COURSES OF INSTRUCTION

514. Supramolecular Structure (2) II Application of diffraction techniques in the study of structure and function of biological macromolecules.

530. Current Topics in Eucaryotic Gene Expression (3) II 1984-85 Detailed examination of current literature in selected areas of eucaryotic molecular biology. P, 568b or consult dept. before enrolling.

540. Advances in Mammalian Cell Biology (2) [Rpt./2] II Selected topics in mammalian cell structure and functions and its genetic control. P, 415 or consult dept. before enrolling.


563. 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, 460. (Identical with WP.M. 563)

564. Plant Growth and Development (3) II 1983-84 Selected topics in growth and development. P, 460. (Identical with PI.S. 564)

568a-568b. Nucleic Acids (3-3) 1983-84 (Identical with Bioc. 568a-568b)

612. Principles of Electron Microscopy (4) I Principles and practice of electron microscopy; specimen preparation, micrograph interpretation, and operation and maintenance of electron microscopes. 2R, 6L.

761. Methods in Cell Biology (3) I Current techniques for qualitative and quantitative studies. 9L. Open to majors only.

CHEMICAL ENGINEERING


Associate Professors William P. Cosart, Thomas W. Peterson

Assistant Professors Simon P. Hanson, Farhang Shadman

Chemical engineering is concerned with utilization and application of scientific theory and principles to develop economically sound manufacturing processes in which chemical and/or physical changes take place. The curriculum prepares the student for employment in the research, development, design and operations aspects of the chemical, petroleum, metals, plastics, food, energy and related industries.

The department offers the following degrees: Bachelor of Science in Chemical Engineering, Master of Science and Doctor of Philosophy with a major in chemical engineering.

The major requires 137 units of science, engineering and humanities—social science courses as shown in the College of Mines section of this catalog. No minor is required but opportunity for specialization is offered through a number of technical electives options.

101. Introduction to Chemical Engineering (1) I A survey of the chemical engineering process industry and the place of the chemical engineer in society.

102. Chemical Engineering Techniques (2) II Introduction to the philosophy of process synthesis and analysis as applied to the chemical engineering profession.

201. Elements of Chemical Engineering (4) I Elementary chemical engineering calculations and basic principles of energy and material behavior. P, Chem. 103a-103b, 104a-104b, Math. 125a. Rehm


204. Chemical Engineering Mass Transfer (3) I Theory and practice in the unit operations of distillation, gas absorption, extraction, drying, and filtration. P, 201, 203.

304. Chemical Engineering Operations Laboratory (3) II Lab. investigation of process equipment. A field trip is made in mid-January of the jr. year. Students will deposit travel expenses, not more than $150, with the University before trip. P, 201, 203, 204, Engl. 308.

305. Chemical Engineering Transport Phenomena (3) II Theory and calculations pertaining to fundamental transport processes. P, 201, Math. 254 or CR.
CHEMICAL ENGINEERING 229


322. Chemical Engineering Industrial Methods (2) II Practical aspects of design and manufacturing methods in the chemical process industry; management of personnel problems. P, 304. Rehm

341. Senior Project (1) II Preparation of an engineering report based on independent application of chemical engineering principles to a literature or experimental project. P, Eng. 308.

402. Intermediate Engineering Analysis (3) GC I Solution of complex chemical engineering problems utilizing both analytical and numerical techniques. P, Math. 254, Ch.E. 202, CR 204. Peterson

413. Process Control and Simulation (3) GC 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. P, CR 402.

418. Physiology for Engineers (4) GC II (Identical with Psio. 418)

419. Physiology Laboratory (2) GC II (Identical with Psio. 419)

421. Topics in Real-Time Computing (3) GC 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.

430. Chemical Reaction Engineering (3) GC I Application of thermodynamic and kinetic fundamentals to the analysis and design of chemical reactors. P, 201, 306b. Shadman

435. Corrosion (2) GC II (Identical with Met. 435)

441. Chemical Engineering Design Economics (2) GC I Economic principles associated with equipment design, preliminary process design, and capital and operating cost estimation. P, CR 442.

442. Chemical Engineering Design Principles (2) GC I Basic design principles associated with pumps, compressors, heat exchangers, reactors, and distillation columns. P, 201, 203, 304, 305, 306b, 442.

443. Chemical Engineering Plant Design (2) GC II Design project from scoping and process selection, through material and energy balances, equipment design and sizing, to economic analysis of capital cost and operating expense. P, 441, 442.


461. Chemical Process Simulation (2) GC II Use of existing large, modular computer programs for computer-aided process design and analysis; program structure, convergence accelerators and control blocks. P. 442.

465. Current Problems in Energy and Power (1 to 4) GC II (Identical with Nu.E. 465)


514. Particulate Processes (3) II 1983-84 Dispersed-phase dynamics, population balances, particle growth kinetics, birth-death functions, phase space particle distributions, suspended-phase reactors, crystallization, and comminution. Randolph

532. **Solid-Fluid Reactions** (3) I Characterization of solid structural properties; principles of heterogeneous reactions involving a fluid and a reacting solid. P, 306b and 430, or Met. 450R and 412. (Identical with Met. 532)

545. **Combustion Generated Air Pollution** (3) II (Identical with A.M.E. 545)

567. **Advanced Solar Engineering** (3) II (Identical with Nu.E. 567)

585. **Advanced Biomechanics** (3) II 1984-85 (Identical with A.M.E. 585)


589. **Energy Use: Analysis and Management** (3) I (Identical with Nu.E. 559)


696. **Seminar**
   a. Chemical Engineering (1) [Rpt./6] I II
   b. Combustion (1) [Rpt./6] I II
   c. Kinetics (1) [Rpt./6] I II
   d. Pollution Control (1) [Rpt./6] I II
   e. Crystallization (1 to 3) [Rpt./6] I II
   f. Extrusion (1) [Rpt./6] I II
   g. Biomedical (1) [Rpt./6] I II
   h. New Developments (1) [Rpt./6] I II

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**CHEMISTRY**


Associate Professors Neal R. Armstrong, Michael F. Burke, Dennis L. Lichtenberger, John V. Rund, G. Krishna Vemulpalapalli

Assistant Professors Peter F. Bernath, William M. Hetherington, Jeanne E. Pemberton

Lecturer Walter B. Miller, III

The Department of Chemistry provides both general and professional training, giving a strong foundation upon which to base a career in the fields of medicine and related health sciences, in secondary education, or leading to industrial work or graduate specialization in chemistry.

The degrees of Bachelor of Science and Bachelor of Arts with a major in chemistry, and Bachelor of Science in Education and Bachelor of Arts in Education with a teaching major or minor in chemistry are offered. A Master of Arts, Master of Science and Doctor of Philosophy with a major in chemistry are also available, as is a Master of Education with a teaching major in chemistry.

The major for the B.A.: 103a-103b and 104a-104b, or 105aH-105bH; 241a-241b, 243a-243b or 245a-245b, 325, 326, 400a, 424, 480a-480b. Not less than fifteen units must be upper-division course work. Math. 125b; Phys. 102b or 103b and 180b, or 121; and S.I.E. 170 or 272 are prerequisite to courses in the major.

The major for the B.S.: 103a-103b and 104a-104b, or 105aH-105bH; 241a-241b, 245a-245b, 325, 326, 400a-400b, 424, 480a-480b, and six additional units in chem., including one 3-unit lab. course. Not less than 23 units must be in upper-division course work. It is highly recommended that the foreign language requirement be fulfilled in German or Russian, and all students are encouraged to participate in undergraduate research (499). Math. 223; Phys. 103b and 180b, or 121; and S.I.E. 170 or 272 are prerequisite to courses in the major. Twenty
units in the first two fields meet the requirements for a split minor. Other minors may be chosen with the consent of the major professor.

The teaching major includes 103a-103b and 104a-104b, or 105aH-105bH; 241a-241b, 243a-243b or 245a-245b, 325, 326, 400a, 424, 480a-480b.

The teaching minor includes 103a-103b and 104a-104b, or 105aH-105bH; 241a-241b, 243a-243b or 245a-245b, 325 or 322, 326 or 323.

Honors: The department participates in the Honors Program.

101a*-101b.** Lectures in General Chemistry (3-3) 101a: General principles and elements of inorganic chemistry. 101b: Principles of organic and biochemistry. Designed for students who do not intend to take further chem. Not to be used as prerequisite to further courses in the dept. without special permission. P, CR 102a-102b. Both 101a and 101b are offered each semester.

102a*-102b.** General Chemistry Laboratory (1-1) Introduction to lab. techniques and experiments in inorganic, organic and biological chemistry. P, CR 101a-101b. Both 102a and 102b are offered each semester.

103a-103b.* Fundamentals of Chemistry (3-3) Essential concepts and problem-solving techniques, with emphasis on chemical bonding, structure and properties, stoichiometry, kinetics, equilibria, and descriptive organic and inorganic topics. 103a: P, CR 104a; Math. 116. Both 103a and 103b are offered each semester. Honors section for 103a-103b and 104a-104b is listed as 105aH-105bH.

104a-104b.* Fundamental Techniques of Chemistry (1-1) Basic techniques in college chemistry, with emphasis on experimental methods, techniques of measurement, separation, purification, and analysis of organic and inorganic substances. P, CR 103a-103b. Both 104a and 104b are offered each semester.

105aH-105bH.* Fundamentals of Chemistry (4 to 5 - 3t to 5) 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. Lab. stresses individual studies and library research. Extra unit credit available for students pursuing optional original lab. research problem. 4R, 3 or 6L. Open to students who have had h.s. chem. and phys. and received acceptable scores on the ACT tests.

Without lab.

112.* Foundations of Science: Chemistry (3) II The classification and structure of matter and the principles of chemical reactions. 2R, 3L.

*Credit is allowed for only one of the following lecture-lab. combinations: (1) 101a, 102a, (2) 103a-103b, 104a-104b, (3) 105aH-105bH, or (4) 112.

241a-241b.** Lectures in Organic Chemistry (3-3) General principles of organic chemistry. P, 103b and 104b, or 105bH. Both 241a and 241b are offered each semester.

243a-243b.** Organic Chemistry Laboratory (1-1) Preparation, reactions, and analysis of organic compounds and an introduction to the lab. techniques of organic chemistry. 3L. Not open to B.S. chem. majors except with permission of dept. P, CR 241a-241b. Both 243a and 243b are offered each semester.

245a-245b.** Organic Chemistry Laboratory (1-1) Similar to 243a-243b. Designed for chem. majors and chemical engineers. 5L. P, CR 241a-241b.

302. Scientific Glassblowing (2) I II Methods of design and construction of scientific glass apparatus. 6L.

322.** Principles of Analysis I (2) I II Principles of modern quantitative analysis. Open to nonmajors only. P, 103b and 104b, or 105bH; CR 323.

323.** Principles of Analysis I Laboratory (1) I II Experiments in modern quantitative analysis. Open to nonmajors only. 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 105bH; CR 323 or 326.

326.** Analytical Chemistry Laboratory (2) I II Experiments in modern quantitative analysis. Designed for chem. majors. 6L. P, CR 325.

396. Proseminar

a. Reports on Current Research (1) II

400a-400b. Chemical Measurements Laboratory (2-2) GC I Lab. work in modern chemical measurements and instrumentation. 1R, 6L. 400a: P, 424 or CR; for majors, S.I.E. 170 or 272. 400b: P, 480b.

410. Inorganic Chemistry (3) GC1 Fundamentals of inorganic chemistry. P, 480a or CR.

412. Inorganic Preparation (3) II Standard inorganic lab. preparations, including coordination compounds, isomeric compounds, and compounds typifying the groups of the periodic table. 9L. P, two semesters of lab. chem. beyond the first yr.
232 DEPARTMENTS AND COURSES OF INSTRUCTION

424. ** Instrumental Analysis (3) GC II Principles of modern instrumental methods of analysis treating basic instrumentation and data acquisition, spectrochemical methods, mass spectrometry, gas chromatography, and electroanalytical and thermal methods. P, 241b, 325 or 322, Phys. 102b or 103b, 180b.

440. Qualitative Organic Analysis (3) GC II 1983-84 The systematic classification and identification of organic compounds. 1R, 6L. P, 241b, 243b or 245b, 325 or 322.

446. Organic Preparations (3) GC II 1984-85 Special experimental methods for the synthesis of organic compounds. 1R, 6L. P, 241b, 243b or 245b.

460. ** General Biochemistry (4 to 5) GC I (Identical with Bioc. 460)

462a-462b. ** Biochemistry (3-3) GC (Identical with Bioc. 462a-462b)

**Credit is allowed for one course only in each of the following groups: 101b, 241a-241b; 1026, 243a-243b, 245a-245b; 325, 322; 424; 326, 323; 460, 462a-462b.

480a-480b. Physical Chemistry (3-3) GC Fundamental principles of physical chemistry. P, 103b and 104b, or 105bH; Math. 125b; Phys. 102b or 103b or 116 or CR.

481 Biophysical Chemistry (3) GC II Topics in physical chemistry pertinent to the biological sciences, including chemical dynamics, transport processes, thermodynamics, bonding, and spectroscopy. P, 480a.


503. Intermediate Physical Chemistry (3) I General survey of physical chemistry, including thermodynamics, structure, kinetics and electrochemistry. P, 480b.

510a-510b. Advanced Inorganic Chemistry (3-3) Survey at the advanced level of the chemistry of the elements. P, 410.

512. Advanced Inorganic Preparations (2 to 4) I Modern inorganic syntheses, including instruction in the use of high pressure, temperature, and vacuum techniques and in the manipulation of unstable compounds. 6 to 12L.

517. Structural Chemistry (3) II 1983-84 Introduction to the determination of structures of complex molecules by X-ray crystallography; the evaluation of structural information; current topics in structural chemistry. 2R, 3L.


521. Advanced Instrumental Analysis (4) II Topics in spectrophotometry, emission spectrometry, chromatography, electroanalysis, principles of instrumentation and data acquisition at an advanced level. 3R, 3L. P, 424, 480b.

522. Electroanalytical Methods (3) II 1983-84 Principles of electrochemistry and electroanalysis, including topics on electrochemical equilibrium and kinetics, potentiometry, voltammetry, amperometry, coulometry, chronopotentiometry, and modern cyclic and pulse methods. P, 480b.

523. Applications of Equilibrium Principles in Analysis (3) II Mathematical description of equilibria in aqueous and nonaqueous systems; theoretical basis of analytical determinations. P, 480b.

524. Chemical Instrumentation (4) I Data acquisition and experiment control by analog and digital techniques; design of chemical instrumentation. 3R, 3L. P, 424.

525. Chemistry of Metal Chelates (3) I 1983-84 Theory underlying the application of organic reagents in chemical analysis. P, 523.


530. Radiochemistry and Radiation Detection (3) I (Identical with Nu.E. 530)

540. Organic Syntheses (3) I Organic reactions and the methods by which they are applied to synthetic problems in organic chemistry. P, 241b, 480b.


561a-561b. Introduction to Biochemical Literature (1-1) (Identical with Bioc. 561a-561b)

565a-565b. Proteins, Enzymes and Physical Biochemistry (3-3) 1984-85 (Identical with Bioc. 565a-565b)

569a-569b. Structure and Function of Biological Membranes (3-3) 1983-84 (Identical with Bioc. 569a-569b)

572. Metabolic and Hormonal Control of Cell Function (3) I 1984-85 (Identical with Bioc. 572)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>580.</td>
<td>Chemical Bonding and Structure (3)</td>
<td>An introduction to quantum mechanics, with applications to atomic structure and spectra, the nature of chemical bonding and molecular structure. P, 480b.</td>
</tr>
<tr>
<td>581.</td>
<td>Chemical Thermodynamics (3)</td>
<td>II Advanced concepts in both classical and modern thermodynamics, with particular emphasis on thermodynamics in solution. P, 480b.</td>
</tr>
<tr>
<td>582.</td>
<td>Statistical Thermodynamics (3)</td>
<td>II Introduction to classical and quantum statistical thermodynamics with application to ideal gases and simple solids; equations of state and elementary solution theory. P, 480b.</td>
</tr>
<tr>
<td>614.</td>
<td>Organometallic Compounds (3)</td>
<td>I 1984-85 Compounds containing carbon-to-metal bonds, with emphasis on those of the transition elements, and the determination of their structures. P, 410.</td>
</tr>
<tr>
<td>615.</td>
<td>Coordination Chemistry (3)</td>
<td>II 1984-85 Selected topics in the area of coordination compounds of transition metals, with particular emphasis on ligand field theory, the symmetry aspects of the spectral properties of transition metal complexes and their magnetic behavior. P, 510b or CR.</td>
</tr>
<tr>
<td>617.</td>
<td>Steroid Chemistry and Biochemistry (3)</td>
<td>I 1984-85 (Identical with N.F.S. 617)</td>
</tr>
<tr>
<td>642a-642b.</td>
<td>Polymer Chemistry (3-3)</td>
<td>1983-84 Synthesis, stereochemistry, and mechanisms of formation of high polymers. 642a: Condensation and ring-opening polymers. 642b: Vinyl polymers. P, 540. 642a is not prerequisite to 642b.</td>
</tr>
<tr>
<td>644.</td>
<td>Heterocyclic Compounds (3)</td>
<td>I 1983-84 The behavior of the more important heterocyclic systems. P, 540.</td>
</tr>
<tr>
<td>680.</td>
<td>Quantum Chemistry (3)</td>
<td>II Principles of quantum mechanics with applications to the properties of molecules. P, 580.</td>
</tr>
</tbody>
</table>
| 696.       | Seminar                                                 | a. Analytical Chemistry (1 to 3) I II  
b. Inorganic Chemistry (1 to 3) I II  
c. Organic Chemistry (1 to 3) I II  
d. Physical Chemistry and Chemical Physics (1 to 3) I II                                                                 |

CHILD DEVELOPMENT AND FAMILY RELATIONS
(See Home Economics)

CHINESE
(See Oriental Studies)

CIVIL ENGINEERING AND ENGINEERING MECHANICS

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 section of this catalog for specific undergraduate program requirements.)

Additional information relating to each of these programs may be obtained by contacting the department head.

Civil Engineering

In addition to the courses listed below, the faculty of the Department of Civil Engineering and Engineering Mechanics is prepared to offer temporary courses in the following areas, subject to faculty availability and student interest: public works planning and engineering, construction engineering, hydraulic engineering, sanitary and environmental engineering, structural engineering, soils engineering, transportation engineering, surveying and mapping, and urban planning and engineering.

Credit for these courses is offered in both civil engineering and engineering mechanics.

101. Environmental Issues (3) I II Sources and effects of pollution of the air, water, and land; legal and economic aspects of environmental quality management. Open to engineering students only.
110. Engineering Graphics (3) I II S GRD Representations and analysis of systems of orthographic projection and graphical methods used in engineering design and production, correlated with technical sketching. 1R, 6L.
121. Man and His Use of the Sea (3) I The study of the past, present and future engineering, economic, social and environmental issues raised by man's use of the sea.
151. Elementary Surveying (3) I II GRD Theory of measurements and errors; vertical and horizontal control methods; topographic, public land and construction surveys; use of surveying instruments. 2R, 3L. P, 110, Math. 118.
214. Statics (3) I II S GRD Equivalent force systems; equilibrium; geometric properties of areas and solids; friction; virtual work; potential energy. P, Phys. 103a. Math. 125b.
300. Civil Engineering Projects (3) I II Individual design study in fields of the student's major emphasis or completion of a research and a development project under direct staff supervision.
307. Contracts, Specifications and Engineering Relations (2) I II Law as applied to engineering contracts and contract documents, including specifications.
320. Fluid Mechanics Laboratory (1) I I Open-channel and closed conduit studies of basic flow phenomena, with emphasis on continuity, conservation of momentum, and exchange of energy; measurement and analysis of turbulence; calibration of flow-measuring devices. One 3-hr. lab. weekly. P, 214; CR 321; A.M.E. 232.

336. Structural Design in Steel (3) I I CDT Structural design in steel and other metals, including design of tension, compression and flexural members; design of welded, riveted and bolted connections; introduction to plastic design. P, 330, CR 331.

337. Structural Design in Concrete (3) I II S Structural design in reinforced concrete; introduction to prestressed concrete design; design in timber. 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, 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. P, 151, 214, S.I.E. 265.


380. Materials Laboratory (2) I II Mechanical properties of concrete, concrete aggregates, steel, and other metals as engineering materials. 1R, 3L. P, 217, Chem. 103b.

394. Practicum a. Junior Field Trip (1) II Students are urged to take this trip in the jr. yr. Fee, not to exceed $40, determined and collected when trip is arranged.


422. Irrigation Engineering (3) GC II (Identical with S.W.E. 422)

423. Hydrology (3) GC I Elementary treatment of major topics in hydrology, including rainfall, evaporation, groundwater, and runoff. Field trips. P, 321. (Identical with Hydr. 423)

424. Hydraulic Engineering Design (3) GC II Hydraulic criteria for design of bridges, stilling basins, gates, open-channel distribution and collection systems; sediment-transport effects; pipe networks and pumping systems. P, 322.

432a-432b. Advanced Structural Engineering Design (3-3) GC Advanced problems in the analysis and design of concrete, steel, and wood structures; yield line and plastic design methods, lateral and vertical load analysis of bridges and multistory buildings; introduction to seismic design; use of structural computer programs. 432a: P, 336. 432b: P, 337.

440. Foundation Engineering (3) GC II Site and subsurface investigations, design of footings and pile foundations, retaining walls, cofferdams and sheet piles, slopes; construction problems. P, 340.

452. Engineering Surveys (3) GC 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. P, 151.

454. Photogrammetry (3) GC I II Reading, interpretations, and geometric characteristics of aerial photographs; stereoscopic principles and their application in the production of planimetric and topographic maps. 2R, 3L. Field trips. P, 151, Math. 125a.

456. Boundary Surveys and Legal Principles (3) GC II Boundary control; property descriptions; public land surveys; writing and interpretation of deeds; subdivision standards; legal aspects; rights, duties and liabilities of land surveyors. Field trip.


463. Traffic Engineering (3) GC I Methods for the efficient and safe operation of transport facilities through analysis of capacity, safety, speed, parking, and volume data. P, 360.

464. Airport Planning and Design (3) GC II Location, analysis and design of airports and airport facilities, including aircraft characteristics, site selection, configuration, capacity, access and terminals. Field trips. P, 360.
236 DEPARTMENTS AND COURSES OF INSTRUCTION

465. **Urban Systems Modeling** (3) GC 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.

471. **Water Quality Control** (3) GC II Aspects of water quality maintenance; physical, chemical and biological factors in water and wastewater treatment and natural purification. 2R, 3L. Degree credit available for nonmajors only. P, Chem. 103b. (Identical with Hydr. 471 and Ws.M. 471)

477. **Environmental Impact of Energy-Related Systems** (3) GC II Effects of energy development and utilization; legal and technological approaches to environmental quality management. (Identical with A.M.E. 477, 477, and Nu.E. 477)

479. **Environmental Air Pollution** (3) GC I Air pollution sources and pollutant control, with special consideration of the meteorological, urban, rural, industrial, and health aspects.

481. **Construction Methods** (3) GC II Introduction to estimating; construction planning and methods; selected topics of fundamental importance in construction, including the Critical Path Method and PERT. 2R, 3L. P, 336 or 337, 380 or CR.

486a - 486b. **Occupational Safety and Health** (3-3) GC (Identical with O.S.H. 486a - 486b)

507. **Drainage of Irrigated Lands** (3) II (Identical with S.W.E. 507)

532. **Advanced Strength of Materials** (3) II Advanced problems in the analysis of deformable solids including curved beams, nonprismatic beams, torsion of thin-walled members, beam on elastic foundation, inelastic deformation.

536. **Advanced Computer Graphics in Engineering** (3) I (Identical with A.M.E. 536)

544. **Soil Stabilization** (3) II Purpose of soil stabilization; stabilization using mechanical means, cement, asphalt, lime, salt and resins; factors governing stabilization techniques; special application. P, 340.

547. **Seepage and Earth Dams** (3) I 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.


561. **Structural Design of Flexible Pavements** (3) Analysis of loads, stresses, material characteristics, and environmental factor for the theoretical and practical design, construction and maintenance of pavements. P, 340, 361.

562. **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.


565a - 565b. **Principles of Transportation Planning** (3-3) 565a: History and concepts of transportation and its planning in relation to urban development. 565b: Theory and application of transportation planning techniques. 2R, 3L. (Identical with U.PI. 565a - 565b)

566. **Highway Geometric Design** (3) II 1984-85 Study of geometric elements of streets and highways, with emphasis on analysis and design for safety. P, 463.


575. **Microbiology of Sanitary Engineering** (3) I Microbiological concepts and their application to natural and engineered systems for upgrading water and wastewater quality. 2R, 4L. P, 370.

576. **Chemistry of Sanitary Engineering** (3) I Chemistry of natural waters and water and wastewater treatment processes. Chemical thermodynamics, equilibria and kinetics are applied to environmental systems. Lab. emphasizes analytical methods. 2R, 3L. P, 370.

596. **Seminar**
a. Sanitary and Environmental Engineering (1 to 3) II


621. **Sediment Transportation** (2) I 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) II 1984-85 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) II 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.

640. Advanced Soil Mechanics (3) I Site investigation and in situ testing; shear strength of sands and clays; interpretation of laboratory test results; consolidation theory: one-dimensional infinitesimal and finite strain; slope stability. P, 340.


642. Engineering Characteristics of Soil (3) II Advanced theories of mechanical and physical aspects of soil. Lab testing including index parameters, compaction, consolidation, shear strength; introduction to critical state and plasticity aspects. 1R, 6L. P, 340.


645. Seepage and Earth Dams (3) I Principles governing the flow of water through soils and their application in the design of earth dams; methods of earth dam design, including earthquake design; theory of wells and groundwater flow. P, 340.

647. Advanced Water and Wastewater Analysis (3) II Advanced chemical, physical and microbiological analyses as related to water and wastewater quality and advanced treatment process design. 1R, 6L. P, 371.


Engineering Mechanics

In addition to the courses listed below, the faculty of the Department of Civil Engineering and Engineering Mechanics is prepared to offer temporary courses in the following areas, subject to faculty availability and student interest: analytical mechanics, plates and shells, structural dynamics and earthquake engineering, experimental mechanics, and fluid mechanics. Credit for these courses is offered in both civil engineering and engineering mechanics.

402. Introduction to Finite Element Methods (3) GC I II (Identical with C.E. 402)

505. Continuum Mechanics (3) I Analysis of deformation, principal stresses and strains, velocity fields, and rate of deformation; constitutive and field equations; elementary elasticity.

539. Advanced Structural Mechanics (3) II (Identical with A.M.E. 539)

603. Elasticity Theory and Application (3) I General three-dimensional equations of elasticity; problems in plane stress, plane strain, extension, torsion; energy and residual (Galerkin) methods; applications to rings, beams, plates, torsion and other problems. P, C.E. 217, 302 or S.I.E. 270.

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.


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. 436.
Plates and Shells (3) I Theory and analysis of circular, rectangular and continuous plates by classical, numerical and approximate methods; introduction to in-plane forces and shells. P, C.E. 336 or A.M.E. 434.

CLASSICS

Professors Norman Austin, Head, Garnet D. Percy (Emeritus), David Soren
Associate Professors Richard C. Jensen, Thomas D. Worthen
Assistant Professor Charles T. Chamberlain
Lecturers Robert A. Burns, Donna E. Swaim

The cultural environment of Greece and Rome is the subject matter taught in the Classics Department. Courses are given in the languages, literatures (in the original and in translation), and in the development and heritage of these civilizations.

A degree of Bachelor of Arts is available with majors in Greek, Latin, and classics. Programs leading to a Bachelor of Arts in Education and a Master of Education with a teaching major in Latin are also offered. In addition, a number of the department’s courses may be used toward a supporting minor in other graduate programs.

The major in Greek: 34 units, including 102a-102b, 202a-202b, 250a-250b, and nine units of 402.

The major in Latin: 34 units, including 101a-101b, 201a-201b, 250a-250b, and nine units of 401.

The major in classics: 34 units, including 101a-101b or 102a-102b, 201a-201b or 202a-202b, six units in ancient history, and at least twelve upper-division credits in classics. The program of study should be planned in consultation with an adviser.

The supporting minor should be chosen in consultation with the major adviser.

The teaching minor: 25 units in Latin, including 101a-101b, 201a-201b, and nine units of 401.

Honors: The department participates in the Honors Program.

101a-101b. Elementary Latin (4-4) The Latin language presented as far as possible from the point of view of its influence on English.

102a-102b. Elementary Classical Greek (4-4) Introduction to ancient Greek for students of the Bible and of the Hellenic authors.

103a-103b. Elementary Modern Greek (4-4) Development of skills in conversation, composition, and reading, with emphasis upon audiovisual practice.

115. The Study of English Words (3) I Vocabulary building through the systematic study of English words derived from Latin and Greek.

120. Introduction to the Greek Bible (3) S Grammar, syntax and vocabulary of Koine Greek, textual criticism of the Bible, concentration on the New Testament. Open to nonmajors only.

126. Mythology (3) I II The myths, legends, and folktales of the Greeks and other peoples of antiquity. (Identical with Reli. 126)

201a-201b. Intermediate Latin (4-4) Reading and discussion of selected passages from Virgil’s Aeneid or other texts; grammar, some composition. P, 101b or two yrs. of h.s. Latin.

202a-202b. Intermediate Greek (4-4) Selections from classical Greek chosen in accordance with the student’s needs and interest. P, 102b.

203a-203b. Intermediate Modern Greek (4-4) Pronunciation, grammar, and vocabulary of modern Greek; development of skills in conversation, composition, and reading; emphasis on aural-oral skills. P, 103b.

204a-204b. The Ancient World (3-3) (Identical with Hist. 204a-204b)

240a-240b. Introduction to Classical Archaeology (3-3) 1983-84 An archaeological history of Greece and Italy through the study of major excavations and monuments, with emphasis on cultural developments and relationships, and methods of excavation and exploration. 240a is not prerequisite to 240b. (Identical with Anth. 240a-240b)
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 New Testament. 250b: Roman literature of the Republican period, and the Silver Age, to the end of the pagan period. 250a is not prerequisite to 250b.

310. **Classical Art** (3) II 1983-84 (Identical with Art 310)

345. **Ancient Cosmology** (3) I Investigation of ancient Greek concepts of the universe, with emphasis on theories regarding nature, matter, and the soul.

346. **Classical Drama** (3) I Survey of tragedy and comedy in ancient Greece and Rome.

347. **Love in Classical Literature** (3) II Love as a theme in Greek and Roman literature of various genres: lyric, tragedy, comedy, philosophy, satire, and romance.

401. **Latin Reading Course** (3) [Rpt.] GC I II Extensive readings in one of the following: epic, lyric, drama, history, oratory, satire, epistles, novel, philosophical, technical or medieval literature. P, 201b.

402. **Greek Reading Course** (3) [Rpt.] GC I II Extensive readings in major Greek authors including Homer, Plato, and the historians and dramatists. P, 202b.

403a-403b. **History of Greece** (3-3) GC (Identical with Hist. 403a-403b)

404a-404b. **History of Rome** (3-3) GC (Identical with Hist. 404a-404b)

411. **Etruscan and Roman Art and Architecture** (3) GC (Identical with Art 411)

417a-417b. **Sanskrit Grammar and Texts** (3-3) GC 1984-85 (Identical with Or.S. 417a-417b)

428. **History of Byzantium** (3) GC II (Identical with Hist. 428)

443. **The Archaeology of Preclassical Greece** (3) GC History, art and culture of Neolithic and Bronze Age Greece through the study of archaeological excavations. P, six units or CR in clas., hist. or anth. (Identical with Anth. 443)

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**CLINICAL ENGINEERING**

*(See College of Engineering section of this catalog)*

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**CLOTHING, TEXTILES AND INTERIOR DESIGN**

*(See Home Economics)*

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**COMPUTER ENGINEERING**

*(See Electrical and Computer Engineering)*

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**COMPUTER SCIENCE**

Professors Ralph E. Griswold, Webb C. Miller
Associate Professors David R. Hanson, Head, Gregory R. Andrews, Peter J. Downey, Christopher W. Fraser
Assistant Professors Timothy A. Budd, Gary M. Levin, Eugene W. Myers, Richard D. Schlichting

The Department of Computer Science offers courses in programming languages and systems, theory of computation, computer architecture, program development, and numerical software. The department's programs prepare graduate students for the design and development of computer systems and applications, and for industrial or academic research in computing.

The department offers graduate programs leading to the Master of Science and Doctor of Philosophy with a major in computer science. For admission and degree requirements, consult the *Graduate Catalog*. 
The teaching minor. Eighteen units, including 115, 227, 237, 327, 342, and one 400-level course.

111. **Introduction to Computing** (3) I II (Identical with M.I.S. 111)

115. **Computer Science Principles** (3) I II S CDT 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. Credit allowed for this course or M.I.S. 111, but not for both. P, Math. 116.

121. **Business Programming** (3) I II (Identical with M.I.S. 121)

122. **Scientific Programming** (3) I II Design and construction of computer programs using the FORTRAN programming language; the concept of algorithm; problem solving techniques and their realization in the FORTRAN language. P, 111 or 115, and Math. 123. (Identical with Math. 122 and M.I.S. 122)

123. **Nonnumerical Programming** (3) I II The SNOBOL4 programming language; character and string data, pattern matching, pointers and structures, programming techniques and applications. P, 115. (Identical with M.I.S. 123)

227. **Program Design and Development** (3) I II Programming using a high-level language such as Pascal. Several medium-sized projects will be required, with emphasis on program design using stepwise development. P, 115.

237. **Introduction to Assembly Language Programming** (3) I II Introduction to digital computers; elementary hardware concepts; machine operations and instructions; assembly language concepts; programming in assembly language. P, 115 or 122.

301. **Program and Data Structures** (3) I II (Identical with M.I.S. 301)

304. **Advanced Scientific Programming** (3) S Structured program development in scientific computing; roundoff error, programmed memory management, disk and tape handling, plotting, interactive command languages, documentation. P, 122.

327. **Comparative Programming Languages** (3) I II Introduction to several major high-level programming languages and their characteristics. Programming projects are required in at least four languages. P, 227 or M.I.S. 301. (Identical with M.I.S. 327)

331. **Data Management Systems** (3) I II (Identical with M.I.S. 331)

342. **Data Structures** (3) I II Mathematical preliminaries; fundamental data structures and associated algorithms, implementations and applications: stacks, queues, trees, graphs, sorting, and searching. P, 227, or CR 327, and Math. 362. (Identical with M.I.S. 342)

402. **Mathematical Logic** (3) GC II 1983-84 (Identical with Math. 402)

421. **Simulation Modeling and Analysis** (3) GC (Identical with M.I.S. 421)

422. **Mathematical Programming and Applications** (3) GC (Identical with M.I.S. 422)

430. **Software Tools** (3) GC I II Techniques for the design and implementation of programs that assist in programming: filters; file managers; editors; text processors. P, 327, 342.

443. **Theory of Graphs and Networks** (3) GC II 1983-84 (Identical with Math. 443)

452. **Principles of Operating Systems** (3) GC II Concepts of modern operating systems; concurrent processes; process synchronization and communication; resource allocation; kernels; deadlock; memory management; file systems; protection mechanisms. P, 237, CR 430.

453. **Translators and Systems Software** (3) GC I Design and implementation of translation-oriented systems programs: macroprocessors; preprocessors; assemblers; loaders; linkers; introduction to compilers and operating systems. P, 237, 430.

472. **Continuous-System Simulation** (3) GC1 (Identical with E.C.E. 472)

473. **Theory of Computation** (3) GC I II Mathematical preliminaries; finite automata, regular expressions, applications; context-free grammars, pushdown automata, Turing machines, undecidability. P, knowledge of a programming language; Math. 119 or 215. (Identical with Math. 473)

474. **Digital Logic Design** (3) GC I II (Identical with E.C.E. 474)

475a-475b. **Mathematical Principles of Numerical Analysis** (3-3) GC (Identical with Math. 475a-475b)

476. **Computer Architecture** (3) GC I II Functional overview of computer systems; interconnection of basic components; input/output; interrupts; virtual addressing; stack architecture; microprogramming; microprocessors. P, 237. (Identical with E.C.E. 476)

478. **Computational Methods of Linear Algebra** (3) GC I (Identical with Math. 478)

479. **Game Theory and Mathematical Programming** (3) GC II 1983-84 (Identical with Math. 479)

520. **Principles of Programming Languages** (3) II Global semantics of algorithmic languages, including scope of declarations, data types, retention, block structure, binding time, subroutines, coroutines, extensibility; implementation issues. P, 430.

521a-521b. **Advanced Systems Modeling and Simulation** (3-3) (Identical with M.I.S. 521a-521b)

541a-541b. **Computer-Aided Information Systems Analysis and Design** (3-3) (Identical with M.I.S. 541a-541b)

545. **Analysis of Algorithms** (3) I Time, space complexity; recurrences; algorithm design techniques; lower bounds; graph, matrix, set algorithms; sorting; fast Fourier transform; arithmetic complexity; intractable problems. P, 342, 473.

550. **String and List Processing** (3) I Data representation, pattern matching, structures. Applications in symbolic mathematics, text analysis, document formatting, cryptography, etc. P, 327, 342.

552. **Principles of Parallel Programming** (3) I Fundamental concepts and applications of parallel programs; program verification; synchronization mechanisms in programming languages; distributed processing concepts; case studies of languages; access control and information flow. P, 452.

555. **Principles of Compilation** (3) II Finite automata and lexical analysis; context-free grammars; parsers; parser generators; code generation; graph-theoretic approaches to optimization. P, 453, 473.

560. **Formal Language Theory** (3) II Basic concepts of languages and their representations; types of grammars and their relation to programming languages and automata; ambiguity and decidability questions for languages. P, 473.

571. **Digital Systems Design** (3) I II (Identical with E.C.E. 571)

573. **Microprocessors, Minicomputers and Real-Time Distributed Processing** (3) II (Identical with E.C.E. 573)

575a-575b. **Numerical Analysis** (3-3) (Identical with Math. 575a-575b)

620. **Advanced Topics in Programming Languages** (1 to 3) [Rpt./12 units] I Design, implementation, and compilation of programming languages; specific topics to be determined by current literature and faculty and student interest.

630. **Advanced Topics in Software Systems** (1 to 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** (1 to 3) [Rpt./12 units] II Design and analysis of algorithms; specific topics to be determined by current literature and faculty and student interest.

652. **Advanced Topics in Operating Systems** (1 to 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.

660. **Advanced Topics in Theory of Computation** (1 to 3) [Rpt./12 units] I Specific topics to be determined by current literature and faculty and student interest.

674. **Sequential Circuits and Automata** (3) I (Identical with E.C.E. 674)

**CONSUMER STUDIES**  
(See Home Economics)

**CORRECTIONAL ADMINISTRATION**  
(See Public Policy, Planning and Administration)

**COUNSELING AND GUIDANCE**

Professors O. C. Christensen, Roger J. Daldrup, Paul J. Danielson (Emeritus), Bill W. Hillman  
Associate Professors Philip J. Lauver, Head, Harley D. Christiansen, Richard L. Erickson,  
Gordon A. Harshman, Elizabeth B. Yost  
Assistant Professor Betty J. Newlon
The department offers professional preparation in counseling and guidance, with concentrations in elementary and secondary school counseling, classroom guidance, community program and agency counseling, career education, and student personnel work in higher education. The Master of Arts, Master of Education, Doctor of Philosophy, and Doctor of Education degrees with a major in counseling and guidance are available through the department. For admission and degree requirements, please see the Graduate Catalog.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
<th>Description</th>
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<tr>
<td>297.</td>
<td>Workshop</td>
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<tr>
<td>a.</td>
<td>Self and the World of Work (2)</td>
<td></td>
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<tr>
<td>b.</td>
<td>Student Executive Training in Higher Education (1)</td>
<td></td>
<td></td>
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<tr>
<td>c.</td>
<td>Student Assistant in College Residence Halls (1)</td>
<td></td>
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<tr>
<td>401.</td>
<td>Basic Skills in Counseling (3)</td>
<td>GC I</td>
<td>Selected counseling skills and their applications to noncounseling settings. Designed for nonmajors needing basic skills in counseling as an adjunct to other primary occupational functions.</td>
</tr>
<tr>
<td>403.</td>
<td>Principles of Adlerian Psychology (3)</td>
<td>GC I II</td>
<td>Techniques for the study of human behavior; implications for improving adult-child relationships, with emphasis on Adlerian principles.</td>
</tr>
<tr>
<td>521.</td>
<td>Techniques of Interviewing (3)</td>
<td>I II</td>
<td>Types and functions, process, and application of the interview in various settings.</td>
</tr>
<tr>
<td>401.</td>
<td>Career Education (3)</td>
<td>I</td>
<td>Concepts and goals, elements and systems of career education, with emphasis on development of materials and teaching strategies for implementing objectives in the elementary and secondary classroom. Open to nonmajors. (Identical with Elem. 531 and S.Ed. 531)</td>
</tr>
<tr>
<td>549.</td>
<td>Counseling and Guidance Laboratory (1 to 3)</td>
<td>[Rpt.]</td>
<td>Supervised observation and participation in selected counseling and guidance activities: campus, public school, and community settings.</td>
</tr>
<tr>
<td>557.</td>
<td>Methods in Marital Therapy (3)</td>
<td>II 1984-85 (Identical with C.D.F.R. 557)</td>
<td></td>
</tr>
<tr>
<td>567.</td>
<td>Law for Teachers and Student Personnel Workers (3)</td>
<td>II (Identical with Ed.F.A. 567)</td>
<td></td>
</tr>
<tr>
<td>570.</td>
<td>Counseling the Adult (3)</td>
<td>I</td>
<td>Adult crisis, midlife changes and developmental patterns; counseling techniques and intervention strategies.</td>
</tr>
<tr>
<td>571.</td>
<td>Counseling Women (3)</td>
<td>II</td>
<td>Examination of the counseling needs of contemporary women and current types of intervention designed to meet these needs. (Identical with W.S. 571)</td>
</tr>
<tr>
<td>581.</td>
<td>Human Relations Training (3)</td>
<td>GC I II</td>
<td>Interdisciplinary human relations training lab. for assessment and development of communication and interpersonal skills. Applications in the home, business, educational and community settings. (Identical with Ed.F.A. 581)</td>
</tr>
<tr>
<td>597.</td>
<td>Workshop</td>
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<tr>
<td>b.</td>
<td>Classroom Group Guidance (3)</td>
<td>I S</td>
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<td>c.</td>
<td>Self-Management Techniques (3)</td>
<td>S</td>
<td></td>
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<tr>
<td>j.</td>
<td>Anger, Depression and Guilt (3)</td>
<td>S</td>
<td></td>
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<tr>
<td>601.</td>
<td>Foundations of Counseling (3)</td>
<td>I II</td>
<td>Relationship and contributions of various fields to the work of the counselor at all levels, in current and historical perspective; derivation of principles and objectives: integrated lab. experience in selected settings. Open to majors only.</td>
</tr>
<tr>
<td>602.</td>
<td>Foundations of Student Personnel Work in Higher Education (3)</td>
<td>I</td>
<td>Orientation to student personnel work in colleges and universities; interdisciplinary foundations; professional aspects; integrated lab. experience in selected campus settings. (Identical with H.Ed. 602)</td>
</tr>
<tr>
<td>607.</td>
<td>The College Student (3)</td>
<td>I</td>
<td>Characteristics of the college student; interactions with campus environmental influences; developmental and normative trends. (Identical with H.Ed. 607)</td>
</tr>
<tr>
<td>617.</td>
<td>Student Personnel Services in Higher Education (3)</td>
<td>II</td>
<td>Student personnel services; purposes; procedures; representative programs; current trends. (Identical with H.Ed. 617)</td>
</tr>
<tr>
<td>622.</td>
<td>Appraisal of the Individual (3)</td>
<td>I II</td>
<td>Methods of appraising and reporting individual behavior, with emphasis on nonpsychometric data. Open to majors only.</td>
</tr>
<tr>
<td>623.</td>
<td>Testing in Counseling (3)</td>
<td>I II</td>
<td>Evaluation and selection of psychological tests for guidance; use of psychometric data in counseling. Open to majors only.</td>
</tr>
<tr>
<td>631.</td>
<td>Career Counseling (3)</td>
<td>I II</td>
<td>Theories of vocational development; types, sources, and use of occupational and educational information in career counseling and decision making. P, 601 or CR.</td>
</tr>
<tr>
<td>644.</td>
<td>The Counseling Process (3)</td>
<td>I II</td>
<td>Introduction to theories of counseling; collation and interpretation of counseling data; the counseling process: study of cases. P, 601, 622.</td>
</tr>
</tbody>
</table>
645. **Theories of Counseling** (3) II Rationale, development, and research underlying major counseling theories. P, 631, 644.

647. **Premarriage and Marriage Counseling** (3) I II Contemporary issues, concepts, and procedures in premarriage and marriage counseling. P, 581, 622.

648. **Procedures in Family Counseling** (1 to 3) I II Theory and process in family counseling; problem solving techniques applied to parent-child conflict; lab. experience. P, 403.

649. **Procedures in Marriage Counseling** (3) I II Application of counseling theory and techniques to the diagnosis of marital relationship and strategies for behavior change. P, 403, 601, 622.

661. **Management of Pupil/Student Personnel Programs** (3) II Services in public schools and/or post-secondary institutions. Area of individual student concentration will depend upon anticipated level of application. P, 12 units of coun.

682. **Group Techniques** (3) I II Group techniques and underlying theories; applications in schools and agencies; interrelationship of group and individual approaches in counseling and related programs. P, 622, 601 or CR.

693. **Internship**
   a. Counseling (1 to 9) [Rpt.] I II
   b. Student Personnel Services (1 to 9) [Rpt.] I II
   c. Career Guidance (1 to 9) [Rpt.] I II

694. **Practicum**
   P, 24 units of counseling courses. Supervised practice is offered on the basis of need and demand in the following areas:
   a. Elementary School Counseling (1 to 9) [Rpt.] I II
   b. Secondary School Counseling (1 to 9) [Rpt.] I II
   c. Higher Education Counseling (1 to 9) [Rpt.] I II
   d. Agency Counseling (1 to 9) [Rpt.] I II
   e. Family Counseling (1 to 9) [Rpt.] I II
   f. Group Counseling (1 to 9) [Rpt.] I II
   g. Marriage Counseling (1 to 9) [Rpt.] I II
   h. Career Counseling (1 to 9) [Rpt.] I II

795. **Colloquium**
   b. Professional Practice (1 to 3) [Rpt.] I II
   c. Counselor Education and Supervision (1 to 3) [Rpt.] I II
   d. Counseling Theory (Theory varies) (1 to 3) [Rpt.] I II
   f. Career Development (1 to 3) I II

**CRIMINAL JUSTICE ADMINISTRATION**
*See Public Policy, Planning and Administration*

**DANCE**
*See Physical Education*

**DIETETICS**
*See Nutrition and Food Science*

**DISTRIBUTIVE EDUCATION**
*See Business and Career Education*
244 DEPARTMENTS AND COURSES OF INSTRUCTION

DRAMA

Professors Robert C. Burroughs, Head, Irene F. Comer (Emeritus), Robert A. Keyworth (Emeritus), Peter R. Marroney (Emeritus)
Associate Professors Harold W. Dixon, J. Michael Gillette, Rosemary Gipson, Peggy Kellner, William A. Lang, Jeffrey L. Warburton
Assistant Professors Jerry D. Allen, Richard T. Hanson, Dianne J. Winslow

The Department of Drama offers the following degrees: Bachelor of Fine Arts with a major in drama production with options available in acting/directing, design/technical production, and theatre specialist; Bachelor of Fine Arts with a major in drama education; Bachelor of Arts in Drama with a major in dramatic theory; Master of Arts and Master of Fine Arts.

The department participates with the School of Music and the dance program of the Department of Physical Education in providing course work for the musical theatre option. Also, in cooperation with the Department of Radio-Television, course work is offered for the cinema option. Both options are available within the Bachelor of Fine Arts, major in general fine arts studies. For additional information concerning these options, see the Faculty of Fine Arts section of this catalog.

Drama core curriculum: All undergraduate majors in the department require the same curricular core. In addition to the group units required, as described under the Bachelor of Fine Arts or Bachelor of Arts in the Faculty of Fine Arts section of this catalog, the following lower division requirements must be met: Dram. 105, 106, 111, 112, 113, 115, 116, 117, 118, 120, 140a-140b, 149, 151, 220, 221, 222, 223, 224, 225 and 245.

The requirements for the various programs are listed below.

Bachelor of Fine Arts (Major in drama production): The Bachelor of Fine Arts is a pre-professional training program for those students interested in a career in theatre in one of the following: performance, production, or teaching areas.

Acting/directing option: admission is by interview and audition at the completion of the drama core curriculum at the end of the sophomore year. The following requirements must be met: Dram. 250, 251, 305, 306, 430, 440a-440b, 449, 451, 452, 455, 475; 4 units from 497; 6 units of drama literature; 4 units selected from Ph.Ed. 112a, 112c, 132a, 132c, 132d, 143a, 143c, 152a, 152c, 175; one course selected from Sp.H. 260 or 367 or Sp.C. 467; G.Bio. 159a or 159b; and one course from Mus. 103 or 111a or 180v or -205. At least 18 units in the major must be taken in residence. Minimum total units required for a degree with this option — 125.

Design/technical production option: admission is by portfolio review and interview at the completion of the drama core curriculum. The following requirements must be met: Dram. 415, 416, 420, 421, 423, 424, 425, 427, 429, 440a-440b, four units selected from 497a, 497b, 497c, 497d, or 497e, and 6 units of dramatic literature. At least 18 units in the major must be taken in residence. Minimum total units required for a degree with this option — 125.

Theatre specialist option: admission is by interview with supporting documents and completion of the drama core curriculum. Upper-division course work must be planned at the beginning of the undertaking of a declared specialty with an academic advisor. This option offers the student the opportunity to design a specific curriculum in consultation with a departmental faculty advisor. The course of study may not substantially parallel that offered in any other departmentally administered degree program. The following requirements must be met: Dram. 440a-440b, 18 units of drama courses, and 6 units of dramatic literature. At least 18 units in the major must be taken in residence. Minimum total units required for a degree with this option — 125.
Bachelor of Fine Arts (Major in drama education): Students may be admitted upon completion of drama core curriculum and an interview. This major is designed for students preparing for a teaching position in the junior and senior high schools. The student must complete the following drama courses: Dram. 250, 251, 410, 455, and 456; and the following education courses: Ed.P. 311, S.Ed. 225, 329, 330, 338t, 435, 493a, and 494b. A teaching minor is not required, but those students anticipating employment in areas where a teaching minor might be advantageous should consult with their advisor. At least 18 units in the major must be taken in residence. Minimum total units required for the degree with this major — 125.

Bachelor of Arts in Drama (Major in dramatic theory): The Bachelor of Arts in Drama is an academic degree designed for the theatre generalist. In addition to the group units required, as described under the Bachelor of Arts in the Faculty of Fine Arts section of this catalog, and the completion of the drama core curriculum, the following requirements must be met: Drama. 440a-440b, 455, and 6 units of dramatic literature. A twenty-unit minor is also required. (See the Faculty of Fine Arts section for details.) If the minor is in a field other than the fine arts, it is recommended that additional general electives be taken in fine arts. At least 18 units in the major must be taken in residence. Minimum total units required for a degree with this major — 125.

"Teaching minor: Twenty units, including 6 units of acting, 6 units of theatre history, and 6 units of technical theatre.

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 nonmajors only.

101. Theatre Appreciation (3) I II An introduction to the art used in producing the play: directing, acting, technical production. Open to nonmajors only.

105. Voice and Movement for the Actor I (1) [Rpt./1] I Beginning voice and movement skills for the actor including the Linklater approach, phonetics, physical isolation and awareness exercises. 2S. Open to drama majors/minors and general fine arts studies majors only.

106. Voice and Movement for the Actor II (1) [Rpt./1] II Continued voice and movement skills for the actor with a new focus on stage dialects and physicalization of character. 2S. Open to drama majors/minors and general fine arts studies majors only. P, 105.

111. Stagecraft (2) I II Basic principles of the scenic process: construction and use of materials.

112. Stagecraft Laboratory (1) [Rpt./2] I II Scenic and property shop techniques and practices. P, CR 111 and 113 for majors.

113. Stagecraft Crew (1) [Rpt./2] I II S Crew work on building theatrical sets or properties for department productions. P, CR 111 and 112 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.

116. Stage Costume (2) 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.

117. Stage Costume Laboratory (1) [Rpt./3 units] I II S Costume construction techniques and shop practices. P, CR 116 and 118 for majors.

118. Stage Costume Crew (1) [Rpt./3 units] I II S Crew work involved with costume construction, wardrobe maintenance and storage. P, CR 116 and 117 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.

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. Open to drama majors and minors 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. P, 105, 149.

170. Introduction to Motion Picture Technique (3) [Rpt./1] I II S Silent motion picture production techniques. Individual and/or team projects to include completion of 3 to 5 short super 8 silent films. University provides camera, editing and projection equipment; student provides film and pays all processing and lab. charges.
171. **Intermediate Motion Picture Technique** (3) II Sound motion picture production technique. Individual and/or team projects to include completion of two short sound films. University provides equipment and editing space, students provide film, audio and/or magnetic film tape, and pay all processing costs. P, 170.

197. **Workshop**  
a. **Performance** (1 to 2) [Rpt./4 units] I II S

200. **Principles of Lighting Design** (2) I Function and qualities of light; typical applications in theatre, dance, television, motion pictures, architecture and interior design.

205. **Musical Theatre** (2) [Rpt./1] I S American musical theatre: its origins, development and influences. Practical applications. 1R, 2S.

220. **Stage Lighting** (2) Studies in stage lighting equipment, procedures, and design techniques.

221. **Stage Lighting Laboratory** (1) [Rpt./2] I II S Stage lighting techniques and shop practices. P, CR 220 and 222 for majors.

222. **Stage Lighting Crew** (1) [Rpt./2] I II S Crew work on theatrical stage lighting productions. P, CR 220 and 221 for majors.

223. **Scene Design** (2) I II Basic principles of scenic design.

224. **Scene Design Laboratory** (1) [Rpt./3 units] I II S Scene painting techniques and shop practices. P, CR 223 and 225 for majors.

225. **Scene Design Crew** (1) [Rpt./3 units] I II S Crew work involved with painting and decorating sets for department productions. P, CR 223 and 224 for majors.

245. **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.

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, 106, 151.

251. **Acting IV** (3) II Non-realistic styles, including expressionism, absurdism and the contemporary avant-garde; work with select exercises in both representational and presentational modes. Analytical skills, scene performance and critique. 2R, 2S. P, 250.

270a-270b. **History of International Cinema** (3-3) Historical and critical survey, with examples, of motion pictures both as a developing art form and as a medium of mass communication. 2R, 3L.

305. **Voice and Movement for the Actor III** (1) [Rpt./1] I Intermediate voice and movement skills for the actor including standard stage speech and period manners and movement; emphasis on Shakespearean style. 2S. Open to majors only. P, 251, audition.

306. **Voice and Movement for the Actor IV** (1) [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. 2S. Open to majors only. P, 305.

338t. **Teaching of Theatre Arts** (3) II Carries credit in ed. only. (Identical with S.Ed. 338t)

410. **Creative Drama** (3) GC I Principles and procedures of improvisation, role-playing, creative playwriting techniques, and program development in creative dramas applicable to the elementary and secondary school levels. P, twelve units of dram. or ed.

412. **Theatre for Children** (3) GC II Principles and techniques of selecting plays, playwriting, directing, designing and producing theatre for children. 2R, 3L. P, twelve units of dram. or ed.


416. **Theatre Graphics III** (2) GC II Advanced practical color theory in pigment and light, scenographic rendering mediums and techniques. P, 120.

420. **Advanced Lighting Design** (3) GC II Special problems, practice and trends in designed light for theatrical productions. P, 220.

421. **Lighting and Sound Technology** (3) GC II Applied theory and techniques associated with sound system and visual effects in the theatre. 2R, 3L.

423. **Scene Painting** (3) GC I Techniques and methods of scenic painting.


425. **Advanced Stagecraft** (3) GC I Advanced studies in scenic construction methods and techniques. P, 111.

427. **Advanced Stage Costume Construction** (3) GC II Advanced techniques in costume construction, including period pattern design, cutting and draping techniques. P, 116.

430. **Stage Management (2)** GC I
Principles and techniques of stage management, practical applications, problems and analysis of stage managing. P, 111, 151.

431. **Theatre Publicity and Box Office (2)** GC I
Publicity, press releases, sales, advertising, display techniques, subscription procedures. P, twelve units of drama.

432. **Theatre Management (2)** GC II
Amateur, educational and professional theatre organization and management; theatrical contracts, professional unions and representative organizations. P, twelve units of drama.

440a-440b. **History of the Modern Theatre (3-3)** GC
Major developments in theatrical art from 19th-century realism to the theatre of the present. P, 140a-140b.

449. **Acting V (3)** GC I
Intensive study of classical acting styles with emphasis on Shakespeare. Individual and group performance. 2R, 2S. P, 251 and audition.

451. **Acting VI (3)** GC II

452. **Acting VII (3)** GC I [Rpt./1]
Audition material, techniques and research into problems of a professional career in the theatre, television, motion pictures and related fields. 2R, 2S. P, 305, 449.

453. **Acting VIII (3)** GC II
Intensive scene study and character analysis. Survey and review of major modern acting theories and techniques. 2R, 2S. P, 452.

455. **Directing I (3)** GC I
Basic techniques of stage directing including play analysis, director-actor communication and technical problems of movement, composition, picturization and blocking. 2R, 2S.

456. **Directing II (3)** GC 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.

460a-460b. **Writing for Stage and Screen I (2-2)** GC
Preparation and analysis of brief scripts for stage and motion pictures; staged readings and lab. productions.

475. **Screen Acting Techniques (3)** GC 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.

496. **Proseminar**
a. Portfolio (1 to 2) GC I II
b. Cinema (1 to 2) GC I II

497. **Workshop**
a. Technical Production (1 to 6) [Rpt./20 units] GC I II S
b. Costume Production (1 to 6) [Rpt./20 units] GC I II S
c. Lighting/Sound (1 to 6) [Rpt./20 units] GC I II S
d. Production Design (1 to 6) [Rpt./20 units] GC I II S
e. Scenic Design (1 to 6) [Rpt./20 units] GC I II S
f. Performance (1 to 6) [Rpt./20 units] GC I II S
g. Cinema Production (1 to 6) [Rpt./20 units] GC I II S

560a-560b. **Writing for Stage and Screen II (3-3)**
Preparation and analysis of full-length scripts for stage and motion pictures. Production possible for selected scripts.

600. **Introduction to Graduate Study of Drama (2)** 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 (4)** [Rpt./1]
Advanced study and exercise in voice and movement for the actor: relaxation, breathing, physical and vocal freedom, resonance, articulation and improvisation including the Linklater Approach, I.P.A., and Neutral Mask. 2R, 4S.

606. **Advanced Voice and Movement for the Actor II (4)** [Rpt./1]
Continued advanced study and exercise in voice and movement for the actor: standard stage speech, stage dialects, period customs, manners and movement. 2R, 4S. P, 605.

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.

642a-642b. **Studies in Theatre History (3-3)**
Concentrated study in theatre history, with major emphasis on the physical theatre, standard scholarly works, and source materials. 642a: Beginnings to circa 1660. 642b: Circa 1660 to 1975.

644. **History of the American Theatre (3)** II
Studies in the American theatre and drama. Directed and individual projects will be assigned.

650. **Experimental Theatre I (3)** I
Post-Stanislavsky experimental theatre techniques and theories of the first half of the twentieth century. Rehearsal and performance of select projects.
DEPARTMENTS AND COURSES OF INSTRUCTION


655. Advanced Directing I (3) I Techniques of analyzing and staging classical texts for a contemporary audience; use of directorial style and the adaptation of directorial philosophies with an emphasis on the staging of Shakespeare. 2R, 2S. P, 456.

656. Advanced Directing II (3) I Techniques of analyzing and staging classical texts for a contemporary audience; use of directorial style and the adaptation of directorial philosophies with an emphasis on staging the plays of Moliere, the English Restoration, and similar historical texts. 2R, 2S. P, 655.

696. Seminar  
a. Contemporary Trends (1 to 3) I II  
b. Special Topics in Acting (1 to 3) I II  
c. Special Topics in Directing (1 to 3) I II  
d. Musical Theatre Production (1 to 3) I II  
e. Directing the Full-Length Motion Picture (1 to 3) I II  
f. Film Editing (1 to 3) I II  
g. Documentary and Educational Films (1 to 3) I II  
h. Theatrical Design (1 to 3) [Rpt./3 units] I II  
  i. Period Design Style (1 to 3) [Rpt./3 units] I

EARLY CHILDHOOD EDUCATION  
(See Elementary Education and Home Economics)

ECOLOGY AND EVOLUTIONARY BIOLOGY


Associate Professors Richard E. Michod, Stephen M. Russell, Oscar G. Ward

Assistant Professors Astrid Kodric-Brown, David I. Jablonski, D. Lawrence Venable, David J. A. Vleck

The Department of Ecology and Evolutionary Biology provides general and professional education for those intending to pursue graduate study or those planning a career in fields where training in basic and applied organismic, evolutionary and environmental biology is necessary or desirable. In addition to excellent instructional facilities on campus, the department utilizes the Marine Biology Station at Puerto Peñasco, Sonora, Mexico; the Southwestern Research Station at Portal, Arizona; and the Research Ranch at Elgin, Arizona. It also operates the research vessel La Sirena for marine biological teaching and research in the Gulf of California, and curates excellent regional collections of plants and animals.

The department offers the Bachelor of Arts and Bachelor of Science degrees with a major in ecology and evolutionary biology, and the Master of Science and Doctor of Philosophy degrees with majors in ecology and evolutionary biology and in botany.

The major for the B.S. 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 102, 103, 104, 320, 434, and 435; in addition, Chem. 103a-103b, 104a-104b; Phys. 102a-102b, or 103a-103b and 180a-180b, or 110, 116, and 121; Math. 125a-125b and 223 which courses constitute the minor; at least nine additional units of upper-division courses listed by the department (chosen with the approval of a major adviser); six to ten additional units of math. or physical sci. (Exception: Only four additional units of physical sci. required if Phys. 121 option is taken.) Students interested in doing graduate or professional work in biological sciences are strongly advised to include a course in plant or animal physiology (450 or 468R and 468L), an additional eight units of organic chem. or bioc. and a course in cell. in their programs.
The major for the B.A. is designed for students with interests in natural history and the biological environmental sciences who may not wish to continue with graduate study. The requirements for the major are 102, 103, 104, 470 or 472, and any one of 480, 482, 483, 484, 485; in addition, Chem. 103a-103b, 104a-104b; Phys. 102a-102b; Math. 117e, 118, and one course from the following: 119, 123, 125a, 263 which courses constitute the minor. With assistance of a major adviser, the student must select eleven or twelve additional units listed by the department for a total of 32 units.

With foresight in course selection, a student could maintain the option of obtaining either the B.S. or the B.A. degree.

Honors: The department participates in the Honors Program.

102. Fundamentals of Ecology and Evolution (4) I II Ecological and evolutionary concepts and principles; including Darwinian evolution; genetic mechanisms of evolution; adaptation; speciation; physiological, population, and community ecology; ecosystems; behavior. 3R, 3L. (Identical with Cell. 102, G.Bio. 102 and Micr. 102)

103. Biology of Cells (4) I II (Identical with Micr. 103)

104. Organismic Biology (5) I II (Identical with G.Bio. 104)

105. Introductory Botany (3) I (Identical with G.Bio. 105)

120. Plants and Society (3) II Lecture-demonstration course on the interrelationships between plants and man; discussion of plants as a source of food, fiber, drugs and other products; plants for esthetic value, survival and energy. (Identical with G.Bio. 120)

123. Introduction to Organic Evolution (2) I Study of the origin and maintenance of the diversity of life.

130. Natural History of the Southwest (3) I Elementary biology of the common plants and animals of the Southwest; identification, distribution, ecology. 2R, 2L. Field trips.

150. Fundamentals of Marine Biology (3) II Survey of the marine environment and its biotic communities, with emphasis on the natural history of marine organisms. 2R, 3L. Weekend field trip.

320. General Genetics for Majors (4) I II (Identical with G.Bio. 320)

411. Philosophy of the Biological Sciences (3) GC I 1983-84 (Identical with Phil. 411)

412. Plants Useful to Man (2) GC S (Identical with G.Bio. 412)

413. The Plant Kingdom (3) GC S Designed for public school teachers and others wishing to become familiar with the major plant groups in our environment; collecting and growing plants. Field trip.

414. Plants of the Desert (2) GC S Designed for teachers and others wishing to become familiar with common native and cultivated plants; identification, ecology, and uses.

431. Environmental Physiology (3) GC II 1984-85 Analysis and synthesis of recent studies of the physiological responses of animals to their environments. P, 468R.


435. Evolution (3) GC I A balanced survey of the present-day concepts of the process and products of evolution, with emphasis on contrasting models and their consequences; recent techniques for the elucidation of phylogenetic pathways. P, 102, 320; Math. 125a, CR Math. 125b.

436. Plant Ecology (4) GC I (Identical with G.Bio. 436)

437. Floras of North America (2) GC II (Identical with G.Bio. 437)

438. Biogeography (3) GC II The role of historical events and ecological processes in determining the past and present geographic distribution of plants and animals. P, 102 or Geos. 225. (Identical with Geos. 438)

440R. Oceanography (2) GC II Introduction to the physical, chemical, geological, and biological dimensions of the oceans, with emphasis on their importance as biological environments. P, six units of a physical sci.

440L. Oceanography Laboratory (2) GC II Field and lab. investigations of the Gulf of California, with emphasis on research techniques important to biological oceanography. Weekend field trips. P, 440R or CR.

441. Limnology (4) GC I (Identical with W.F.Sc. 441)

442. Marine Ecology (6) GC S A field introduction to basic concepts in marine ecology with emphasis on the behavior and ecology of invertebrates and fishes and the factors affecting the diversity and community structure of marine communities. The entire course is conducted at selected sites in the Gulf of California. Consult instructor before enrolling.

250 DEPARTMENTS AND COURSES OF INSTRUCTION

456. Developmental Biology (4) GC I (Identical with Cell. 456)
458. Comparative Vertebrate Anatomy (4) GC II (Identical with V.Sc. 458)
460. Plant Physiology (4) GC I II (Identical with Cell. 460)
462. Neurobiology Laboratory (1) GC II (Identical with Cell. 462)
463. Introduction to Neurobiology (3) GC I (Identical with Cell. 463)
467R. Endocrinology (3) GC II (Identical with G.Bio. 467R)
467L. Endocrinology Laboratory (1) GC II (Identical with G.Bio. 467L)
468R. Comparative Physiology (3) GC I The responses of physiological systems to the environment; energy exchanges, respiration, thermal and osmotic regulation, locomotion, behavioral regulation, and integration of responses. P, 102, G.Bio. 104.
468L. Comparative Physiology Laboratory (1) GC I Physiological measurement techniques in laboratory and field studies. P, CR 468R.
470. Plant Diversity and Evolution (3) GC I Survey of the plant kingdom, with emphasis on comparative structure and evolution of major plant divisions. 2R, 3L. Field trips. P, four units of bio. or pl.s.
472. Systematic Botany (4) GC II Evolutionary relationships of orders and families of spermatophytes; systems of classification; collection and identification of local flora. 2R, 6L.
473. Legumes, Grasses, and Composites (2) GC I 1984-85 Identification and classification of the three largest flowering plant families of the Southwest. 6L.
475. Freshwater Algae (3) GC II 1983-84 Systematics, ecology, and evolution of planktonic and benthic species; field techniques and lab. culture. 2R, 3L. Field trips. P, four units of bio. or pl.s.
476. Marine Algae (4) GC II 1984-85 Systematics, ecology, and evolution of marine algae; field collection in marine environments and lab. culture. 2R, 6L. Field trips. P, four units of bio. or pl.s.
477. Aquatic Plants (3) GC I Identification, ecology and economic importance of freshwater aquatic plants, as related to fisheries, wildlife management, limnology, plant ecology and aquatic biology. 2R, 3L. Field trips. P, four units of bio. or pl.s.
480. Invertebrate Zoology (4) GC I (Identical with G.Bio. 480)
482. Ichthyology (4) GC I Ecology, evolution and systematics of fishes, with field and lab. emphasis on Gulf of California and Arizona fishes. 2R, 6L. Weekend field trips. P, 104. (Identical with W.F.Sc. 482)
483. Herpetology (4) GC II Systematics, ecology, and evolution of the amphibians and reptiles. 2R, 6L or field work. P, 104.
484. Ornithology (4) GC II Natural history of birds and its bearing upon the problems of animal behavior, distribution, and evolution. 2R, 2L. Field trips. P, 104. (Identical with W.F.Sc. 484)
485. Mammalogy (4) GC I Systematics, ecology, and evolution of mammals. 2R, 6L or field work. P, 104. (Identical with W.F.Sc. 485)
487. Animal Behavior (3) GC I Concepts and principles of the development, evolution, causation and function of behavior, with emphasis on the adaptiveness of behavior; discussion and films. P, eight units of bio.
488. Sociobiology (2) [Rpt.] GC I Selected topics in animal behavior; survey of recent literature, with emphasis on sociobiological theory. P, 487 or CR.
489. Parasitology (4) GC S (Identical with G.Bio. 489)
523. Cytogenetics (3) II Investigation into the structure and function of chromosomes and their role in heredity and evolution. 2R, 3L. P, 320.
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)
525. Speciation (2) [Rpt.] II Mechanisms of evolution in the formation of races and species of animals and plants. P, 320.
535. Tropical Ecology (2) II Attributes of tropical ecosystems, particularly tropical rain forests; special applications of ecological theory to tropical biotas; survey of recent literature. P, 102.
537. **Advanced Ecology (2)** [Rpt.] II Special topics in field ecology, with emphasis on study of natural habitats in the southwestern United States and northwestern Mexico. Field trips. P, 102. (Identical with W.F.Sc. 537 and Geos. 537)


542. **Marine Ecological Research (4)** I Analysis and discussion of current advances in the marine biological sciences.

547. **Ecology of Wildlife Reproduction (2)** GC II (Identical with W.F.Sc. 547)

574. **Recent Advances in Botany** (2 to 3) [Rpt.] I Recent advances in fields of botany selected on the basis of need and demand.

584. **Selected Studies of Birds** (2) [Rpt.] I Recent advances in ornithology. 1R, 3L or field trip. P, 484. (Identical with W.F.Sc. 584)


596. **Seminar**
   a. **Evolutionary Ecology** (1 to 2) [Rpt./5] I
   b. **Population Biology** (1) [Rpt./6] I II Open to majors only.

610a-610b. **Research in Ecology and Evolution** (2-2) Introduction to the research currently being pursued by faculty and staff in the dept. 6L. 610a: Three-day field trip. Open to majors only.

620. **Applications and Techniques of Human Genetics** (3) I (Identical with Gene. 620)

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**ECONOMICS**


Associate Professors David E. Pingry (Acting Head), Richard D. Auster, Michael K. Block (Public Policy, Planning and Administration), Jon B. Christianson (Public Policy, Planning and Administration), John Z. Drabicki, Donald G. Heckerman, James C. McBrearty, Ronald L. Oaxaca, Gerald J. Swanson, Ronald J. Vogel (Public Policy, Planning and Administration)

Assistant Professors Soo Hong Chew, R. Mark Isaac, Kevin A. McCabe, Sharon Bernstein Megdal, Michael R. Ranson, Stanley S. Reynolds, Fernando M.C.B. Saldanha, Carol A. Taylor, James M. Walker

Lecturers R. Bruce Billings

The study of economics is designed for those who wish to concentrate in economic analysis to prepare for careers in business, government, teaching, or private research and consulting.

A Bachelor of Arts with a major in economics is available through the College of Arts and Sciences; the degrees of Bachelor of Science in Business Administration with a major in business economics, Master of Arts and Doctor of Philosophy with a major in economics are also offered. The department participates in the Master of Business Administration and the Master of Public Administration degrees as well. Two undergraduate minors are offered: a teaching minor and a general minor for nonbusiness students. The department offers a structured honors program open to nonmajors as well as majors in economics. The program is normally entered in the junior year and consists of four courses: 332H, 361H, 422H, and an elective senior-level course such as 406H, 441H, 460H, 461H, or 481H. Additional information can be obtained by contacting the department.
The major in economics consists of a minimum of thirty units, including 201a-201b or 210, 330, 361, 439 (or Mgmt. 275, 375 or Math. 461), 332 and twelve additional upper-division units of which at least six units must be selected from 401, 405, 406, 421, 422, 441, 460, 461, 481, 482 and 484. In addition, students contemplating graduate study in economics should take, at a minimum, Math. 125a-125b, Econ. 401 and 422; additional courses in computer science, statistics and mathematics are recommended.

The major in business economics: See the College of Business and Public Administration section of this catalog.

The teaching minor: 24 units, including 201a-201b, 300 or 361, 330, three additional upper-division units in econ. and nine additional upper-division units in another soc. sci.

The nonbusiness minor consists of a minimum of twenty units in econ., including 201a-201b or 210, 300, 330 and other electives needed to meet minor requirements of the student's college.

Honors: The department participates in the Honors Program.

201a-201b. Principles of Economics (3-3) GRD 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, 1.5 units of h.s. algebra or Math. 116. Both 201a and 201b are offered each semester.

210. Survey of Economic Theory (3) I II Introduction to current economic theory. Not open to students with credit in 201a-201b. P, three units of calc.

217. Resource and Environmental Economics (3) I (Identical with A.Ec. 217)

300.* Microeconomic Analysis for Business Decisions (3) I II GRD Examination of industrial structure; theory of prices under varying market conditions; applications to business problems. Not open to students with credit in 361. P, 201b or 210.

303.* History of Economic Thought (3) I The origins and evolution of contemporary economic doctrines; classical, socialist, Keynesian and neoclassical thought in past and present social contexts. P, 201b or 210.


308.* Economic History of Europe (3) I Europe's economic origins and development; process of industrialization; economic underpinnings of modern Europe. P, 201b or 210.

313.* Economics of Futures Markets (2) II (Identical with A.Ec. 313)

330.* Money and Banking (3) I II GRD Nature of money and credit; commercial banking; Federal Reserve System; monetary theories; domestic and international monetary policies. P, 201b or 210.

332.* Aggregate Economic Analysis (3) I II Analysis of output, employment, interest rates, and the price level; the effects of these changes in monetary and fiscal variables. P, 330.


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, 201b.

383.* Labor Arbitration (3) I 1984-85 Study of the place and function of arbitration in the field of labor management relations. P, 201b.


401.* Studies in Microeconomics (3) GC II Studies in microeconomics, such as the economics of imperfect information and uncertainty, externalities and public goods, and imperfect competition. P, 361, Math. 125b.

405.* Comparative Economic Systems (3) GC II Analysis of economic policy in market (capitalist) economies and of economic ideology and planning in command (Soviet-type) economies. P, 300 or 361.

406.* Introduction to Experimental Economics (3) GC II Lab. experimental studies of economic behavior; applications to monopoly, bilateral bargaining, and competitive markets under various exchange rules; speculation, voting processes, public goods. 2R, 3L. P, 210 or 300 or 361.

409.* Economic Anthropology (3) GC II (Identical with Anth. 409)

411.* Economic Development (3) GC II Analysis of the economic development process of newly developing nations. P, 201b or 210.
421. *Introduction to Mathematical Economics (3) GC I Comparative statics; stability, classical optimization, the Kuhn-Tucker theory, calculus of variations, linear algebra, and game theory, and the application of these techniques in economic analysis. P, six upper-division units in econ.; Math. 125b.

422. *Introduction to Econometrics (3) GC 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, 439 or Mgmt. 375.


436. *Economics of Fiscal Federalism (3) GC II Study of the economics of intergovernmental fiscal relationships in a federal system inclusive of allocational, distributional, and aggregate economic effects. P, 435.

439. *Economic Statistics (3) GC II (Identical with A.Ec. 439)

441. *International Trade Theory (3) GC II General equilibrium analysis of product and input markets of international trade, tariffs, commercial policy, and growth and the welfare aspects of each. P, 300 or 361.

442. *International Economics (3) GC I Financial aspects of international trade relations and commercial policy. P, 300 or 330.


461. *Economics of Regulated Industries (3) GC II Economic analysis of the regulated sector of the American economy, including communications, transportation and energy industries; impact of existing and alternative public policies. P, 300 or 361.

476. *Natural Resource Economics (3) GC II (Identical with A.Ec. 476)

481. *Economics of Wage Determination (3) GC 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, 300 or 361.

482. *Labor and the Economy (3) GC I Macro aspects of labor economics: unemployment — causes and cures; unemployment and inflation; distribution of income. P, 300 or 361.

483. *Urban Economics (3) GC II Problems of metropolitan areas; evaluation of alternative solutions. P, 201b or 210. (Identical with BLS. 483)

484. *Regional Economics (3) GC I Location theory, regional growth, techniques of regional analysis. P, 300 or 361.

487. *Health Economics (3) GC II A study of pricing, allocation, and distribution in the health-care industry, with particular emphasis on the economic effects of current governmental policy. P, 201b.

497. *Workshop
   a. Economics Education Workshop (2) S Consult instructor before enrolling.
   b. Summer Institute on the American Economy (3) S Consult instructor before enrolling.
   c. Economic Issues for Teachers (3) S Consult instructor before enrolling.

*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. Micro-Macroeconomics (3-3) 500a: Theory of price and its application. P, Math. 117e. 500b: Theory of income, employment, interest rates and the price level. Both 500a and 500b are offered each semester. Advanced degree credit available for nonmajors only. Open only to students admitted to a BPA graduate program.


503. Development of Economic Theory (3) II Development of economic thought from ancient times to the present. P, 300 or 361.

504. Production Economics (3) I (Identical with A.Ec. 504)

512. International Agricultural Economic Development (3) II (Identical with A.Ec. 512)

513. Agricultural Price and Marketing Analysis (3) II (Identical with A.Ec. 513)


520. Theory of Quantitative Methods in Economics (3) II Introduction to the basic concepts of statistics and their application to the analysis of economic data. P, 421.
522a-522b. Econometrics (3-3) 522a: Least squares estimation, statistical inference in the linear regression model. P, 520. 522b: Simultaneous equation estimation, identification, forecasting with econometric models; Bayesian econometrics.

534. Public Finance (3) I II The study of public fiscal economics, with emphasis on relevant topics for public administration and urban planning grad. students: public goods, tax and nontax revenues, intergovernmental issues, benefit-cost analysis. P, 500a.

553. Business and Economic Forecasting (3) II Forecasting techniques used in business; assembly, interpretation and use of economic data; analysis of business conditions; examination of related environmental factors; construction of actual industry sales forecasts. P, 500b, Mgmt. 552. Advanced degree credit available for nonmajors only.

576a-576b. Advanced Natural Resource Economics (3-3) (Identical with A.Ec. 576a-576b)

597. Workshop

696. Seminar
   a. Experimental Economics (1 to 3) I II 2R, 3L P, 501b.
   b. Mathematical Economics (1 to 3) I II P, 421, 501b, 502b.
   c. Advanced Microeconomic Theory (1 to 3) I II P, 501b.
   e. Advanced Econometrics (1 to 3) I II P, 522b.
   f. Monetary Economics I (1 to 3) P, 502b.
   g. Monetary Economics II (1 to 3) I II P, 696f.
   h. Labor Economics I (1 to 3) I P, 501a; or 361 and 421.
   i. Labor Economics II (1 to 3) I II P, 501a; or 361 and 421.
   j. Public Sector Economics I (1 to 3) I P, 501a; or 361 and Math. 123.
   k. Public Sector Economics II (1 to 3) I II P, 501a; or 361 and Math. 123.
   l. International Trade and Finance I (1 to 3) I II P, 421; 361 or 501a.
   m. International Trade and Finance II (1 to 3) I II P, 300, 330, or 361.
   n. Economic Growth and Development I (1 to 3) I II P, 501a, 502a.
   o. Economic Growth and Development II (1 to 3) I II P, 501a, 502a.
   p. Industrial Organizations I (1 to 3) I P, 501a; or 361 and Math. 123.
   q. Industrial Organizations II (1 to 3) I II P, 501a; or 361 and Math. 123.
   r. Regional and Urban Economics I (1 to 3) I P, 501a; or 361 and Math. 123.
   s. Regional and Urban Economics II (1 to 3) I II P, 501a; or 361 and Math. 123.
   t. Natural Resources and Environmental Economics (3) I II P, 501a; or 361 and Math. 123.
   u. Economics of Regulated Industries (1 to 3) I II P, 501a; or 361 and Math. 123.

EDUCATION OFFICE MANAGEMENT
(See Business and Career Education)

EDUCATIONAL FOUNDATIONS AND ADMINISTRATION

Professors Robert T. Grant, Head, Henry E. Butler, Jr. (Emeritus), John H. Chilcott, Lawrence O. Nelson, T. Frank Saunders, Marsden B. Stokes (Emeritus), Herbert B. Wilson
Associate Professors Lee A. Droegemueller, Donal M. Sacken, Stanley Pogrow, Macario Saldate IV (Director, Mexican American Studies and Research Center)
Assistant Professors Arminda Fuentevilla (Director, Bilingual Programs), Marcello Medina, Jr.

The department offers programs leading to the Master of Arts and Master of Education degrees with majors in bilingual/bicultural education, educational administration, and foundations of education. The Educational Specialist degree is offered with a major in educational administration. The Doctor of Education and Doctor of Philosophy degrees are offered with majors in educational administration and foundations of education. A doctoral program in educational foundations or administration emphasizing bilingual/bicultural education is offered. Students seeking institutional recommendation for Arizona administrative certification must enroll in a graduate degree program. For admission and degree requirements, please see the Graduate Catalog.
The department offers a teaching minor in bilingual/bicultural education for prospective secondary teachers. The minor (18 to 24 units, depending upon major) must include 325, 408, 427, Span. 473, and S.Ed. 338j. Spanish Proficiency Test required for Arizona State endorsement in bilingual education.

226. Introduction to Education and Careers (3) II The educational system in the United States, including higher education and a review of careers in education in addition to the classroom teacher.

325. Foundations of Bilingual Education (3) I Introduction to the theory and practice of bilingual education. (Identical with Elem. 325 and M.A.S. 325)

350. Social Foundations of Education (3) I Introduction to the cultural and social influences on educational theory and practice.

401. Environmental Education (3) GC I II (Identical with Geos. 401)

403. Study of Exceptional Children (3) GC I II (Identical with Spec. 403)

408. English as a Second Language in Bilingual Education (3) GC I II (Identical with Engl. 408)

411. Public Administration and the Mexican American (3) GC I (Identical with P.P.P.A. 411)


429. Pedagogical Linguistics: Applied Linguistics for Language Teachers (3) GC II (Identical with Or.S. 429)

437. Issues in Indian Education (3) GC II An interdisciplinary approach to give school administrators, teachers, students, and laymen insight into the governmental, anthropological, public school, and Indian points of view relating to Indian education. (Identical with A.In.S. 437)

465. Educational Program Management (3) GC I Program planning, management, and evaluation for educationally related positions.

476. Philosophical Foundations of Education (3) GC II Introduction to philosophy as general educational theory; logic for teachers, major philosophic thinkers, value theory and epistemology.


489. Anthropology and Education (3) GC I II The application of anthropological theory and methodology to education. (Identical with Anth. 489)

508. Bilingual Reading (3) I (Identical with Rdng. 508)

540. Issues in Educating Mexican American Children (3) I S The application of social science theory and methodology to the issues of educating American children of Mexican heritage; examination of the research and related literature concerning the goals of education in a pluralistic society, cross-cultural education, and bilingualism.

567. Law for Teachers and Student Personnel Workers (3) II Law in the school and university setting; nature of the legal process; forces behind law and education; law and education as social processes and institutions; legal rights and responsibilities. (Identical with Coun. 567, Elem. 567, S.Ed. 567)

581. Human Relations Training (3) GC I II (Identical with Coun. 581)

601. Current Problems in Education (3) I II The problems found in current educational literature, research studies, and school reports.

603. Introduction to Educational Research (3) I II Research techniques in education, interpretation of data and the reporting of results.

604. Educational Administration in Anthropological Perspective (3) I The application of anthropological field techniques and theory to specific educational problems associated with school administration. (Identical with Anth. 604)

605. Social/Cultural Perspectives of School Administration (3) II The use of social science theory and methodology in analyzing school administration problems and solutions.

606. 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.

607. Pragmatic Philosophies of Education (3) I Intensive analysis of modern philosophies and their relationships to American educational thought; the emergence of the "pragmatic" curriculum.

610. 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.
256 DEPARTMENTS AND COURSES OF INSTRUCTION

611. History of Western Education (3) I II The historical development of western educational thought from its origins to the present.

612. History of Education in the United States (3) I II The development of American educational thought from its colonial origin to the present.

614. State School Systems and School Law (3) II Legal provisions for the government of state school systems; legal basis of local, state and federal relations in education; legal principles relating to pupils, teachers, and school administrators. P, nine grad. units in ed.

615. Public Relations for Teachers and Administrators (3) I Nature of the school community: interagency relationships, influence and use of media, public opinion polls, public relations programs.

616. General School Administration (3) I Organization structures and purposes through which societal demands for education are met; administrative competencies and skills. (Identical with Spec. 616)

620. Education and the Culturally Diverse (3) I II Issues in the education of the culturally, socially, and economically diverse.

625. Educating the Bilingual Learner (3) I S Analysis of theories and practices affecting bilingual learners; historical, social, and cultural influences; relationship of theory to the characteristics and needs of the bilingual learner. (Identical with M.A.S. 625)

647. The Principalship (3) I S Functions and activities of building-level administrators, with emphasis on instruction, staff development, student services, evaluation, and operational services. (Identical with Elem. 647 and S.Ed. 647)

648. The Superintendency (3) I II Functions and responsibilities of the chief school executive and central office staff, with emphasis on external and internal system relationships in policy formation and decision-making. (Identical with Elem. 648 and S.Ed. 648)

664. Theory and Behavior in School Administration (3) I S Theory in administration: patterns of theory classifications; relationship of theory to administrative function and organizational dynamics. P, nine grad. units in ed.f.a. (Identical with Spec. 664)

670. Personnel Administration in Education (3) I Composition of school staffs and the functions of various personnel; patterns and practices in school personnel management; issues, trends, and prospects in personnel management. P, fifteen grad. units in ed. 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. (Identical with Spec. 671)

672. 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, nine grad. units in school admin.

673. Planning and Maintenance of School Facilities (3) II Problems in the planning, construction, and maintenance of school facilities; visitation and evaluation of school facilities.

675. The Law and American Education (3) I The analysis of educational questions as influenced by legal principles and the case law; effect of legal provisions upon administrative and other educational decisions and upon social policy. (Identical with H.Ed. 675 and Spec. 675)

676. Supervision of the Instructional Program (3) II Purposes of instructional supervision: organization, techniques and skills for supervisory competency.

677. Higher Education and the Law (3) II (Identical with H.Ed. 677)

680. Administrative Leadership (3) I Explores the leadership process in education, including the use of power and authority in relation to existing social, organizational, and behavioral theories. P, fifteen grad. units in ed.f.a.

683. Curriculum Development and Supervision in Reading (3) I II (Identical with Rdng. 683)

684. Administration of Bilingual Education Programs (3) 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. (Identical with M.A.S. 684)
695. Colloquium
   a. Theory into Practice (1 to 4) I II
   b. The Administrator and the Organization (1 to 4) I II
   c. The Politics of Decision Making (1 to 4) I II
   f. Computer Applications in Educational Administration (1 to 4) I II
   m. Philosophy of Education (1 to 4) I II
   n. Social Foundations of Education (1 to 4) I II
   p. Evaluation (1 to 3) I II (Identical with Ed.P. 695p, which is home)

697. Workshop
   a. Collective Negotiations (1 to 3) I II (Identical with H.Ed. 697a)
   c. Educational Evaluation (1 to 3) [Rpt. /1] I II
   d. Leadership and the Mexican-American Educator (1 to 3) [Rpt. /1] I II
   n. Problems and Processes in Teacher Appraisal (1 to 3) I II (Identical with S.Ed. 697n)

794. Practicum
   b. Bilingual Education (3) [Rpt. /2] P, 15 grad. units incl. 540, 625. Open only to students majoring or concentrating in bilingual ed. (Identical with Elem. 794b and S.Ed. 794b)

796. Seminar
   a. Educational Administration (1) [Rpt. /2] I II Open to majors only.
   b. Bilingual Education (3) I

EDUCATIONAL PSYCHOLOGY

Associate Professors Sarah M. Dinham, Joseph D. Gullo, Shitala P. Mishra, Rosemary A. Rosser
Assistant Professor Edward S. Shapiro

Educational psychology includes the study of psychological processes as applied in educational settings, human learning and development, measurement, research, and statistics in education.

The department offers programs leading to the degrees of Master of Education, Master of Arts, Educational Specialist, Doctor of Education, and Doctor of Philosophy with a major in educational psychology. Specialist and doctoral programs are available leading to certification as a school psychologist. For admission and degree requirements, please see the Graduate Catalog.

301. Child Development (3) I II Human growth and development from conception through early adolescence; integration of behavioral principles into the elementary school setting.

302. Adolescent Development (3) I II Concepts of human development from early adolescence through young adulthood; consideration of major influences on physical, cognitive, and social development with emphasis within the school environment.

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.

311. Learning and Development in the Secondary School (3) I II S Psychological and developmental principles relevant to learning in the secondary school setting. Credit is allowed for this course or 310, but not for both. Open to majors only.

340. Statistics and Measurement for Research in Education (3) I II Basic concepts essential to the comprehension of research in education, including measurement principles and descriptive statistics.

400. Development Throughout Life (3) I II Life span development within the context of physical, intellectual, social, emotional, and moral development; emphasis on the dynamics of personal growth.

414. Mental Health in Education (3) GC I II The principles of mental health, with emphasis on effective personal adjustment in educational settings.

458. Psychological Measurement in Education (3) GC I II S Psychometric methods as applied to the assessment of achievement, mental ability, and attitudes.

487. Microcomputers in Education (3) GC I II S (Identical with Ed.F.A. 487)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>501</td>
<td>Advanced Child Development</td>
<td>Aspects of growth and development which influence behavior of the school age child; emphasis on current research findings.</td>
<td>P, 301</td>
</tr>
<tr>
<td>502</td>
<td>Advanced Adolescent Development</td>
<td>Major developmental issues within the adolescent years; emphasis on the importance and design of adolescent research.</td>
<td>P, 302</td>
</tr>
<tr>
<td>510</td>
<td>Psychology of the Educational Process</td>
<td>Major theories of learning, motivation, cognitive development and instructional design; emphasis on relationships between theory and practice.</td>
<td>P, 310</td>
</tr>
<tr>
<td>512</td>
<td>Individual Differences</td>
<td>Psychological, social, and biological factors producing human variation and their implications for education.</td>
<td>P, 310 or 510</td>
</tr>
<tr>
<td>517</td>
<td>Classroom Application of Behavior Modification Techniques</td>
<td>Application of behavior principles and techniques to promote learning and social development of school related behavior.</td>
<td>2R, 3L. P, 510 or CR.</td>
</tr>
<tr>
<td>540</td>
<td>Statistical Methods in Education</td>
<td>Descriptive, correlational, and inferential procedures for presenting and analyzing school and research data.</td>
<td>For students in all fields</td>
</tr>
<tr>
<td>558</td>
<td>Educational Tests and Measurements</td>
<td>Theoretical and practical application of psychometric techniques to test construction, analysis, and interpretation of test results.</td>
<td>P, 540 or CR</td>
</tr>
<tr>
<td>593</td>
<td>Internship</td>
<td>a. Research and Evaluation (1 to 6) [Rpt./2] I II Open to majors only.</td>
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<td></td>
<td></td>
<td>b. College Teaching (1 to 6) [Rpt./2] I II Open to majors only.</td>
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<tr>
<td></td>
<td></td>
<td>c. Learning and Development (1 to 6) [Rpt./2] I II Open to majors only.</td>
<td></td>
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<tr>
<td>595</td>
<td>Colloquium</td>
<td>a. Technology in Instruction (1 to 3) I II</td>
<td></td>
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<td></td>
<td></td>
<td>b. Creativity (1 to 3) I II</td>
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<td></td>
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<td>c. Preadolescent Development (1 to 3) I II</td>
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<tr>
<td>597</td>
<td>Workshop</td>
<td>a. Development of Values (1 to 3) I II</td>
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<tr>
<td>600</td>
<td>Theories of Human Development</td>
<td>History and analysis of psychological theories of human development and a comprehensive overview of major theoretical systems.</td>
<td>P, 501 or 502</td>
</tr>
<tr>
<td>610</td>
<td>Psychological Theory in Educational Practice</td>
<td>Major theories of psychological thought; strategies for utilizing such theories in educationally relevant research.</td>
<td>P, 510</td>
</tr>
<tr>
<td>612</td>
<td>Cognitive Development</td>
<td>Cognitive theory and research as they bear upon developmental and educational processes.</td>
<td>P, 501 or 502</td>
</tr>
<tr>
<td>614</td>
<td>Design of Instruction</td>
<td>Historical and theoretical bases for developing instructional design; emphasis on relationship between learning theory and instructional design.</td>
<td>P, 610</td>
</tr>
<tr>
<td>615</td>
<td>Adult Learning and Development</td>
<td>The psychodynamics of continuing development across the adult years; characteristics of adult learners.</td>
<td>P, 510 or CR</td>
</tr>
<tr>
<td>618</td>
<td>Research on Teaching</td>
<td>To acquaint educational researchers with the models, paradigms, strategies, and empirical research that are the basis for understanding how classroom teaching and learning are related.</td>
<td>P, 510, 540, 558</td>
</tr>
<tr>
<td>630</td>
<td>School Psychology</td>
<td>Roles of the school psychologist; implementing programs in the public schools; and legal and ethical issues in school psychology.</td>
<td>2R, 3L.</td>
</tr>
<tr>
<td>638</td>
<td>Behavioral Consultation in Educational Settings</td>
<td>Principles and techniques of conducting behavioral consultation in educational settings to promote learning and development of children and youth.</td>
<td></td>
</tr>
<tr>
<td>640</td>
<td>Advanced Statistical Methods in Education</td>
<td>Inferential procedures for analyzing educational data; includes nonparametric methods and introduction to multivariate and and causal procedures.</td>
<td>P, 540</td>
</tr>
<tr>
<td>646</td>
<td>Multidimensional Methods in Educational Research</td>
<td>Provides an understanding of and facility with research application of multivariate correlational techniques, such as multiple regression, discriminant function, canonical correlation, and factory analysis.</td>
<td>P, 640</td>
</tr>
<tr>
<td>658</td>
<td>Theory of Measurement</td>
<td>Advanced topics related to theoretical and practical issues in psychometrics.</td>
<td>P, 558; 640 or CR.</td>
</tr>
<tr>
<td>667</td>
<td>Research Design in Education</td>
<td>Problems in the design of experimental studies in education; statistical adaptations to specific educational problems.</td>
<td>P, 640, Ed.F.A. 603</td>
</tr>
<tr>
<td>671</td>
<td>Theories of Intellectual Assessment</td>
<td>Various theories and models of human ability and their implications for intellectual assessment.</td>
<td>P, 558 or CR</td>
</tr>
<tr>
<td>672a-672b</td>
<td>Field Experience in Intellectual Assessment</td>
<td>Supervised field experience in the administration, scoring and interpretation of various intellectual assessment devices. 672a: Wechsler Adult Intelligence Scale. 672b: Intellectual assessment techniques.</td>
<td>1R, 3L. Open to majors and minors only. Credit allowed for 672a or 672b, but not for both. P, 671 or CR.</td>
</tr>
</tbody>
</table>
673. **Individual Assessment Techniques in the Schools** (3) II Techniques for assessing personality and social behavior; practice in implementing programs derived from assessment techniques. 2R, 3L. Open to majors and minors only. P, 630; 671, 672b and 517, or CR.

674. **Psychoeducational Assessment in the Schools** (3) I Psychoeducational assessment techniques; practice in prescribing remedial programs. 2R, 3L. Open to majors and minors only. P, 630; 671, 672b and 517, or CR.

693. **Internship**
   a. Research and Evaluation (1 to 6) [Rpt./12 units] I II
   b. College Teaching (1 to 6) [Rpt./12 units] I II
   c. Learning and Development (1 to 6) [Rpt./12 units] I II
   d. School Psychology (1 to 6) [Rpt./12 units] I II

694. **Practicum**
   a. Research and Evaluation (3) [Rpt./1] I II
   b. Learning and Development (3) [Rpt./1] I II
   c. School Psychology (3) [Rpt./1] I II

695. **Colloquium**
   a. Cognition (1 to 3) I II
   b. Cross-Cultural Perspectives (1 to 3) I II
   c. Human Development (1 to 3) I II
   d. Instructional Technology (1 to 3) I II
   e. Learning and Development (1 to 3) I II
   f. Motivation for Learning (1 to 3) I II
   g. Personality and Adjustment (1 to 3) I II
   h. School Psychology (1 to 3) I II
   i. Computer Applications in Educational Research (3) II P, 540, Ed.F.A. 603
   p. Evaluation (1 to 3) I II (Identical with Ed.F.A. 695p).

696. **Seminar**
   a. Research Design and Techniques (1 to 3) I II

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**ELECTRICAL AND COMPUTER ENGINEERING**


Assistant Professors Robert A. Schowengerdt (Arid Lands Resource Sciences), Robin N. Strickland

The Department of Electrical and Computer Engineering in the College of Engineering offers the degrees of Bachelor of Science in Electrical Engineering and in Computer Engineering, and Master of Science and Doctor of Philosophy with a major in electrical engineering.

Both 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, power, communications, control, electromagnetics, and instrumentation. The computer engineering program prepares students for careers in the dynamic and rapidly expanding field of computer technology. (See the *College of Engineering* section of this catalog for specific undergraduate program requirements.)

For information regarding the clinical engineering option, please see the *College of Engineering* section of this catalog. For graduate admission and degree requirements, consult the *Graduate Catalog*. 
101. Introduction to Electrical Engineering (3) I II S CDT Introduction to selected fundamental concepts and techniques encountered in the practice of electrical engineering. P, 1½ entrance unit trigonometry or Math. 118. 2R, 3L.

207. Elements of Electrical Engineering (3) I II S CDT Introductory survey of electrical engineering, with emphasis on electric power. P, Math. 125a, Phys. 103b or 116.


271a-271b. Digital Systems and Microprocessors (3-3) S CDT 271a: Number systems and coding, logic design, sequential systems, computer organization. P, CR S.I.E. 170. 271b: Microprocessor programming, assembly language, input/output, stacks and interrupts. Both 271a and 271b will be offered each semester.

301. Electrical Engineering Laboratory (3) I II S CDT Emphasis on measurement techniques, lab. procedures, and operating principles of basic instruments. Experiments deal primarily with basic circuit and electronic concepts. P, CR 321a, 351a.


372. Computer System Hardware (3) I II S CDT Computer components and circuits, random and sequential memory devices, peripherals and interface design, case studies of computer systems. 2R, 3L. P, 371.


411. Electronic Instrumentation (1 to 3) GC II Individualized instructional units in specific areas: light, temperature, psychometry, reference electrodes, gas analysis, basic electric circuits, signal processing. P, college phys.

415. Medical Instrumentation (3) GC I Basic concepts of instrumentation and measurement; principles of transducers, operational amplifiers and instrument systems, with emphasis on biomedical measurements; lab. experiments with transducers and medical equipment. 2R, 3L. P, sr. engr.

417. Clinical Engineering (3) GC II Activities and responsibilities of clinical engineers; hospital facilities, medical equipment specifications and control, safety, management, health care, and developing and selling new ideas. Field trips. P, 208 or 351b. (Identical with A.M.E. 417)

418. Physiology for Engineers (4) GC I (Identical with Psio. 418)

419. Physiology Laboratory (2) GC I (Identical with Psio. 419)


426. Modern Filtering and Signal-Processing Techniques (3) GC I Operational amplifier circuits; basic active RC filter design; nonlinear wave shaping; analog switches; A/D and D/A conversion. P, 321b.

428. Digital Signal Processing (3) GC II Discrete-time systems and difference equations; time and frequency analysis, Z-transforms; sampling and data reconstruction; modern design of digital filters. P, 321b, Math. 322.

431. Principles of Communication Systems (3) GC I Signal analysis techniques associated with modulation and demodulation in systems such as AM, FM, and PCM, with special emphasis on digital communication. P, 321b, 351b.

434. Electrical, Magnetic and Optical Properties of Materials (3) [GC] 1 1984-85 (Identical with Met. 434)

436. Introduction to Coding Techniques (3) GC II Error-correcting codes used in modern digital communications, systems, with emphasis on hardware implementations and performance on real channels.

441. Automatic Control (3) GC I II Linear control system representation, analysis, stability and design. P, 321b.

442. Digital Control Systems (3) II Modeling, analysis, and design of digital control systems; A/D and D/A conversions, Z-transforms, time and frequency domain representations, stability, microprocessor-based designs. P, 441.

452. Solid-State Device Design (3) GC II Properties of semiconductors, impurity behavior, solid-state effects; the operation of p-n junctions, transistors, photocells, tunnel diodes, surface devices. P, 381.

455. Elementary Digital Circuit Design (3) GC II Emphasis on first-order analysis and design; integrated bipolar digital and MOS logic circuits. P, 351b.

457. Integrated Circuit Technology Laboratory (3) GC I II Theory of and experiments in diffusion, oxidation, etc.; fabrication of an integrated circuit. (Identical with Met. 457)

458. Solid-State Circuits (3) GC I Intermediate level circuitry and devices, with applications ranging from DC to the microwave and optical regions; consideration of discrete and integrated circuits. P, 321b, 351b.

459. Laser Engineering (3) GC I Introductory laser theory, device and systems engineering, including demonstrations and design problems of current importance. P, 351a, 381.

461. Energy Conversion (3) GC I Principles and operating characteristics of rotating machinery and electromagnetic transducers, single-phase and polyphase transformer operation, variable-frequency transformers. P, 321b, 381.


465. Current Problems in Energy and Power (1 to 4) GC II (Identical with Nu.E. 465)

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

472. Continuous-System Simulation (3) GC I Interdisciplinary introduction to continuous-system simulation, mainly digital; modeling, state equations, languages, sensitivity and optimization. P, 305. (Identical with C.Sc. 472)

474. Digital Logic Design (3) GC I II Truth-functional calculus, Boolean algebra, map tabular minimization, coding, synthesis of sequential circuits, selected lab. exercises. 3R, 3L. P, 271b or C.Sc. 476. (Identical with C.Sc. 474)

475. Microcomputer-Based Design (3) GC I II Design of microprocessor-based real-time test and control systems, use of development systems and emulators. 2R, 3L. P, 372.

476. Computer Architecture (3) GC I (Identical with C.Sc. 476)

477. Environmental Impact of Energy-Related Systems (3) GC I (Identical with C.E. 477)

481. Microwave Measurements (3) GC II Measurement techniques and applications of devices used in microwave research. 2R, 3L. P, 381.

482a-482b. Electromagnetic Applications (3-3) GC Special functions, boundary value problems, potential theory, transmission lines and in wave guides, resonant cavities, power flow in propagating waves, antennas and radiation. P, 381 or Phys. 415a.

483a-483b. Controlled Thermonuclear Energy (3-3) GC (Identical with Nu.E. 483a-483b)

494. Practicum
   a. Senior Practicum in Design (3) I II P, 302.

497. Workshop

501. Linear Systems Theory (3) I Techniques for the analysis of continuous and discrete-time linear systems; state variable representation, time domain and frequency domain methods; Laplace, Fourier, Z transforms.

502. Analytical Methods in Electrical Engineering (3) I Electrical engineering phenomena in terms of partial differential equations; solutions by Green's functions, eigen function expansions, and transform methods; the special functions, including Bessel and Legendre functions; application to practical analysis problems.
262 DEPARTMENTS AND COURSES OF INSTRUCTION

503. Introduction to Statistical Communication Theory, Random Processes, and Noise (3) I Probability, random variables, stochastic processes, and their relation to communications systems analysis; correlation functions and spectra, impulse noise and other simple random wave forms, noisy networks.

504. Optimal Control of Dynamic Systems (3) II 1983-84 (Identical with A.M.E. 504)

505. Modern Control Theory (3) II 1984-85 (Identical with A.M.E. 505)

515. Advanced Medical Instrumentation (3) II Concepts and design of transducers, instrumentation and measurement systems, with emphasis on biomedical technology; research project on lab. computer. 2R, 3L.

521. Network Synthesis (3) I Synthesis of active and passive low—, high—, and band—pass network functions, time and frequency domain approximation, use of optimization techniques, properties of distributed elements.

522. Active RC Filters (3) II Modern techniques for realizing active RC filters, using lumped and distributed elements and operational amplifier gain blocks; determination of sensitivity.

531. Image Processing Laboratory (3) I Introduction to hardware and software used in image processing: image sampling and display systems, principles and applications; image processing software for image enhancement and information extraction; applied problems in natural resources, remote sensing. 3R, 3L. (Identical with Opti. 531)

533. Image Processing: Devices, Systems and Applications (3) II 1983-84 (Identical with Opti. 533)

534. Advanced Electronic, Magnetic and Optical Materials (3) II 1984-85 (Identical with Met. 534)

539. Algebraic Coding Theory (3) (3) II 1983-84 (Identical with Math. 539)


552. Linear Circuit Design (3) I Design of discrete and integrated solid-state circuits for small-signal applications; flow graph analysis; DC operational and wide-band amplifier design; power amplifier design.


556. General Physical Electronics (3) I Fundamentals of plasma, solid-state and optical electronics. Specific topics include lasers, thermoelectricity, solid-state and plasma devices.

557. Advanced Solar Engineering (3) II (Identical with Nu.E. 567)

558. Photovoltaic Cells, Arrays and Systems (3) I Photovoltaic fundamentals, silicon solar cells, thin film cells, concentrators, miscellaneous cells, solar cell arrays and systems, future terrestrial applications. (Identical with Nu.E. 568)

559. Energy Use: Analysis and Management (3) I (Identical with Nu.E. 569)

571. Digital Systems Design (3) I II Computer organization, memory systems, AHPL, control unit design, microprogramming, input-output, computer arithmetic, features of large computers, time sharing. P, computer programming. (Identical with C.Sc. 571)


581. Electromagnetic Field Theory (3) I Development and application of electromagnetic field theory required in advanced studies; topics chosen to apply to many electrical engineering subdisciplines.

584. Antenna Theory (3) II 1983-84 Electromagnetic radiation and diffraction; dipoles, slots, open wave guides, and horns; apertures, reflectors, and arrays; mechanical and electronic scanning; applications to practical radar and communications problems. P, 581.

589. Atmospheric Electricity (3) II 1984-85 (Identical with Atmo. 589)
636. **Information Theory and Coding** (3) II 1984-85 Definition of a measure of information and study of its properties; introduction to channel capacity and error-free communications over noisy channels; encoding and decoding systems, with emphasis on error correcting and error detecting codes for noisy binary channels. P, 503. (Identical with Math. 636)

639. **Methods of Communication and Detection Theory and Signal Extraction** (3) II 1983-84 Communication, detection and measurement as statistical decision problems; principles of communication in the presence of noise; discussion of AM, FM, and PCM; matched filter and correlation detection; coherent detection, phase-locked loops. P, 503.

652. **Analysis and Design of Semiconductor Junction Devices** (3) II 1983-84 Analysis of physical phenomena in semiconductors, including carrier transport, injection, and lifetime, with emphasis on how these phenomena affect design and operation of junction devices. P, 556.


674. **Sequential Circuits and Automata** (3) I Analysis and synthesis of sequential circuits, partitioning and state assignment, linear sequential circuits, iterative networks, fault test generation and design automation. P, 474. (Identical with C.Sc. 674)

683. **Principles of Atmospheric Remote Sensing** (3) II 1984-85 (Identical with Atmo. 683)


693. **Internship**
   c. Clinical Engineering (2 to 3) I II P, enrollment in clinical engr. option.

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**ELEMENTARY EDUCATION**

Professors Milo K. Blecha, Head, Edward D. Brown, Joseph Fillerup, Kenneth Goodman, Yetta Goodman, Pat N. Nash, Bill J. Ranniger

Associate Professors Ruth A. Beeker, Evelyn Carswell, Vivian E. Cox, Vivian F. Dutton, Willis Horak, Carol Larson

Assistant Professors Juanita Boggs, Richard Lopez, Alice Paul

The department sponsors undergraduate programs leading to professional careers in teaching preschool, kindergarten, and all elementary school grade levels. Course work is designed to accommodate students wishing to attain proficiency in alternative programs, such as bilingual education, early childhood education, and Indian education, in addition to general elementary education.

The department offers the Bachelor of Arts in Education, as well as advanced programs leading to the Master of Education, Master of Arts, Master of Teaching, Educational Specialist, Doctor of Education, and Doctor of Philosophy degrees.

*The major* for prospective elementary teachers must include Ed.F.A. 350; Ed.P. 301, 310; Elem. 304, 322, 323, 324, 326, 327, 395a, 493a, 494; Li.S. 480.

*The major* for prospective early childhood teachers must include Ed.F.A. 350; Ed.P. 301, 310; Elem. 304, 323, 324, 326, 395a, 376, 377, 379, 493a, 494; Li.S. 480.

*The major* for prospective bilingual education teachers must include Ed.F.A. 325, 350, 427; Ed.P. 301, 310; Elem. 322, 323, 324, 327, 394, 395a, 493a; Rdnng. 406, 494a.

Elementary education majors may specialize in English language arts, science, mathematics, social sciences, fine arts, or physical education.

*Honors:* The department participates in the Honors Program.

304. **Decoding Skills in the Elementary School** (2) I II (Identical with Rdng. 304)

322. **Teaching Language Arts in the Elementary School** (3) I II The teaching of language arts in the elementary school, with special emphasis on current approaches and organization of methods and materials. P, Ed.P. 301, 310, or CR.
323. **Teaching Reading in the Elementary School** (3) I II The teaching of reading in the elementary school, with special emphasis on current approaches and organization of methods and materials. Other aspects of communicative arts are also included. P, Ed.P. 301, 310, or CR.

324. **Teaching Science in the Elementary School** (3) I II Basic course in methods of elementary school science instruction, with special emphasis on the skills and structure of science in relation to the processes of inquiry. P, Ed.P. 301, 310, or CR.

325. **Foundations of Bilingual Education** (3) I (Identical with Ed.F.A. 325)


327. **Teaching Social Studies in the Elementary School** (3) I II Methods and materials for teaching elementary school social studies. P, Ed.P. 301, 310, or CR.

328. **Language Arts in Early Childhood** (3) I II Language development of children in the primary grades; investigation of language arts materials utilized in the programs and construction of teacher-prepared materials. P, Ed.P. 301, 310, or CR.

329. **Early Childhood Education** (3) I II Curriculum practices in the primary grades. P, Ed.P. 301, 310, or CR.

376. **Kindergarten Education** (3) I II Growth and learning of 4 to 6 year-old children, and study of programs for children of these ages in creative arts, music, science, mathematics, social studies, and language arts; evaluation of and reporting pupil growth to parents. P, Ed.P. 301, 310, or CR.

395. **Colloquium**
   a. Student Teaching (1) I II Open to majors only. P, CR 493a.

403. **Study of Exceptional Children** (3) GC I II (Identical with Spec. 403)

408. **English as a Second Language in Bilingual Education** (3) GC I II (Identical with Engl. 408)

417. **Visual and Auditory Aids in Teaching** (3) GC I II (Identical with S.Ed. 417)

427. **Bilingual/Bicultural Education Curriculum Development** (3) GC I II (Identical with Ed.F.A. 427)

487. **Microcomputers in Education** (3) GC I II S (Identical with Ed.F.A. 487)

493. **Internship**
   a. Student Teaching in Elementary School (3 to 10) I II P, 322, 323, 324, 326, 327, Ed.P. 301, 310. (Early childhood education majors substitute 376, 377, and 379 for 322 and 327).

494. **Practicum**
   a. Elementary School Reading (1) I II (Identical with Rdng. 494a, which is home)
   c. Reading in School Settings (3) I II (Identical with Rdng. 494c, which is home)

497. **Workshop**
   g. Creative Arts for Native Americans (3) GC I II
   j. Elementary Techniques of Mexican Folk Crafts (2) S Offered in Guadalajara only.

526. **Methods and Materials in Bilingual Education** (3) GC I II Evaluation and study of methods and materials used in bilingual education programs. (Identical with S.Ed. 526 and Spec. 526)

531. **Career Education** (3) I (Identical with Coun. 531)

545. **Multicultural Instructional Materials Development** (2 to 4) S (Identical with S.Ed. 545)

561. **History of Children's Literature** (3) I (Identical with Li.S. 561)

567. **Law for Teachers and Student Personnel Workers** (Identical with Ed.F.A. 567)

595. **Colloquium**
   c. Language Experiences in Learning (3) II S P, 322. (Identical with S.Ed. 595c)

597. **Workshop**
   a. Evaluating the Elementary School (1 to 3) I II S P, Ed.P. 301 or 310.
   c. Elementary School Science (1 to 3) [Rpt./1] I II S P, Ed.P. 301, 310.
   e. Newspaper in the Classroom (1 to 3) I II S P, Ed.P. 301 or 310.
   f. Investigating the Environment (1 to 3) I II S Field trips. (Identical with S.Ed. 597f)
   n. Miscue Analysis in Teacher Education (2 to 3) II 1982-83
   r. Curriculum for Self Development (3) S (Identical with S.Ed. 597r, which is home)
   w. Southern Arizona Writing Project (3-9) [Rpt./12 units] I II S (Identical with S.Ed. 597w, which is home)

613. **Teaching of ESL** (3) I (Identical with Engl. 613)

616. **Coordination of Instructional Media Programs** (3) II (Identical with S.Ed. 616)

617. **Preparation of Instructional Materials** (3) I (Identical with S.Ed. 617)

620. **Science Curriculum in the Elementary School** (3) I II Trends in the science curriculum of the elementary school, with emphasis on selection of content, concepts and activities, methods of teaching, needed equipment, and community resources. Primarily for in-service, public-school personnel. P, twelve units of elem.
621. Trends and Issues in Early Childhood Education (3) I II S 1984-85 Trends and issues in contemporary early educational programs with emphasis on changing needs in the home, school and society.

623. Constructing the Elementary School Curriculum (3) I II The elementary school curriculum and its relationships; basic theories and techniques of curriculum construction discussed, evaluated and applied. P, twelve units of elem.


625. Developing the Language Arts Curriculum in the Elementary School (3) I II Trends in the language arts curriculum of the elementary school, with emphasis on linguistic theory and its application to the instructional program. P, twelve units of elem.

626. Social Studies Curriculum in the Elementary School (3) I II Trends in the social studies curriculum of the elementary school, with emphasis on selection of content, grade placement of concepts and activities, methods of teaching, needed equipment, and community resources. Primarily for in-service, public-school personnel. P, twelve units of elem.


629. Investigations in Elementary Education (3) I II Critical study and evaluation of the investigations and experimental evidence basic to the aims and instructional practices of the elementary school.

631. Curricular Studies in School Mathematics (3) II 1984-85 (Identical with S.Ed. 631)

632. Diagnosis and Remediation in School Mathematics (3) II Techniques for identifying mathematical learning difficulties and strengths; strategies for designing systematic instruction for correcting identified difficulties. 3R, 1L. P, 326.

633. Language Acquisition and Development (3) I Study of the development of language in young children, and exploration of instructional techniques to maximize that development.

634. Day Care Education (3) I History, types, goals, environments, planning for adults, standards and licensing requirements, understanding public responsibility of comprehensive child care. Field trips.

635. Applied Linguistics in Education (3) I The application to curriculum, teaching and learning of concepts from linguistics, psycholinguistics and sociolinguistics.

636. Research Methodology in Educational Linguistics (3) II Applied research methodology using insights from linguistics, psycholinguistics, sociolinguistics and information theory; cognitive and linguistic development in school and life. P, 633 or 635.

637. Application of Miscue Analysis (3) II 1983-84 Study of miscue analysis to explore the reading process, reading research, and readability, as well as to evaluate readers; applications to reading strategies and curriculum; focus on comprehension. P, 635, Rdng. 633. (Identical with Rdng. 637)

638. Written Language Development (3) I II S Exploration of the emerging writing and reading behavior of children ages 2-10 and the relationship between oral and written language development through current and original student research. P, 633.

639. Research in Language and Literacy (3) [Rpt./9 units] II New concepts and research on the nature and function of written language. P, master's degree or consult department before enrolling.

640. Applications of Language and Literacy (3) [Rpt./9 units] II Contemporary research in language development from pre-school to adult as it relates to school language programs.

647. The Principalship (3) I S (Identical with Ed.F.A. 647)

648. The Superintendency (3) II S (Identical with Ed.F.A. 648)

695. Colloquium
   a. Elementary Education (1 to 4) I II
   b. Early Childhood Education (1 to 4) I II
   e. The Instructional Program (1 to 4) I II (Identical with Ed.F.A. 695e, which is home)

697. Workshop
   b. Teacher Self-Appraisal (3) I II S (Identical with S.Ed. 697b, which is home)
   e. Future Studies: Elementary Curriculum (3) I
   f. Simulation and Gaming in the Classroom (3) I II S (Identical with S.Ed. 697f, which is home)
   h. Learning Centers in Elementary School Math (3) S
   n. Problems and Processes in Teacher Appraisal (1 to 3) I II S (Identical with S.Ed. 697n)


794. Practicum
   b. Bilingual Education (3) [Rpt./2] (Identical with Ed.F.A. 794b, which is home)
266 DEPARTMENTS AND COURSES OF INSTRUCTION

ENERGY ENGINEERING
(See Nuclear and Energy Engineering)

ENGINEERING MATHEMATICS
(See College of Engineering)

ENGINEERING MECHANICS
(See Civil Engineering and Engineering Mechanics)

ENGINEERING PHYSICS
(See College of Engineering)

ENGLISH

Professors Edgar A. Dryden, Head, Vance Bourjaily, J. Douglas Canfield, L. D. Clark, Sigmund Eisner, Dorothy V. Fuller (Emerita), Albert F. Gegenheimer, Frances Gillmor (Emerita), Byrd H. Granger (Emerita), Marie P. Hamilton (Emerita), Richard Hosley, Robert W. Houston, Billie Jo Andrew Inman, Carl F. Keppler (Emeritus), Carl H. Ketcham, John H. McElroy, Gerald M. McNiece, N. Scott Momaday, A. Laurence Muir (Emeritus), Harry F. Robins, Cecil Robinson, Paul Rosenblatt, Herbert Schneidau, Richard Shelton, Oliver F. Sigworth, Melvin T. Solve (Emeritus), Inez E. Thrift (Emerita), Peter Wild


Assistant Professors Jon Anderson, Carl Berkhout, Dhira Mahoney, Patrick O'Donnell, Jonathan Penner, Duane Roen, Alice M. Senob (Emerita), Leslie Marmon Silko, Carolyn Jan Swearingen, Charlotte Thompson, Thomas Willard, Jean Zukowski/Faust

Lecturers Edward Abbey, Christopher Carroll, Dorothy N. Fuller, Ruth M. B. Gardner, Evelyn J. Kirmse (Emerita), Gloria I. Morton, Tom C. Taylor

The Department of English offers courses in composition, language, literature, and creative writing.

Departmental programs lead 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, Master of Education, Master of Fine Arts, and Doctor of Philosophy. For further information regarding the graduate programs, please see the Graduate Catalog.
The major in English for the B.A.: 36 units of upper-division English and American literature, including 370a-370b; one proseminar (496); and one course from each of the following periods: (1) Medieval Literature (426, 427); (2) Renaissance Literature (432, 434a, 434b, 444); (3) Restoration and Eighteenth-Century Literature (446, 450a, 450b, 458a); (4) Nineteenth-Century Literature (458b, 460a-460b, 465, 466); (5) American Literature (481, 482, 483, 486). Majors are also required to take Hum. 250a as part of their college humanities requirement and to fulfill the college language requirement in a single language.

The supporting minor for majors in English: Recommended subjects are classics, drama, philosophy, modern languages, history and theory of art or of music, journalism, speech, anthropology, government, economics, history, linguistics, psychology, sociology; other subjects as may be individually justified.

The major in creative writing: 36 units, including 209, 210, 370a-370b; three units from 261, 265, 267a-267b, 380; six units from 301, 304, 309; six units from 401, 404, 409, 413, Dram. 460a-460b; three units from 473a-473b, 475, 488a-488b; and six units of upper-division literature courses in the English Department.

The minor in creative writing: 24 units, including 209, 210, 370a-370b; three units from 301, 304, 309; three units from 401, 404, 409, 413, Dram. 460a-460b; three units from 261, 265, 267a-267b, 380; three units from 473a-473b, 475, 488a-488b.

The teaching major in English (for students who are candidates for a teaching certificate in secondary education): 36 units, including 306, 370a-370b, 380, 405, 406, 410, 411, 412, 496, one course in Shakespeare, and one course in American literature. Engl. 107 and 108 may not be used to satisfy the freshman-composition requirement.

The teaching minor in English (for students who are candidates for a teaching certificate in secondary education): 21 units, including 306, 370a or 370b, 380, 406, 410, 411, and one course in American literature. Engl. 107 and 108 may not be used to satisfy the freshman-composition requirement.

The teaching major in extended English: In place of one of the minor fields listed under "Program for Secondary Education" in the College of Education section of this catalog, a student may combine the English teaching major listed above with additional courses in clas., dram., Engl., ling., jour., rdng., or sp.c. to make a total of fifty units. One course must be in sp.c.

Courses taken to fulfill the University requirement in freshman composition may not be used as part of any English major or minor. Satisfaction of the freshman composition requirement is prerequisite to all other courses in English.

Students may fulfill the English requirement for graduation by completing one of the following sequences: Engl. 100, 101, and 102; 101 and 102; 103 and 104; for ESL students: 106, 107, and 108. Students are placed in Freshman 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.

Honors: The department participates in the Honors Program.

100. Freshman Composition (3) I II Exposition, review of syntax and usage.
101. Freshman Composition (3) I II Exposition, emphasis on essays.
102. Freshman Composition (3) I II Critical papers on selected subjects.
103. Freshman Composition (3) I II Exposition for superior students.
104. Freshman Composition (3) I II Critical papers for superior students. P, 103.
106. English Composition for Foreign Students (3) I II Exposition, syntax and usage for ESL students.
107. English Composition for Foreign Students (3) I II Exposition, emphasis on essays, for ESL students.
108. English Composition for Foreign Students (3) I II Exposition, critical papers, for ESL students.

*NOTE: All entering foreign students must take a placement examination given at the beginning of each semester and summer session. See "Admission of Foreign Students" in Admission to the University section.

207. Sophomore Composition (3) I II Exposition and narration.
209. Introduction to Poetry Writing (3) I II Beginning techniques of poetry writing. P, 102.
260. **Major British Writers** (3) I II Intensive study of selected works by major British writers.

261. **Modern Literature** (3) I II Readings in modern fiction, drama, and poetry.

265. **Major American Writers** (3) I II Intensive study of selected works by major American writers.

267a-267b. **World Literature** (3-3) 267a: Dramatic literature; great plays of the western literary tradition with emphasis on genre, theme and structure. 267b: Narrative literature; great narrative works of western literary tradition with emphasis on form, theme and culture context.

268. **Introduction to the Literature of the Americas** (3) I Major literary works and movements throughout the English-, Spanish-, Portuguese-, and French-speaking Americas, in translation.

300e-300b. **Literature and Film** (3-3) Aesthetic relationships between literature and film. 300a: The art of translating literature into film as aesthetic expression. 300b: The artistic medium of the narrative film.

301. **Non-fiction Writing** (3) I II P, 207 or 210.


306. **Advanced Composition** (3) I II Study of rhetorical theory; practice in writing exposition and argument.

307. **Business Writing** (3) I II Practice in writing business letters and reports.

308. **Technical Writing** (3) I II Analysis and presentation of scientific and technical information.

309. **Poetry Writing** (3) I II Practice in writing poetry. P, 209.

311. **Major Themes in the Literature of the Americas** (3) [Rpt.] I II Works in translation: civilization from wilderness, making of national culture and authentic language, fall of Big House, time warp.


324. **Literature of the Southwest** (3) I II S The last frontier in fact and fiction, the accounts of early travelers, the development of the "Western story," the regional novel; useful bibliography.

331. **Introduction to Shakespeare** (3) I II A close reading of six to eight Shakespearian plays, including a comedy, a history, a tragedy, and a tragicomedy.

370a-370b. **English Literature** (3-3) A survey, with emphasis on major writers in their literary and historical contexts. 370a: From Old English to Renaissance literature. 370b: From Restoration to modern literature. 370a is not prerequisite to 370b. Both 370a and 370b are offered each semester.


380. **Literary Analysis** (3) I II Introduction to the various modes, techniques, and terminology of practical criticism.

401. **Advanced Nonfiction Writing** (1 to 4) [Rpt./2] GC I II P, 301.

402. **Business Report Writing** (3) GC I II Study and development of written reports in business.

403. **Advanced Scientific Writing** (3) GC I II Preparation of professional literature for publication.

404. **Advanced Fiction Writing** (1 to 4) [Rpt./2] GC I II P, 304.

405. **History of the English Language** (3) GC 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)


408. **English as a Second Language in Bilingual Education** (3) GC I II Methodology for the teaching of English as a component of bilingual education; grammar, phonology, and syntax as they apply to the teaching of language skills. (Identical with Ed.F.A. 408, Elem. 408 and S.Ed. 408)

409. **Advanced Poetry Writing** (1 to 4) [Rpt./2] GC I II P, 309.

410. **Teaching of Composition** (3) GC I II Theory and practice of teaching writing in secondary schools and colleges. P, 306. (Identical with S.Ed. 410)

411. **Teaching of Literature** (3) GC I II Theory and practice of teaching literature, with intensive study of genres and works commonly taught in secondary schools. P, nine units of lit. (Identical with S.Ed. 411)

412. **Teaching of the English Language** (3) GC I II Theory and practice of teaching various aspects of language in the secondary schools. P, 405, 406. (Identical with S.Ed. 412)
Poetry Writing in Forms (3) GC II Explores English prosody through discussing and writing major forms; research paper. Open to creative writing majors only. P, 309.

Literature and Writing in the Elementary School (3) GC II Critical approaches to children's literature; theoretical and practical preparation for teaching writing. P, 207, and six units of upper-division lit.

General Linguistics (3) GC I General survey of the principles and history of modern general linguistics.

The Nature of Literature (3) I What literature is and does, as exposed in theories of writing and in self-conscious literary works.

Women Authors (3) I Analysis of the representation of women in selected works from antiquity to the twentieth century. (Identical with W.S. 417)

Women in Literature (3) II Analysis of female characters in selected British and American novels, stories, plays, and poems. (Identical with W.S. 418)

The Literature of the Caribbean (3-3) 425a: I 1983-84 Literature of the Spanish-speaking Caribbean; conducted in Span. 425b: I 1984-85 Literature of the English- and French-speaking Caribbean; conducted in Eng. and Fren. 425a is not prerequisite to 425b. (425a is identical with Span. 425a.)

English Medieval Literature (3) II Survey of Old and Medieval English literature (exclusive of Chaucer), chiefly in modern versions.

Chaucer (3) II The Canterbury Tales and other poems, read in Middle English.

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.

Renaissance Drama (3) II Critical and historical study of Marlowe, Jonson, Middleton, Webster, and other contemporaries of Shakespeare.

Renaissance Literature (3-3) 434a: Critical and historical survey of major authors, including More, Skelton, Wyatt, Sidney, and Spenser. 434b: Bacon and Hobbes; Ben Jonson and his Tribe; Donne and the Metaphysicals; Milton.

The Literature of English-Speaking Canada (3) II An introduction to important works, mostly modern, of English-speaking Canada.

Black Literature in the Americas (3) II 1983-84 A study of the literary works written in the western hemisphere which deal with the African experience in the Americas. (Identical with Bl.S. 437)

The Indian in the Literature of the Americas (3) GC II 1984-85 Studies of works by and about Indians published throughout the Americas. (Identical with A.In.S. 438)

Women in the Literature of the Americas (3) I 1983-84 A comparative study of woman writers throughout the Americas. (Identical with W.S. 439)

Literary Genres in the Americas (3) I Intensive study of one of the literary genres — the novel, the short story, poetry, the epic, drama — in the literature of the Americas.

Literary Criticism in the Americas (3) II 1983-84 Major critics in the Americas: Bello, Sarmiento, Rodo, Paz, Brooks, Wilson, Trilling, DeVoto, Smith.

English Medieval Literature (3) II Survey of Old and Medieval English literature (exclusive of Chaucer), chiefly in modern versions.

Restoration Drama (3) I Critical and historical study of major plays from Dryden to Sheridan (1660-1780).

Folklore (3-3) GC 449a: Customs and beliefs of birth, initiation, marriage, death material culture, art, medicine, the supernatural, and the calendar. 449b: Myth, tales, epic, legend, drama, song, dance, music, riddles, proverbs, and other speech forms. (449a is identical with A.In.S. 449a and Anth. 449a)

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.

The English Novel (3-3) 458a: Defoe, Richardson, Fielding, Sterne, Smollett, and Austen. 458b: Scott, the Brontes, Dickens, Thackeray, Eliot, Trollope, and Hardy.

Romantic Literature (3-3) 460a: Wordsworth, Coleridge, Keats, and essayists. 460b: Blake, Byron, Shelley, and essayists. 460a is not prerequisite to 460b.

Victorian Literature (3) I Major poetry and nonfictional prose.
270 DEPARTMENTS AND COURSES OF INSTRUCTION

466. Themes in Victorian Literature (3) II The impact of science, the sexual revolution, art and ecology, and the Romantic heritage.

468. Literature of the Irish Renaissance (3) II Irish writers of the 19th and early 20th centuries: Yeats, Synge, O’Casey, Lady Gregory, AE, Stephens, and others.

469a-469b. Germanic Folklore: An Introduction to Nonliterary Forms (3-3) GC (Identical with Ger. 469a-469b)

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 (3-3-3) 473a: Development of British fiction from the late 19th century to the present. 473b: Development of British poetry from the turn of the century to the present.

475. Modern Continental Drama (3) I The development of Continental drama from 1875 to the present; Ibsen, Chekhov, Strindberg, Brecht, Pirandello, Giraudoux, Anouilh, Beckett, Ionesco, and other playwrights.


481. Literature of the Early Republic (3) I Satire, drama, essays, novels, and poetry of the Revolutionary and post-Revolutionary periods; Franklin, Frenneau, Crevecoeur, the Connecticut Wits, C. B. Brown, Irving, Cooper.

482. American Romanticism (3) II Prose and poetry by Hawthorne, Poe, Emerson, Whitman, Thoreau, and Melville.

483. American Realism (3) I The development of realism and naturalism in American literature; Twain, James, Crane, Dreiser, and other writers.

484a-484b. The American Novel (3-3) 484a: The nineteenth century — Hawthorne, Melville, Twain, and others. 484b: The twentieth century — James, Fitzgerald, Faulkner, and others.

485. Modern British and American Drama (3) II The development of drama in English from 1900 to the present; Shaw, O’Casey, Beckett, Osborne, Pinter, O’Neill, Wilder, Miller, Williams, Albee, and other playwrights.

486. American Humor (3) II The historical development of comic archetypes, language, and other aspects of comedy in American literature.


488a-488b. Modern American Literature (3-3) 488a: Development of American poetry since the last quarter of the 19th century. 488b: Development of the American novel, novella, and short story, from 1900 to the present.

495. Colloquium
Ha. Honors for Juniors (3) II
Hb. Honors for Seniors (3) I II

496. Proseminar
a. Studies in a Literary Period (3) I II
b. Literary Themes (3) I II
c. Literary Genres (3) I II
d. Major Authors (3) [Rpt. /9 units] I II S
e. Comparative Literature (3) [Rpt. /9 units] I II S
f. Literature and Other Disciplines (3) [Rpt. /9 units] I II S

515a-515b. History of Criticism (3-3) 515a: Plato through the 19th century. 515b: Modern criticism.

516a-516b. Theories of Linguistic Structure (3-3) 516a: The American tradition in linguistics. 516b: The European tradition in linguistics. 516a is not prerequisite to 516b.

520a-520b. History of the German Language (3-3) (Identical with Ger. 520a-520b)

525. Beowulf (3) II (Identical with Ger. 525)

526. Advanced Studies in Chaucer (3) II


531. Advanced Studies in Shakespeare (3) II

533. Studies in the Renaissance (3) I

534. Advanced Studies in Milton (3) I

541. Studies in the Restoration and Eighteenth Century (3) II

**ENTOMOLOGY**

Professors George W. Ware, Head, Larry A. Cröwder, Paul D. Gerhardt (Emeritus), Harry M. Graham (Adjunct), Roger T. Huber, Leon Moore, Mervin W. Nielson (Adjunct), William L. Nutting, Donald M. Tuttle, Theo F. Watson, Floyd G. Werner

Associate Professors Norbert Kauffeld (Adjunct), Gordon D. Waller (Adjunct)

Assistant Professors David N. Byrne, Robert L. Smith

The Department of Entomology provides basic training for students planning to become professional entomologists or a more general background for those specializing in related fields, such as plant protection. Career opportunities in entomology include teaching, research and technical positions with colleges and universities, experiment stations, governmental agencies, military services and private and industrial organizations.

Undergraduate studies lead to the Bachelor of Science in Agriculture degree under the agriculture, agricultural business, or agricultural sciences curriculum. The department also offers opportunities for study toward the degrees of Master of Science and Doctor of Philosophy. For graduate admission and degree requirements, consult the Graduate Catalog.

*Agriculture curriculum:* Minimum of sixteen units in ento. selected in consultation with the student’s adviser.
Agricultural business curriculum: Minimum of sixteen units in ento., including the following suggested courses selected in consultation with the student's adviser: 201R; Pl.S. 100; G.Bio. 104; Chem. 103a-103b, 104a-104b; three units of phys.

Agricultural sciences curriculum: Minimum of sixteen units in ento., including the following suggested courses selected in consultation with the student's adviser: 201R, 404, 407; G.Bio. 104, Pl.S. 100; Chem. 103a-103b, 104a-104b, 241a-241b, 243a-243b; three units each of phys., ecol., and gene.

151. Insects and Man (3) I Introduction to the recognition, biology and management of insects affecting man and his interests. Huber

201R. Fundamentals of Entomology (3) II Insects and other land arthropods, their relationship to their environment, and classification to the level of orders and families. Werner

201L. Fundamentals of Entomology Laboratory (1) I Recognition of insects and other terrestrial arthropods to the level of orders and families; collection. Field trips. P, CR 151 or 201R.

214. The Honey Bee (2) II Biology and social behavior, pollination, ecology, and management. Kaufield/Waller

395. - Colloquium
   a. Senior Colloquium in Entomology (1) II Open to majors only. Ware


402. Introduction to Pesticides and Their Use (2) GC II (Identical with Pl.P. 402)

403. Parasites of Domestic Animals (2) GC I (Identical with V.Sc. 403)

404. Insect Morphology (4) GC I 1984-85 External and internal anatomy as related to identification, function and phylogeny of insects and other arthropods; modifications in development and habits peculiar to the insects. 2R, 6L. P, three units of ento. or invertebrate zoo. Nutting

407. Insect Physiology (4) GC II 1984-85 Principles of the physiological systems of insects and lab. methods for their study, with emphasis on the functioning of these systems in the environment. 2R, 6L. P, three units of organic or bioc. Crowder

411. Applied Insect Ecology (3) GC I Population dynamics of agriculturally important insects, with emphasis on sampling, phenology, and key factor analysis of regulating mechanisms. 2R, 3L. Field trips. P, three units of stat. Huber

415. Agricultural Entomology (4) GC I Nature of injury, life history, habits, and control of major agricultural insect pests in Arizona; insecticides and implications of use. 3R, 3L. P, 151 or 201R.

420. Urban Entomology (3) GC II 1983-84 Biology of insects, other arthropods and vertebrates, beneficial and pestiferous, that impact humans in the urban ecosystem. Identification of species and management of pests. 2R, 3L. Field trips. Smith

425. Insect Pest Management (3) GC II Concepts and methods of pest management; the integration of all control methods compatible with optimum crop production practices. 2R, 3L. Field trips. P, 415. Watson/Moore

502. Acarology (2) I 1984-85 A survey of the Acarina, or mites, followed by more detailed study of the recognition and biology of plant feeding forms. 1R, 3L. Tuttle

506. Plant Resistance to Insects (2) II 1984-85 Insect-plant relationships pertaining to resistance and related factors in crop plants; methods, problems, and research techniques involved in developing resistant varieties. (Identical with Pl.S. 506) Nelson

508. Insect Toxicology (3) II 1983-84 Insecticides and related chemicals; their modes of action, detoxication, resistance in arthropods, and environmental distribution and effects. P, three units of organic or bioc. (Identical with Tox. 508) Crowder/Ware

512. Insect Behavior (3) II 1983-84 The physiological basis of insect behavior, with examples and methods of study of the diverse types of behavior exhibited by insects and other land arthropods. Nutting

514. Biological Control (3) I 1984-85 Principles of the biological control of arthropods, with emphasis on their application to agricultural entomology. Watson

516. Applied Insect Taxonomy (4) I 1983-84 Principles and methods in the development of a classification of insects in limited areas and habitats, with emphasis on groups of economic importance. 3R, 3L. Field trips. Werner

576. Environmental Toxicology (3) I (Identical with Tox. 576)

696. Seminar
   a. Entomology (1) [Rpt./6] I II
FINANCE AND REAL ESTATE

ETHNIC STUDIES
(See American Indian Studies, Black Studies, and Mexican American Studies)

FAMILY ECONOMICS AND HOME MANAGEMENT
(See Home Economics)

FAMILY RELATIONS
(See Home Economics)

FINANCE AND REAL ESTATE

Professors Clark A. Hawkins, Head, Gerald O. Bierwag, Nestor R. Roos, James E. Wert
Associate Professors Erich K. Bleck, John T. Emery, Joseph S. Gerber, Eric Sorensen
Lecturers Thomas C. Moses, Sanders K. Solot, Robert Ash Wallace

Majors in finance are prepared for corporate financial management, investment portfolio
management, brokerage, and investment and commercial banking. Those who concentrate in
real estate are exposed to the practical aspects of appraising, marketing and managing real
property in addition to the economics of land uses.

Undergraduate majors in finance and real estate are offered through the Bachelor of
Science in Business Administration (see the College of Business and Public Administration sec-
tion 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.

201. **Personal Finance** (3) I II Principles of personal money management and financial planning for the
individual and family, including analysis of home buying, credit purchases, insurance, savings, and
investments. Not open to B.P.A. students.

221. **The Stock Market** (3) I II Analysis of the markets for securities of both public and private issuers:
brokers, dealers, investment bankers, organized and over-the-counter markets; the mechanics of
trading, and the investment risks and merits of all classes of securities. Open only to nonmajors.

251. **Risk and Insurance** (3) I II Theory of risk; essentials of risk management, with emphasis on insur-
ance, including analyses of coverages purchased by business firms and families. Designed for those
seeking a general knowledge of insurance.

261. **Real Estate Principles** (3) I II Survey of the business aspects of real estate.

311.* **Corporation Finance** (3) I II Financial problems involved in the organization and conduct of business
enterprise. P, Acct. 210, Econ. 201b.

313.* **Economics of Futures Markets** (2) II (Identical with A.Ec. 313)

361.* **Real Estate Finance** (3) I II Real estate risks and financing; kinds, sources, costs, and uses of funds;
the secondary market and related governmental activities. P, 261.

362.* **Real Estate Appraisals** (3) I II Factors influencing real property values; application of three ap-
proaches in determining the value of residential, commercial, and industrial properties. P, 261.

412.* **Corporate Financial Problems** (3) GC I II Advanced financial problems of the firm: capital structure,
421.* Investments (3) GC I II Operation and analysis of the stock, bond, and commodity markets; theory and practice in construction and management of investment alternatives. P, 311.

422.* Securities Analysis (3) GC I II Current practices and techniques of evaluating common stocks, bonds, stock options and warrants. P, 421.

431.* Financial Intermediaries (3) GC 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.

453.* Risk Management (3) GC I II Analysis of a logical and systematic approach to uncertainty regarding loss; the identification, analysis, and evaluation of risk and the selection of the most advantageous method of treating it. P, Acct. 210, Econ. 201b.

455.* Safety Management (3) GC I Definition of functional requirements of a safety program, management's responsibilities, relationship to insurance; the effect on business of the Occupational Safety and Health Act of 1970 and similar state laws.

461.* Real Estate Law (3) GC I II Principal areas of the law of real estate. P, 261.

463.* Real Estate Investment and Taxation (3) GC II Professional management and use of real estate for income production; tax influences. P, 361, 362, Acct. 320.

465.* Advanced Real Estate Appraisal (3) GC II Valuation of income-producing property; the capitalization process, discounted cash flow, concepts of investment analysis. P, 361, 362.

471.* Policy Formulation and the Finance Function (3) GC I II Integrative course utilizing the case study approach and focusing on the financial impact of marketing and production strategies. P, 412, Mgmt. 305, 373, Mktg. 361.

486a-486b.* Occupational Safety and Health (3-3) GC I (Identical with O.S.H. 486a-486b) 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. Business Finance (3) I II Integration of the basic principles and theory of business finance, with emphasis on analytical financial management of the firm. Students with credit in 412 should take 512. Open only to students admitted to a BPA graduate program. P, Acct. 550.

512. Advanced Corporation Finance (3) II Theory and practice of capital investment decisions in the corporation, including replacement, refunding, risk and uncertainty. P, 412 or 511.

513. Theory of Finance (3) II Theoretical models pertaining to financial decisions. P, 412 or 511.

521. Portfolio Management (3) I Portfolio theory and portfolio choice; the options market; investor risk behavior and strategy. P, 421.

522. Advanced Securities Analysis (3) II Examination of securities risk, return, and price behavior in competitive markets. P, 421 or 521.


532. Financial Futures and Options (3) I Design and trading of interest rate futures and options. Examination of their use in hedging, speculating, arbitraging, and their regulation. P, 421 or 521.

555. Advanced Safety Management (3) I Relating safety management to modern motivation theories; coordinating control of environment and behavior; interaction of unions, business, government, and other societal institutions. P, 455.

556. Safety Law (3) II History of law; tort and contract law; court procedure and trial; administrative law; worker's compensation, O.S.H.A., and C.P.S.C. law and cases; safety professional's responsibilities.

557. Safety and Institutional Policy (3) S Occupational safety problems; society's organization of safety; early legislation; successes and failures of early safety efforts; consumerism; institutions bearing on safety problems. P, 555.

561. Advanced Subjects in Real Estate (3) I Syndication, feasibility studies, tax-free exchanges, and advanced appraising. P, 361.


696. Seminar a. Investment Analysis (1 to 3) I II b. Financial Markets (1 to 3) [Rpt./1] I II c. Corporation Finance (1 to 3) [Rpt./1] I II d. Capital Budgeting (1 to 3) I II e. Research Methods (1 to 3) [Rpt./1] I II
FRENCH AND ITALIAN

FOOD, HUMAN NUTRITION AND DIETETICS
(See Nutrition and Food Science)

FOOD SCIENCES
(See Nutrition and Food Science)

FOOD SERVICE MANAGEMENT
(See Nutrition and Food Science)

FOUNDATIONS OF EDUCATION
(See Educational Foundations and Administration)

FRENCH AND ITALIAN

Professors Jean-Jacques Demorest, Head, Guido Capponi, Frank M. Chambers (Emeritus), Loyal Gryting (Emeritus), Charles I. Rosenberg
Associate Professors Edward G. Brown, Ingeborg M. Kohn, Henri Servin, Gianni Spera
Lecturers Gerard Agnieray, John L. Gesell, Jean Goetinck, Annamaria Kelly

The Department of French and Italian offers instruction in both languages at the elementary, intermediate, and advanced levels. It also offers courses in the two literatures, the civilizations of France and Italy, as well as courses devoted to the study of areas common to both cultures. The department, which cooperates actively with the Arizona Center for Medieval and Renaissance Studies, conducts programs in France and Italy.

The department offers the following degrees: Bachelor of Arts with majors in French and Italian; Bachelor of Arts in Education with a teaching major in French; Master of Arts with majors in French and Romance languages; Master of Education with a teaching major in French; and Doctor of Philosophy with a major in French. For information concerning the Bachelor of Arts with a major in Romance languages, contact the department head.

Undergraduate majors in French or Italian can expect to attain a command of the idiom and of the culture that prepares them to teach in secondary schools, to undertake professional graduate studies, and to pursue careers in multinational corporations or in the foreign service.

Honors: The department participates in the Honors Program.

French

Unless otherwise indicated, all courses are taught in French.

The major: Thirty units (in addition to 101a-101b), including 300a-300b-300c, 375a-375b, and six additional units of literature in the 400 series. No fewer than 22 units must be upper-division coursework. The minor subject will be chosen in consultation with the major adviser.

The teaching major: Thirty units (in addition to 101a-101b), including 300a-300b-300c, 375a-375b, 414, and six additional units of literature in the 400 series.
The teaching minor: Twenty units (in addition to 101a-101b), including 305a-305b. Students offering 2 yrs. of Fren. as entrance credit must include six units from 300a-300b-300c.

101a-101b. Elementary French (4-4) CDT 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.)

101y. Intensive Review and Elementary French (4) I Review at the 101b level for students handicapped by time-lapse between high school Fren. and enrollment in college Fren.; prepares for 201a in the following semester. Admission is by assignment based upon placement test results. P, no more than two yrs. of h.s. Fren.

105a-105b. Training in Reading French for Graduates (3 hrs./week - no credit) Summary of basic grammar essential to a reading knowledge of the language, accompanied by readings of increasing difficulty both in the general literature and the chosen field of specialization.

201a-201b. Intermediate French (4-4) CDT P, 101b or two yrs. of h.s. Fren. Both 201a and 201b are offered each semester.

201y. Intensive Review and Intermediate French (4) I Review at the 201a level for students handicapped by time-lapse between second-year high school Fren. and the first year of college; prepares for 201b in the following semester. Admission is by assignment based upon placement test results.

250a-250b. Types of French Literature (3-3) Introduction to French literature through the detailed study of varied literary texts. P, 201b.

300a-300b-300c. Introduction to French Literature (3-3-3) 300a: The Middle Ages and the Renaissance. 300b: The 17th and 18th centuries. 300c: The 19th and 20th centuries. P, 201b.

302a-302b. Intensive French (4-4) P, knowledge of another language at the 305b level, or permission of instructor. 302a is the equivalent of 101a-101b; 302b is the equivalent of 201a-201b.

305a-305b. Composition and Conversation (3-3) Designed for students who wish to write and speak fluently in everyday idiom; material based upon practical current topics. P, 201b. Both 305a and 305b are offered each semester.


375a-375b. Advanced Composition and Conversation (3-3) Practice in formal writing and formal oral communication. P, 305b.

382a-382b. French Literature in Translation (3-3) Representative masterpieces of French literature. Will not count toward fulfillment of the language requirement or the major or minor in Fren.


403a-403b. Literature of the 18th Century (3-3) GC 1983-84 403a: Early Renaissance, Reformation, Rabelais, the Pleiade. 403b: The Humanists, Montaigne, D'Aubigne, the drama. P, 201b.


405a-405b. Literature of the 18th Century (3-3) GC 1984-85 405a: Rationalist currents. 405b: Sensibility. P, 201b.


414. Teaching of Modern Languages (3) GC I II (Identical with S.Ed. 414)

415. Stylistics (3) GC I Principles of stylistics, with exercises in literary translation and original writing. P, 375b.

422. Introduction to Romance Philology (3) GC I 1984-85 (Identical with Span. 422)

430a-430b. French Civilization (3-3) GC Historical, social, economic, literary, and artistic elements in the development of the French nation. P, 201b.

431. Contemporary French Philosophy (3) GC II 1983-84 Discussion course, conducted in Eng. with readings in Fren.; Bergson, Camus, Simone Weil, Teilhard de Chardin, Sartre, Levi-Strauss.

450. French Literature of Black Africa and the West Indies (3) GC I 1984-85 P, 201b. (Identical with B.L.S. 450)

451. Literature of the Fantastique (3) GC II 1984-85 Study of certain elements of the supernatural, the unexpected, the unexplainable in French literature; analysis of dominant themes and important authors of the 18th, 19th, and 20th centuries. P, 201b.

452. French Literature of Quebec (3) GC II 1984-85 Comprehensive study of the most significant literary expression in Quebec. P, 201b.
FRENCH AND ITALIAN


470. Advanced Grammar and Usage (3) GC II Structural analysis of spoken and written French, with emphasis on structural patterns and attention to contrasts with Eng. Grad. students will do additional work in composition and stylistics. P, 201b.

472. French Phonetics (2) GC II 1983-84 Description, analysis, and practice in the larger elements of articulatory phonetics; designed for teaching majors and minors. P, 372.

510. Materials and Methods of Research (2) I 1983-84

511. Approaches to French Literature (3) II 1983-84 Methods of criticism and techniques of literary analysis.


557. Rousseau (3) II 1984-85 Rousseau’s political thought; his ideas concerning education; The Confessions; the beginning of Romanticism.

558. Realism and Naturalism in the Novel (3) I 1983-84 Flaubert, Zola, Maupassant, etc.

559. New Theatre (3) II 1984-85 Ionesco, Beckett, Adamov, Arrabal, etc.


Italian

The major: 30 units (in addition to 101a-101b), including 305a-305b, and 405a-405b (for students who require additional fluency); 400a-400b-400c and six additional units of literature courses in the 400 series. No fewer than 20 units must be upper-division course work.

The minor: Twenty units (in addition to 101a-101b), including 305a-305b and 405a-405b (for students who require additional fluency); 400a-400b.

Students with teaching minors will be required to complete a course in methodology dealing with teaching foreign languages in high school and/or junior college.

101a-101b. Elementary Italian (4-4) CDT Both 101a and 101b are offered each semester. (The first year of work in a foreign language shall not be counted toward a minor.)

201a-201b. Intermediate Italian (4-4) CDT Both 201a and 201b are offered each semester. P, 101b or two yrs. of h.s. Ital.

282a-282b. Literature of the Renaissance in Translation (3-3) Representative literary masterpieces of the Italian Renaissance. Does not fulfill the language requirement, the major or the minor in Ital.

302a-302b. Intensive Italian (4-4) P, lang. major or proven lang. proficiency.

305a-305b. Composition and Conversation (3-3) GRD Designed to develop linguistic skills aimed at achieving an FSI rating of 2 plus in listening, comprehension, speaking and writing. P, 201b or consult dept. before enrolling.

400a-400b-400c. Survey of Italian Literature (3-3-3) GC Representative masterpieces of the Italian Renaissance in translation. Will not count toward fulfillment of the language requirement for the major or minor. P, 201b or consult dept. before enrolling.

405a-405b. Advanced Composition and Conversation (3-3) GC P, 201b.

406a-406b. The Italian Novel (3-3) GCP, 201b.

420a-420b. Italian Civilization. (3-3) GC Historical, geographical, social, and artistic aspects of the development of the culture of Italy. P, 201b. 420a is not prerequisite to 420b.

422. Introduction to Romance Philology (3) GC I 1984-85 (Identical with Span. 422)

430a-430b. Literature of the Renaissance (3-3) GC P, 201b.
435a-435b. *La Divina Commedia* (3-3) GC P, 201b.

696. **Seminar**  
   a. Italian Literature (3) [Rpt.] I II

**Romance Languages**

422. **Introduction to Romance Philology** (3) GC I 1984-85 (Identical with Span. 422)

429. **Pedagogical Linguistics: Applied Linguistics for Language Teachers** (3) GC II (Identical with Or.S. 429)

**GENERAL BIOLOGY**

Associate Professors Russell Davis, Robert S. Mellor, Willard Van Asdall  
Assistant Professor Denis J. Meerdink  
Lecturers C. William Gaddis, Donald B. Sayner

The Department of General Biology is concerned with an integrated approach to the study of biological systems. The approach is on the organismic and molecular levels, including consideration of the interaction of biological systems and their environment. The department also curates excellent regional collections of invertebrates.

The Bachelor of Science, Master of Science and Doctor of Philosophy degrees are offered with a major in general biology. The degrees of Bachelor of Science in Education and Master of Education with a teaching major in biology are also available. Related undergraduate majors in fisheries science and wildlife ecology may be obtained through the College of Agriculture.

*The major:* 102, 103, 104; Chem. 103a-103b, 104a-104b, 241a-241b, 243a-243b; Phys. 102a-102b, 180a-180b; eight units of math., including Math. 125a and either 160 or 263. Majors must also complete three or four units in each of the following groups (ten to twelve units):  
   1. systematics-morphology — 458, 459, 480; Ecol. 470, 472, 475, 476, 482, 483, 484, 485;  
   2. genetics — developmental — 320, 456; Ecol. 450;  
   3. physiology — 410a, 464aR-464bR, 467R; Cell. 460, 463; Ecol. 468; Micr. 417R. From ten to twelve units of additional upper-division elective credit must also be taken for a total of 35 units in the major. No more than four of these elective units may be taken as 399 (independent study). Programs resulting in the equivalent of majors in botany, zoology and physiology may be pursued. Other areas of emphasis are ethnobotany, genetics, invertebrate zoology, predentistry, premedicine and other appropriate preprofessional programs. General Biology has a structured split minor in chemistry/physics or chemistry/math.

*The teaching major:* 102, 103, 104, 320, 410a; Chem. 103a-103b, 104a-104b, 241a-241b, 243a-243b; eight units of math.; fifteen units of electives selected in consultation with a biological sci. adviser.

*The teaching minor:* 102, 103, 104; seven units of electives selected in consultation with a bio. sci. adviser.

*Honors:* The department participates in the Honors Program.

101a-101b. *General Biology* (4-4) Important biological principles and problems related to the origin, nature, and population ecology of man. Not designed for bio. majors. 3R, 3L. Field trips.

102. **Fundamentals of Ecology and Evolution** (4) I II (Identical with Ecol. 102)

103. **Biology of Cells** (4) I II (Identical with Micr. 103)

104. **Organismic Biology** (5) I II Structure, function, development, and economic value of flowering plants; structure, function, and development of animals; brief survey of the plant and animal kingdoms. P, CR Chem. 103b, 104b, Cell. 103. 3R, 6L. (Identical with Cell. 104, Ecol. 104, and Micr. 104)
105. **Introductory Botany** (3) I Structure, function, and development of flowering plants and an overview of the plant kingdom. 3R. (Identical with Ecol. 105).

112. **Foundations of Science: Life** (3) I, II Emphasizes those fundamental aspects of biology that are most useful in an elementary classroom; incorporates classroom techniques, teaching methods, and experimental design. Designed for prospective elem. teachers. 2R, 3L. Field trip. P, Chem. 112.

120. **Plants and Society** (3) I (Identical with Ecol. 120)

159a-159b. **Human Anatomy and Physiology** (4-4) Correlated structure and function of the human body. Primarily for majors in nurs., phrm., and p.e.; not designed for bio. majors. 3R, 3L.


260. **Elementary Plant Physiology** (4) I, II Functions, nutrition, metabolism, and development of higher plants. 3R, 3L. P, Chem. 101b, 102b; G.Bio. 104 or PL.S. 100.

320. **General Genetics for Majors** (4) I, II Inheritance in plants and animals, with emphasis on lab. experimentation. 3R, 3L. P, 104. Chem. 103b, 104b. (Identical with Cell. 320 and Ecol. 320)

321. **General Genetics** (4) I, II Inheritance in plants and animals, with emphasis on lab. experimentation. 3R, 3L. Open to nonmajors only.

332. **Introductory Microbial Genetics** (3) I (Identical with Micr. 332)


402. **History of Biology** (2) GC II (Identical with Hist. 402)

403. **Techniques of Biological Literature** (2) GC II Selecting the research problem, sources of reference, recording and assembling data, preparation of the scientific report, publication procedure.

410a. **Advanced Cell Biology** (3) GC III (Identical with Cell. 410a)

412. **Plants Useful to Man** (2) GC S Lecture-demonstration course for teachers and others wishing information on the uses of plants: foods and food plants, medicinal plants, plants and industry, plants in textiles and other manufacturers. (Identical with Ecol. 412)

418a-418b. **Scientific Illustration-Photography** (2 to 4 - 2 to 4) [Rpt.] GC Individual basic training in the execution of thesis drawings and graphic art techniques. Consult dept. before enrolling. (Identical with Anth. 418a-418b and Micr. 418a-418b)

428R. **Advanced Microbial Genetics** (3) GC II (Identical with Cell. 428R)

428L. **Advanced Microbial Genetics Laboratory** (2) GC II (Identical with Cell. 428L)

433. **Advanced Scientific Illustration** (4) [Rpt./] GC S Individualized advanced work in scientific illustration; lecture demonstrations on a variety of techniques. Field trips. P, 418a. (Identical with Anth. 433, and Micr. 433)

438. **Plant Ecology** (4) GC I Plants in relation to their environment; plant communities, and factors affecting the distribution of plants. 3R, 3L. All-day field trips and/or labs. on six Saturdays. (Identical with Ecol. 436)

437. **Floras of North America** (2) GC II Analysis of the ranges of naturally-occurring plant taxa and communities of North America, both past and present. Two-day field trip. (Identical with Ecol. 437)

456. **Developmental Biology** (4) GC I (Identical with Cell. 456)

457. **Experiments in Developmental Biology** (4) GC I (Identical with Cell. 457)

458. **Comparative Vertebrate Anatomy** (4) GC II (Identical with V.Sc. 458)

459. **Comparative Vertebrate Histology** (4) GC I (Identical with V.Sc. 459)

464aR-464bR. **Human Physiology** (3-3) GC Basic principles and concepts of physiology applied to humans. P, 104 or 159b; Chem. 241b, 243b. (Identical with Cell. 464aR-464bR and Tox. 464aR-464bR)


467R. **Endocrinology** (3) GC II Neural and endocrine integration in the regulation of mammalian physiological functions. P, 104. CR 467R. (Identical with Ecol. 467R)

467L. **Endocrinology Laboratory** (1) GC II Techniques in endocrinology. P, CR 467L. (Identical with Ecol. 467L)

474R. **Ethnobotany** (3) GC II Survey, with emphasis on cultural uses of plants, both past and present; theories and techniques of archaeological and ethological identification of plant materials. P, eight units of bio. or anth. (Identical with Anth. 474R)

474L. **Ethnobotany Laboratory** (1) GC II Field-lab. course treating sampling, processing, storage, and identification techniques and interpretation in ethnobotany. Field trips. P, eight units of bio. or anth. (Identical with Anth. 474L)
478. **Origins and Development of Cultivated Plants** (3) GC I Evaluation of theories of origins and early development of cultivated plants in general, with special attention given to important crop plants and cultivars whose origins are more firmly established. Three-day field trip. P, 321.

480. **Invertebrate Zoology** (4) GC I Comparative morphology, physiology, and ecology of invertebrates. 2R, 6L. Field trips. P, 104. (Identical with Ecol. 480)

489. **Parasitology** (4) GC S Etiology, distribution, symptomatology, pathology, epidemiology, diagnosis, and control of parasites of man and domestic animals, with emphasis on the evolution of parasitism and host-parasite relationships. P, sixteen units of bio. (Identical with Ecol. 489, Micr. 489 and V.Sc. 489)

495. **Colloquium**
a. Problems in Plant Ecology (2) [Rpt./2] GC I (Identical with Ecol. 495a, which is home.)

503. **Zoological Taxonomy** (1) II Nomenclatural procedure, taxonomic problems, synonymy, homonymy, priority, availability, validity, describing the new taxon.


542. **Marine Ecological Research** (4) I (Identical with Ecol. 542)

550. **Selected Studies in Malacology** (2 to 4) [Rpt.] II Recent advances in malacology. 2R, 6L. Field trips. P, 480.

580. **Recent Advances in Genetics** (2) I (Identical with Gene. 670)

**GENETICS**

*Committee on Genetics (Graduate)*

Professors Robert M. Harris (General Biology), *Chairperson*, William P. Bemis (Plant Sciences), Harris Bernstein (Microbiology), John R. Davis (Pathology), John E. Endrizzi (Plant Sciences), William B. Heed (Ecology and Evolutionary Biology), Frank R. H. Katterman (Plant Sciences), Robert G. McDaniel (Plant Sciences), Neil H. Mendelson (Cellular and Developmental Biology), David Mount (Microbiology), Robert T. Ramage (Plant Sciences), Donald E. Ray (Animal Sciences),

Associate Professors Richard E. Michod (Ecology and Evolutionary Biology), Nobuyoshi Shimizu (Cellular and Developmental Biology), Oscar G. Ward (Ecology and Evolutionary Biology), Stephen Zegura (Anthropology)

The genetics program is administered by an intercollege committee comprising geneticists from various departments. It offers areas of study in animal and plant genetics, cytogenetics, ecological, human, microbial, molecular, physiological, population and statistical genetics.

Graduate study leading to the Master of Science and Doctor of Philosophy degrees with a major in genetics is provided. For admission and degree requirements, please see the *Graduate Catalog*.

520. **History of Genetics** (1) 1984-85 Experiments and discoveries which have led to the present state of knowledge in the various areas of genetics. P, G.Bio. 320.

595. **Colloquium**
a. Genetics (1) [Rpt.] I II

620. **Applications and Techniques of Human Genetics** (3) I Genetic theory and technique, as applied to man; methods of analysis of genetically determined cytological and biochemical differences in individuals and populations. 2R, 3L. P, G.Bio. 320 or 321. (Identical with Ecol. 620) Ward

670. **Recent Advances in Genetics** (2) I Recent advances in the field of genetics. (Identical with G.Bio. 670 and Micr. 670)
Curricula in geography and regional development are designed to contribute to general education, to provide a solid, substantive and methodological grounding in geography for those who plan to teach or pursue graduate work in the field, and to provide professional education for careers in regional and industrial development. Individual counseling of undergraduate majors may provide a background appropriate for professional training and/or careers in urban and regional planning and development, resource management, environmental affairs, foreign service, and cartography, among a variety of activities in government and private enterprise.

The degree of Bachelor of Arts with a major in geography is available through the College of Arts and Sciences; the Bachelor of Arts in Education with a teaching major in geography, through the College of Education; and the Bachelor of Science in Business Administration with a major in regional development, through the College of Business and Public Administration. In addition, the Master of Arts, Master of Education, and Doctor of Philosophy degrees are offered with a major in geography.

The major in geography: 35 units, including 257 and three additional units of geographical methods and techniques, plus at least six units in each of the three subfields of physical geography, human geography, and regional geography. At least 21 units must be at the upper-division level.

The supporting minor may be in biological sciences, earth sciences, languages, social sciences, or other fields approved by the departmental adviser.

The teaching major in geography: Thirty units, including six units from each of the four subfields of physical geography, human geography, regional geography, and geographical methods and techniques.

The teaching minor in geography: 18 to 24 units, depending upon major and electives, to include at least three units from each of the four subfields of physical geography, human geography, regional geography, and geographical methods and techniques.

For the regional development major, see College of Business and Public Administration section of this catalog.

For classification of courses by subfields, consult the departmental adviser.

Honors: The department participates in the Honors Program.

Note: 103a-103b and 104a-104b are the only geog. courses which may be applied to the Arts and Sciences Group VI requirement.

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. Pederson/Gibson

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 man. Both 103a and 103b are offered each semester. (Identical with Geos. 103a-103b) Altschul/Reeves

104a-104b. Physical Geography Laboratory (1-1) Field observation and lab. analysis of data and map interpretation. 104a: P, CR 103a. 104b: P, CR 103b. Both 104a and 104b are offered each semester. (Identical with Geos. 104a-104b)

151. World Regional Geography (3) I II Geographic concepts and information organized by conventional region and nation. Appropriate for elem. teaching. Not open to students with six or more units of credit in 102a-102b, 103aR-103bR.

171. Introduction to Meteorology and Climatology (3) I II (Identical with Atmo. 171)

207. United States (3) I The changing character of the land and man's occupancy of it, with emphasis on eastern regions; regionally organized and historically and problem oriented. Hecht
257. Geographical Techniques (3) II Formulation and solution of geographic problems; models, research design, and methods of gathering, analyzing, and portraying geographic data. 2R, 3L. P, three units of geog. Reeves

257. Metropolitan Tucson (3) I Physical and cultural bases of Tucson's geographic patterns, with emphasis on the city's site, situation, settlement patterns and problems of growth and change. Field trips. Saarinen

305. Economic Geography (3) I II Analysis and modeling of the spatial structure of primary, secondary, and tertiary economic activities; location theory and regionalization in economic systems. Mulligan


360. Environmental Perception (3) II Consideration of patterns in human perception in relation to modification of environment and environmental planning. Saarinen

362. Man and the Earth Ecosystem (3) I Concept of the interrelatedness of earth systems; significance of humanly induced ecological modifications through man's tenure on the earth. Field trips. P, 103a or 103b. Reeves

371. Principles and Practices of Regional Development (3) I Introduction to basic concepts, objectives, practices and techniques of regional and industrial development as a professional activity, with emphasis on development problems and solutions. Field trips. Gibson

379. Urban Growth and Development (3) I II Economic, financial, political, social, and aesthetic problems arising from growth of the modern city; place of planning and zoning in possible solutions. Field trips. Plane

381. Cartography (3) I Tools and techniques, properties and construction of projections, design and preparation of maps for publication. 2R, 3L. Reeves

401a-401b. Water Resource Management (3-3) GC (Identical with W.R.A. 401a-401b)

407. The American Landscape (3) GC II Origin and character of the visual aspects of places viewed individually and regionally; changes in habitat, vernacular structures, landscaping, townscapes, countrysides and special features. Field trips.

408. Arizona and the Southwest (3) GC I II The changing character of the land and man's occupation of it, with emphasis on Arizona; historically and problem oriented. Field trip.

411. Middle America (3) GC II Land, man, and culture in the major natural and cultural regions of Mexico, Central America, and West Indies. Pederson

412. South America (3) GC I Physical and cultural bases of South America's geographic patterns, with emphasis on human settlement and problems of resource development. Pederson

413. Africa (3) GC II Physical and human bases of regional contrasts, with emphasis on tropical environmental systems and changing patterns of resource utilization. Altschul

414. Rural Area Development (3) GC I (Identical with A.Ec. 414)

453. Industrial Location Analysis (3) GC II Geographic distribution of industrial location; location factors and case studies; scale and the modern corporation; geographic inequalities and public policy. Mulligan

456. Urban Geography (3) GC I Analysis and modeling of the spatial organization of cities; concepts of settlement patterns and processes; social and economic interpretations of the modern city. Field trip. Mulligan

457. Statistical Techniques in Geography and Planning (3) GC I Methods of gathering and analyzing data for the solution of geographical, urban, and regional planning problems, with emphasis on quantitative and statistical techniques used in spatial analysis and cartography, on the one hand, and program planning, on the other. (Identical with U.Pl. 457)

459. Topics in Economic Geography of the Middle East (3) GC II (Identical with Or.S. 459)

461. Population and Resources (3) GC I Estimates of present and potential world population; distribution and methods of conserving important resources. Field trips. (Identical with W.R.A. 461)

463. Physical Aspects of Arid Lands (3) GC II Landforms, climate, hydrology, soils, vegetation, and animal life of deserts, with particular emphasis on the interaction of these phenomena in southern Arizona. Field trips. Altschul/Reeves

464. The Arid and Semi-arid Lands (3) GC I Past, present and future of settlement and resource utilization in the world's arid lands; spatial interrelationships of environmental, demographic, socioeconomic and political systems. Altschul

469. Geography of the Middle East (3) GC I (Identical with Or.S. 469)
471. **Problems in Regional Development** (3) GC I II Regional inventories and methods of analysis; development problems, policies and strategies; generation, implementation, and evaluation of development programs; case studies. P, 371 or Fin. 261 or A.Ec. 414. (Identical with A.Ec. 471) Plane/Gibson

481. **Computer Cartography** (3) GC II Introduction to the use of computers for map production, with emphasis on cartographic principles and practical experience with several user-oriented mapping programs. Reeves

483. **Geographic Applications of Remote Sensing** (3) GC II Use of aircraft and satellite imagery for monitoring and analyzing landforms, soils, vegetation and land use, with the focus on problems of land-use planning, resource management and related topics. 2R, 3L. Field trip. P, two units of remote sensing or equivalent experience. Hutchinson

485. **Geography Summer Field Camp** (6) [Rpt./2] GC S Physical and cultural problems in geography studied at first hand. Fee, $300. P, six units of geog. Gibson/Reeves

501. **Advanced Physical Geography** (3) I Extensive reading in important journal articles and other original publications. Designed for M.A. candidates, to be taken during their first or second semester, to provide a comprehensive foundation. P, 103b; twelve additional units of geog. Reeves

502. **Advanced Cultural Geography** (3) II Similar in scope and method to 501, but in the field of cultural geography. P, 102a-102b; twelve additional units of geog.

556. **Urban Systems Analysis** (3) II Theoretical and applied analysis of urban growth models, gradients of urban influence, residential and facility decisions, and urban transportation. Mulligan

557. **Spatial Analysis** (3) II Formal analysis and modeling of spatial structures and processes; conceptual evaluation of point patterns, networks, surfaces and interaction. P, 457.

561. **Resource Management** (3) I Examination and critical appraisal of social and behavioral science aspects of resource management, with special emphasis on factors affecting decision making. Saarinen

562. **Paleoecology and Man** (3) I (Identical with Geos. 562)

563. **Perception of Environment** (3) I II Examination of interdisciplinary research on environmental perception; consideration of social and behavioral variables at all scales of environmental perception and planning. (Identical with U.Pl. 563) Saarinen

589. **History of Geographic Thought** (3) I History of geographic philosophy and methodology. P, fifteen units of geog. Pederson

596. **Seminar**
   u. Interdisciplinary Environment-Behavior-Design (3) I (Identical with Idis. 596u, which is home)

609. **Problems of Urban Change** (3) II (Identical with U.Pl. 609)

696. **Seminar**
   a. Economic Geography (3) I II
d. Historical Geography (3) I II
   b. Cultural Geography (3) I II
e. Area Study (3) I II
   c. Physical Geography (3) I II

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**GEOLOGICAL ENGINEERING**

*(See Mining and Geological Engineering)*

**GEOLOGY**

*(See Geosciences)*
GEOSCIENCES

Professors George H. Davis, Head, John W. Anthony, Victor R. Baker, William B. Bull, Peter J. Coney, Paul E. Damon, William R. Dickinson, Charles W. Ferguson (Laboratory of Tree-Ring Research), Harold C. Fritts (Laboratory of Tree-Ring Research), Laurence M. Gould (Emeritus), John M. Gullbert, C. Vance Haynes (Anthropology), Gerhard O. W. Kremp (Emeritus), Valmore C. LaMarche (Laboratory of Tree-Ring Research), Everett H. Lindsay, Paul S. Martin, Evans B. Mayo (Emeritus), Edgar J. McCullough, Jr., Bartholomew S. Nagy, Denis L. Norton, Hugh Odishaw, Joseph F. Schreiber, Jr., George Gaylord Simpson (Emeritus), Terah L. Smiley, Marvin A. Stokes (Laboratory of Tree-Ring Research), John S. Sumner (Emeritus), Spencer R. Titley, James R. Wait (Electrical and Computer Engineering)

Associate Professors Robert F. Butler, Karl W. Flessa, Jibamitra Ganguly, Austin Long, Timothy P. Loomis, H. J. Melosh (Planetary Sciences), Charles W. Stockton (Laboratory of Tree-Ring Research)

Assistant Professors Owen Davis, Christopher J. Eastoe, Susan M. Kidwell, Randall M. Richardson, Marc L. Sbar

Geosciences, or those sciences dealing with the study of the Earth, incorporate singularly or collectively the various fields of study which are applicable to an understanding of the formation and development of the chemical, physical, and biological aspects of the Earth. Academic and research pursuits in the geosciences lead toward a professional career in solving or helping to solve the current and projected issues dealing with land use, urban development, the search for energy sources, water, industrial and commercial minerals, and questions concerning earth processes involved in modern geologic studies.

The degree of Bachelor of Science in Geosciences is available with a major in geosciences and a concentration in geochemistry, geology or geophysics. The degree of Bachelor of Science in Education with a teaching major in earth science is offered through the College of Education; the Bachelor of Arts with a major in geosciences, through the College of Arts and Sciences. A Master of Science and Doctor of Philosophy with a major in geosciences are also available.

The requirements for the B.S. in Geos. and the earth science teaching major are specified in the College of Earth Sciences section of this catalog.

The major for the B.A.: Geos. 101a-101b; Math. 125a-125b, Chem. 103a-103b, 104a-104b, Phys. 103a-103b, and 180a-180b; further course requirements are flexible but normally should include Geos. 109, 221, 302, 315a-315b, and a field course or suitable equivalent. Approved 200 or higher level courses from geosciences, mathematics, chemistry, physics, biological sciences, computer science, engineering, and anthropology may be applied toward completion of the degree. The minor may be selected from one or more supporting or complementary areas. Double majors with other departments in the basic or allied sciences are encouraged.

The teaching minor: Twenty units of approved earth science courses, including Geos. 101a-101b, Astr. 110a-110b, and Atmo. 171.

Honors: The department participates in the Honors Program.

101a-101b.* Introduction to Geology (4-4) Development of the plate tectons model. History of the earth over the last five billion years. Modern concepts dealing with the origin of life and evolution. Lab. field trips.

103a-103b. Physical Geography (3-3) (Identical with Geog. 103a-103b)

104a-104b. Physical Geography Laboratory (1-1) (Identical with Geog. 104a-104b)

106. Survey of the Solar System (4) I II (Identical with Pty.S. 106)

107. Introduction to Mineralogy and Lithology (4) I GRD Crystallography, crystal chemistry, mineral recognition, genesis and characteristics of rocks and their recognition in hand specimen. 2R, 6L. Not open to geology majors or to students concentrating in geochemistry. P, 101a or 151; Chem. 103a-103b, 104a-104b. Anthony
109. Introduction to Crystallography and Mineralogy (5) II GRD Morphological crystallography; recognition of selected minerals in hand specimen; relation of properties of minerals to their internal structure; mineral genesis. 3R, 6L. P, 101a or 151; Chem. 103a-103b, 104a-104b. Anthony

112.* Foundations of Science: Geology (3) II GRD Current theories on earth processes, the applications of these processes to understanding man's physical environment, and the problems that remain to be solved. 2R, 3L. Field trips. Credit for 112 will not be allowed if a student has credit for 101a, 101b or 151. P. Chem. 112. Phys. 112. McCullough

151.* Physical Geology (2 to 3) I GRD Principles of physical geology for students majoring in hydrology, engineering, and agriculture. 2R, 3L. Field trips.

* Credit will be allowed for only one course in each of the following groups: 101a, 112, 151; 101 b, 112.
286 DEPARTMENTS AND COURSES OF INSTRUCTION

424. Paleomagnetism: Principles and Applications (3) GC II Physical basis for remanent magnetism in rocks, techniques of sample collection, measurements, and statistical treatment; review of polarity time scale, apparent polar wander, plate tectonics. P, Phys. 103b or 116. Butler

425. Methods in X-Ray Analysis (3) GC II Generation and properties of X rays; their application to X-ray diffraction techniques of the study of minerals and to chemical analytical methods based on X-ray fluorescence. 2R, 3L. P, Phys. 121. Anthony


435. Hydrogeology (3) GC I (Identical with Hydr. 435)


438. Biogeography (3) GC II (Identical with Ecol. 438)


450. Geomorphology (4) GC I Concepts of landform development, with emphasis on fluvial processes and environmental applications. 3R, 3L. Field trips. P, 101a or 151. Bull

454. Glacial and Quaternary Geology (3) GC II Glacial processes, landforms, and deposits. Physical aspects of Quaternary paleoenvironmental change and effects on fluvial, eolian, lacustrine, weathering, and mass movement processes. P, 101b or 151. Baker

457. Principles of Geochemistry I (3) GC I Equilibrium and kinetic chemical processes producing soils, natural waters, and chemical sediments. P, 101a or 151, 101b; Chem. 103b, 104b. Long

462. Introduction to Quaternary Ecology (3) GC I Methods and theories used in reconstructing vegetation and climate. Palynology, packrat middens, dendroclimatology. Field trip. (Identical with Anth. 462)

464a-464b. Introduction to Dendrochronology (3-3) GC Survey of tree-ring methods, theory and applications to archaeological dating, modern chronology and dendroclimatology. 2R, 3L. Field trips. (Identical with Anth. 464a-464b and WS.M. 464a-464b) Stokes

470. Introduction to Paleoecology (3) GC II Paleontologic approaches to the reconstruction of ancient environments, populations and communities. Evolution of communities through geologic time. 2R, 3L. Field trips. P, 225, 302. Flesa

475. Cenozoic Mammalian Faunas (3) GC II 1983-84 Continental Cenozoic stratigraphy and mammalian biochronology of North America and other continents. 2R, 3L. Field trips. P, 409. Lindsay

504. Geology of Arizona (3 to 4) GC Systematic coverage of Basin and Range province and Colorado Plateau geology as part of the Southern Cordillera, with emphasis on significant problems. Field trips. Consult dept. before enrolling for three unit option. Damon

505. Evidences of Past Climates (3) GC II Deductive factors used to determine past climates; interrelation between these factors and paleogeography. Smiley

507. Applied Multispectral Imagery (3) GC (Identical with G.En. 507)

509a-509b. Petrology (3-3) Earth composition; spatial and temporal distribution of rock types; application of physicochemical principles to magmatic and metamorphic processes. P, 405, Chem. 480a or CR. Loomis/Ganguly

512. Petrology of Sandstones (3) GC I Origin, deposition, and diagenesis of sandstones and other terrigenous sedimentary rocks; classification in hand specimens, detrital grains, and thin sections. 2R, 3L. Field trips. P, 405. Schreiber

514. Late Quaternary Geology (3) GC I How geologic processes affect environment; how late Pleistocene and Holocene paleoenvironments and geochronology have been inferred from stratigraphic records and geomorphology at key localities and archaeological sites. Field trips. P, 101b. (Identical with Anth. 514) Haynes

520. Meteorites (3) GC II 1984-85 (Identical with Pty.S. 520)

521. Analysis of Regional Geologic Structure (3) GC I Systematic analysis of the sum total of geologic structures within regional terranes. Emphasis on the strain significance of regional structure. Field trip. G. Davis

525. **Regional Tectonics (3)** I Methods of tectonic regionalization and integration based on litho-tectonic assemblages, tectono-stratigraphic terranes, and regional structural analysis. Discussion of types of orogenic systems, plate regimens and their kinematics, economic aspects regional tectonics. Coney

526. **Regional Tectonics of the North American Cordillera (3)** II Tectonic evolution of the North American Cordillera viewed through the model of plate and accretionary tectonics. Coney

527. **Advanced Geochemistry (3)** I Isotope and trace element geochemistry applied to problems in the origin of the Earth, magmas and mineral deposits, and the evolution of the crust-mantle system. P, 458. (Identical with Pty.S. 527)

528. **Nuclear Geology (3)** II 1984-85 Nuclear phenomena applied to the solution of geologic problems, with emphasis on radio isotope dating and isotope petrology. (Identical with Pty.S. 528) Damon

529. **Atomic Structure of Minerals (2)** I Physical and chemical properties of crystalline solids examined with regard to their internal structures; special emphasis on minerals. P, 405. Anthony

530. **Aquifer Mechanics (3)** I (Identical with Hydr. 535)

531. **Development of Groundwater Resources (3)** II (Identical with Hydr. 536)

532. **Advanced Ecology (2)** II (Identical with Ecol. 537)

533. **Soil Genesis (3)** II (Identical with S.W.E. 541)

534. **Ore Deposit Petrology (3)** II 1984-85 Orthomagmatic, porphyry base metal, skarn, and leached capping lithologic-mineralogic studies by petrographic microscope, electron probe, and advanced techniques. 1R, 6L, P, 425 or CR, 546a. Guilbert/Tilley

535. **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

536. **Theory of Ore Deposition (3)** II Application of physical chemistry and allied laboratory techniques to the problems of hydrothermal ore formation. P, Chem. 480a. Eastoe

537. **Geochemical Processes in Magma-Hydrothermal Systems (3)** II Migration of chemical components in natural fluid-rock systems are analyzed using the geochemical theory that represents irreversible, equilibrium and advection mass transfer. Norton

538a-546b. **Advanced Ore Deposit Geology (4-4)** Geology characteristics and origin of ore deposits in igneous, sedimentary, and metamorphic rocks. Labs. include field trips, analytical techniques, problem solving. 2R, 6L, P, 303, 405, Chem. 480a or CR. Tilley/Guilbert


541. **Quantitative Methods in Dendrochronology (3)** I 1984-85 Processing and evaluation of tree-ring data, with applications in climatology, ecology, hydrology, and archaeology. 2R, 3L, P, 464a-464b, Agri. 539. (Identical with Ws.M. 557) LaMarche


543. **Paleo-Indian Geochronology (3)** II (Identical with Anth. 561)

544. **Paleoecology and Man (3)** I Changing environments of the last 100,000 years; migration, extinction, and domestication in prehistoric time. 2R, 3L. Field trips. (Identical with Geog. 562) Martin

545. **Isotope Hydrology (3)** Theory and application of light stable and cosmogenic isotopes to hydrological and paleoenvironmental problems. Radiometric dating of ground water. (Identical with Hydr. 564) Long

545. **Isotope Geology (3)** II Theory and application of light stable isotopes to petrological, ore deposition, and geothermal processes. Long


547. **Inverse Problems in Geophysics (3)** I 1984-85 Linear inverse theory, including generalized and stochastic methods, with application to geophysical problems in seismology, gravity, geomagnetics and other areas. P, Math. 422b. (Identical with Pty.S. 567) Richardson

548. **Constitution and Evolution of the Terrestrial Planets (3)** I 1983-84 (Identical with Pty.S. 571)


550. **Quaternary Palynology (4)** II Theory and application of pollen to geology, biology, archaeology, and paleoecology; definition of information pollen sample record; experience in pollen extraction and identification. 3R, 4L. (Identical with Anth. 581)
584. Sedimentary Basins (3) II Sedimentologic, stratigraphic, structural, thermal, and diagenetic evolution of sedimentary basins in various plate tectonic settings, with emphasis on exploration for hydrocarbon resources. Field trips. Dickinson

585. Petrology of Carbonate Rocks (3) II Origin, depositional environments, and diagenesis of carbonate and associated chemical and biochemical sedimentary rocks. 2R, 3L. Field trips. P, 405. Schreiber

596. Seminar
  a. Petrography-Petrology (1 to 4) I II
  b. Structural Geology (1 to 4) I II
  c. Mineral Deposits (1 to 4) I II
  d. Petroleum Geology (1 to 4) I II
  e. Tectonics (1 to 4) I II
  f. Mineralogy-Crystallography (1 to 4) I II
  g. Vertebrate Paleontology (1 to 4) I II
  h. Paleontology (1 to 4) I II
  i. Paleoclimatology-Paleoenvironments (1 to 4) I II
  j. Geomorphology (1 to 4) I II
  k. Geophysics (1 to 4) I II
  l. Geomathematics (1 to 4) I II
  m. Sedimentology (1 to 4) I II
  n. Stratigraphy (1 to 4) I II
  o. Regional Tectonics (1 to 4) I II
  p. Hydrogeology (1 to 3) [Rpt. /2] I II (Identical with Hydr. 596p, which is home)
  q. General Geochronology (1 to 4) I II
  r. Quaternary Geochronology (1 to 4) I II (Identical with Anth. 596r)
  s. Sedimentary Petrography (1 to 4) I II
  t. Organic Geochemistry (1 to 4) I II
  u. Inorganic Geochemistry (1 to 4) I II
  v. Dendrochronology (1 to 4) I II
  w. Palynology (1 to 4) I II
  x. Paleobotany (1 to 4) I II
  y. History of Earth Sciences (1 to 4) I II
  z. Geophysical Data Handling (1 to 4) I II


651. Tectonic and Climatic Geomorphology (3) II 1984-85 Effects of tectonic movements and climatic changes on geomorphic processes, landforms, and soils; paleoclimatic and earthquake-hazards interpretations. 2R, 3L. Field trips (includes spring break field trip). Bull


GERMAN

Professors David J. Woloshin, Head, Jean R. Beck (Emeritus), Max Dufner, Renate A. Schulz
Associate Professors David H. Chisholm, Dennis I. Greene, Richard C. Helt, Babette Luz (Emerita), Roland Richter
Assistant Professor Pack Carnes
Lecturer John R. Wendel

The Department of German offers courses on German language, literature and culture. The department also offers courses in German, Scandinavian, and Yiddish literature in translation; and training for secondary-school and college teachers of German as well as for technical translators.

The degrees available are Bachelor of Arts and Master of Arts with a major in German, and Bachelor of Arts in Education and Master of Education with a teaching major in German.

The major: 24 units beyond 201b, including 315a-315b and 410b. Ger. 307a-307b is highly recommended.

The supporting minor must be selected with the assistance and approval of the major adviser.
The teaching major: 24 units beyond 201a-201b, including 302a or 302b, 307a-307b, 315a-315b, 410a-410b, 475a, and 479a-479b. The work done in the College of Education will include S.Ed. 493a, which carries up to ten units of credit. The student may proceed to student teaching as soon as the teaching major, which includes passing a qualifying examination in the German language, has been satisfactorily completed.

The department offers no teaching minor.

Honors: The department participates in the Honors Program.

101a-101b-101i. Elementary German (4-4-6) GRD 101i: I Intensive. 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.) Schulz

201a-201b-201i. Intermediate German (4-4-6) GRD Speaking, understanding, writing, and reading Ger. 201i: II Intensive. P, 101b or 101i. Both 201a and 201b are offered each semester. Helt

202a-202b. Intermediate German: Reading (4-4) Reading comprehension and basic translation skills using readings from social and natural sciences, arts, and humanities. Credit is allowed for this course or 201a-201b, but not for both. P, 101b or 101i or consult dept. before enrolling.

207a-207b. Conversation (2-2) GRD Intermediate course for students who wish to concentrate on spoken Ger. P, 101b.

208. Intensive Conversation (4) S Intensive training toward fluency in spoken German; emphasis on frequent idioms and conversational patterns dealing with contemporary life in Germany. Successful completion fulfills foreign language proficiency at 16-unit level. P, three semesters of college level German.

270a-270b. German Literature in Translation (3-3) Reading and discussion of representative works from the 13th century to the present. 270b: Emphasis on modern works since about 1800. Will not count toward fulfillment of language requirement or a major or minor in Ger. Dufner/Helt

302a-302b. Masterpieces in German Poetry and Prose (3-3) GRD Careful study of significant expressions in literature of German thought and life, with attention to periodic and individual differences in style. P, 201b. Helt

307a-307b. Advanced Conversation (2-2) GRD Intensive practice leading toward fluency in spoken Ger., using material based upon topics of current interest. P, 201b or 207b.

315a-315b. Oral Expression and Written Composition (3-3) GRD Review and practical application of important grammatical principles; vocabulary building. P, 201b or 207b. Richter

345. Yiddish Literature in Translation (3) I GRD Reading and discussion of representative works of Yiddish literature in English translation. (Identical with Or.S. 345) Woloshin

371. Scandinavian Literature in Translation (3) II GRD Outstanding works of Scandinavian poetry, drama and narrative prose read in translation to trace their development in relation to intellectual and social evolution of Denmark, Norway, and Sweden. Chisholm

400a-400b. History of German Literature (3-3) GC GRD Historical survey of German literary development from the beginning to the modern period; lectures in Ger., alternating with conferences in Engl. P, six units of upper-division Ger. Carnes/Greene

405. History of the English Language (3) GC I II (Identical with Engl. 405)

410a-410b. Cultural Development in Germany (3-3) GC GRD Social, political, religious, and artistic elements entering into the growth and development of Germany; lectures in English, with collateral reading in Engl. and Ger. P, six units of upper-division Ger. Dufner/Richter

426b. German Art (3) GC II (Identical with Art 426b)


475a-475b. Advanced Grammar and Stylistics (3-3) GC GRD Practical training in written Ger. through the study of the more complex refinements of German grammar and style, as found in representative documents. P, 315b. Richter

479a-479b. Problems of Teaching German (3-3) GC 479a: Modern methods of language teaching with emphasis on the particular problems presented by Ger. 479b: Emphasis on applied linguistics. Schulz


502a-502b. German Lyric Verse from the 16th to the 20th Century (3-3) 1984-85 Introduction to the principles and forms of poetry; analysis and interpretation of outstanding examples of German lyric verse from the 16th through the 20th century. P, 302a, 302b, 400a or 400b. Chisholm

503. Eighteenth-Century German Literature (3) II 1983-84 Klopstock, Lessing, Wieland, Goethe, Schiller, Hoelderlin and other authors. P, six units of upper-division Ger. Dufner
290 DEPARTMENTS AND COURSES OF INSTRUCTION

505a-505b. Nineteenth-Century German Literature (3-3) 1984-85 GRD A survey. P, six units of upper-division Ger. 505a is not prerequisite to 505b. Richter/Heit

507. Goethe's Faust (3) II 1984-85 A close reading of the poem and an introduction to some of the critical secondary literature. P, six units of upper-division Ger. Dufner

509a-509b. Modern German Literature (3-3) GRD 1983-84 Class and collateral reading, lectures and reports, partly in Ger. P, six units of upper-division Ger. 509a is not prerequisite to 509b. Greene

511a-511b. Middle High German (3-3) GRD 1984-85 Brief study of Middle High German grammar; selective readings from representative literary works of the period. P, 302b, 315b. Carnes

520a-520b. History of the German Language (3-3) GRD 1983-84 Introduction to Germanic philology; the development of the German language from its roots in the Indo-European language family to New High German. P, eight units of upper-division Ger. (Identical with Engl. 520a-520b)

525. Beowulf (3) II (Identical with Engl. 525, which is home)

527a. Studies in Medieval Language and Literature (3) (Identical with Engl. 527a)

594. Practicum
   a. Translation (2 to 5) [Rpt./3] P, 496a or departmental proficiency exam.

596. Seminar
   a. Germanic Linguistics (3) [Rpt.] I II (Identical with Engl. 596i, which is home)

597. Workshop
   a. Translation (3) [Rpt./3] I II P, competency at third-yr. undergrad. level or pass departmental placement test.

601a-601b. Materials and Methods of Research (2-2) Survey of the tools of literary and linguistic research and methods of dealing with research problems in Germanics.

696. Seminar
   a. Literature (2 to 4) I II
   b. Linguistics (2 to 4) I II (Identical with Engl. 696b)
   c. Folklore (2 to 4) I II (Identical with Engl. 696c)
   d. Pedagogy (2 to 4) I II
   e. Translation (2 to 4) I II

GERONTOLOGY

Committee on Gerontology
Professors William A. Stini (Anthropology), Chairman, Herbert E. Carter (Biochemistry), Victor A. Christopherson (Home Economics), William F. Denny (Internal Medicine), Louis J. Kettel (Internal Medicine), Dorothy I. Marquart (Psychology), Jack H. Wilmore (Physical Education)
Associate Professors Theodore H. Koff (Public Policy, Planning and Administration), Jessie V. Pergrin (Nursing), Roy G. Spece, Jr. (Law)
Assistant Professor J. Lyle Bootman (Pharmacy Practice), William L. Roberts (Family and Community Medicine)
Director of Interdisciplinary Programs John R. Edwards, Jr.

Because of its multidisciplinary nature, courses in gerontology are located in a number of departments. The Committee on Gerontology plays a facilitating role in the coordination and development of aging studies and will guide students who wish to include an emphasis in gerontology in their course of study. Although the Committee offers neither an undergraduate or graduate major it is possible for students to include an emphasis in gerontology in one of several ways. An undergraduate in the College of Arts and Sciences may satisfy requirements for the minor or for Subject Area III in general studies by following an approved gerontology curriculum. At the graduate level students interested in incorporating an emphasis in gerontology into their chosen minor should consult the Coordinator of the Committee on Gerontology as well as their departmental advisers. Graduate work with a strong gerontological focus is available in long term care administration (M.P.A.) and gerontological nursing (M.S.). Also at the graduate level, it is possible to obtain formal recognition for a gerontological emphasis through an 18-unit structured course of graduate study designed primarily for individuals planning to enter or to continue in a profession which involves provision of services and/or administration of programs for aging.
Courses identified as having content which deals specifically with elderly and with aging processes include: Anth. 470a-470b, Coun. 570, Gero. 694, 695a, C.D.F.R. 413, C.Sc. 436, Law 656, Med. 596bb, Nurs. 589, 600a-600b-600c, N.F.S. 538, 638, Ph.Ed. 422, Ph.Pr. 448, Psyc. 421, 435, P.P.P.A. 365, 394, 454, 466, 595c, 595d, 662, 693f, 696e, Rhab. 455, Soc. 406, Sp.H. 484, 554R, 554L, 596e.

Students wishing further information on study in gerontology should contact the Coordinator, Committee on Gerontology, Anthropology 316.

695. Colloquium
   a. Research in Gerontology (1) I II

GOVERNMENT
(See Political Science)

GREEK
(See Classics)

HEALTH EDUCATION
(See Health-Related Professions)

HEALTH-RELATED PROFESSIONS

Professors William H. King, David Wayne Smith
Associate Professors Sue Criswell, Kam Nasser, Pierre DeCoufle
Assistant Professors Lucinda A. Alibrandi, Paul R. Marques
Lecturers Marilyn Bever, Judith Nevin, Sr. Joann Thomas, Diane Woodworth, Deborah Wyckoff

The School of Health-Related Professions, an integral part of the Arizona Health Sciences Center, offers the Bachelor of Science in Health Sciences degree with majors in health education, medical technology, and occupational safety and health; the Master of Science degree with a major in addiction studies; and the Master of Education degree with a major in health education. For more detailed information on admission requirements, please see the General Divisions of the University section of this catalog.

Health-Related Professions

210. Introduction to the Health Field (3) I II Interdisciplinary course for the orientation of students to the various health sciences and current health-care concepts. (Identical with Micr. 210 and Rhab. 210)

301. Social Perspectives of Health Sciences (3) I II S Examination of the health sciences and their relationships with economic, political and cultural systems.

302. Introduction to Health Statistics (3) I II Introduction and application of statistics to the health sciences, including basic statistical methods, survey research, indices for health status, sources of health data, and research design.

460. Introduction to Epidemiology (3) GC I II Introduction to the purposes, principles, and methods of epidemiology.
564. **Principles and Methods of Epidemiology** (3) II Study of chronic diseases and mortality; indices of health, factor-disease associations; measures of disease frequency, study design, data analysis, and interpretation of results; discussion of basic biostatistical procedures.

### Addiction Studies

For admission and degree requirements, please see the *Graduate Catalog*.

197. **Workshop**  
a. Behavioral Health (1 to 2) [Rpt./6 units] I II S Taught off campus only.

405. **Introduction to Addiction Studies** (3) GC I II S Biological, medical, pharmacological, sociological and psychological aspects of addiction and addictive substances.

505. **Psychosocial Perspectives of Addictions** (3) I II Factors of addiction considered from psychosocial, cultural, and anthropological perspectives.

506. **Biomedical Perspectives on Psychoactive Drug Use** (3) I II Overview of psychophysiology and pharmacology relevant to abused drugs; discussion of health and ill health relevant to drug use.

509R. **Applied Management Treatment Strategies** (3)  
I Consideration of project and program planning, development, administration and grant writing. P, 505, 506 or CR.

509L. **Applied Management Treatment Laboratory** (1) I

519. **Research Design in Addictions** (2) I II P, 505, 506.

596. **Seminar**  
a. Psychosocial Research Issues in Addictions (2) I II P, CR 505.  
b. Biomedical Issues (2) I II P, CR 506.

694. **Practicum**  
a. Agency Visits (3) I Field trips.  
c. Agency Work II (2) I II S P, 694b.

### Health Education

Health education offers preparation for careers focusing on critical societal health problems.

**Requirements for admission to the nonteaching option:** Engl. 102, 103, Chem. 103a-103b, 104a-104b, Psyc. 100a-100b, Micr. 103, G.Bio. 103, 104, 159a-159b, N.F.S. 101, Hist. 178, Ph.Ed. 261, Math. 117e, six units from humanities/arts.

**Requirements for admission to the teaching option:** Engl. 102 or 103, 104, hum. option (six to eight units), Math. 116, G.Bio. 159a-159b, Psyc. 100a-100b, Chem. 101a, 102a, Hist. 130a or 130b, Hist. 178, 180, or 181, Pol. 110, N.F.S. 101.

**The teaching option:** 33 units, including Hist. 330, 430, 431, 432, 433, 434, 437, 440, and Micr. 357. The candidate for the degree with this major must also complete the following education courses: Ed.P. 311, Rdnng. 435, S.Ed. 225, 329, 330, 340, 417, 493a, and 494b.

Supporting courses required for students planning careers in community health education: Micr. 357, H.R.P. 301, P.P.P.A. 100, Soc. 100, G.Bio. 321, Ad.S. 405, H.R.P. 302, H.R.P. 460, O.S.H. 486a. Additional courses will be selected from an approved list, in consultation with advisers, according to students' individual needs and career objectives.

**The teaching minor in health education:** Twenty units, including 178, 180, or 181, 330, 433, 434, 437, and Ph.Ed. 261.

**The teaching minor in safety education:** Twenty units, including 180 or 181, 435, 436, Ph.Ed. 261, and electives selected from Mn.E. 304, 315, Fin. 251, 455, O.S.H. 410, 486a.

Students in the health education teaching option may select any of the approved College of Education teaching minors.

178. **Introduction to Health Science Education** (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.
180. **Secondary School Health Education** (3) I Emphasis on health science information pertaining to secondary school health instruction programs, community and individual health problems. Credit allowed for this course or 181, but not for both.

181. **Elementary School Health Education** (2) I II Emphasis on health science information applicable to elementary health education classes; for students preparing to teach in elementary schools. Credit allowed for this course or 180, but not for both.

330. **Human Sexuality** (3) I II Discussion of the basic aspects of human sexuality, including male and female reproductive physiology, congenital defects, venereal disease, myths and fallacies, variations of sexual response.

430. **Critical Analysis of Health Education** (3) GC I Analysis and evaluation of curriculum, new teaching techniques and administrative trends in health science education; critical discussion of issues, research publications, and current periodicals in the area of health education. P, 180 or 181.

431. **Field Work in Health Education** (3) GC I On the job participation and observation in health programs of public and voluntary health organizations. Open to health education majors only.

432. **Organization and Administration of School Health Education** (3) GC I Principles and techniques for organizing and administering school health programs; discussion of curriculum, facilities, personnel, school legislation, administrative problems.

433. **International Health Problems** (3) GC I Interprets the major health problems not only of the developed and emerging nations, but also the situations in underdeveloped countries; includes assistance programs by international health groups.

434. **Sex Education** (3) GC II Critical analysis of the current philosophy, principles, programs, problems, trends and basic issues in sex education on the elementary, junior high and high school levels.

435. **Safety Education and Accident Prevention** (3) GC II Analysis of accident prevention programs in schools, colleges, communities, and industry, with emphasis on specific protective measures pertaining to athletics, physical education, recreation, highway safety, and vocational training.

436. **Traffic Safety Education** (3) GC I II Principles of accident prevention and traffic survival education, with emphasis on the certification of secondary school teachers preparing to teach driver education and training.

437. **Contemporary Community Health Problems** (3) GC II Analysis of the concept of community health services, human ecology, and conservation of human resources, with emphasis on modern miasmas such as air, water, and noise pollution; sociological problems of alcohol, alcoholism, and drug abuse. P, 178.

440. **Survey of Health Education Literature** (3) GC II Examination of health education literature from ancient societies to present, including an analysis of current health literature from various professional, community, voluntary, public and international health organizations.

448. **Perspectives in Geriatrics for Health Professionals** (3) GC II (Identical with Ph.Pr. 448)

475. **Alcohol Abuse and Alcoholism** (1) GC S Review of the nature and ramifications of alcohol problems, as well as analysis of physical, psychological and social implications.

496. **Proseminar**
   a. Tobacco, Alcohol, and Narcotics (3) GC II

**Medical Technology**

Director: Dr. Sue Criswell

Medical technology is the health profession responsible for clinical laboratory analysis, including quantitative, qualitative, and morphological measurements which assist the physician in clinical diagnosis and treatment.

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

**Requirements for admission to the program:** Engl. 102 or 103, 104, Hum. 250 (or two hum. opt.)*, soc. sci. (twelve units)*, ph.ed. (two units), Math. 117e and 118 or 125a, 263, C.Sc. 115 or S.I.E. 272, Chem. 103a-103b, 104a-104b, 241a-241b, 243a-243b, G.Bio. 159a-159b, Phys. 102a-102b, 180a-180b, Micr. 110. In addition, the following courses are required: Chem. 322, 323, N.F.S. 406a-406b or Chem. 460 and Micr. 460 and Micr. 450, V.Sc. 423, Micr. 419, 420.

The major: 49 units as follows: 387, 481a-481b, 482a-482b, 483a-483b, 484a-484b, 485, 496a.

*See College of Arts and Sciences section of this catalog.
Problems in Medical Technology (3) II Medical lab. procedures and theory. 2R, 3L.

Clinical Laboratory: Hematology (6-4) GC [Rpt./1] S Basic hematology and hematological procedures including cell structure and function, inherited and acquired anomalies, hemostasis, cell enumeration and differentiation, cytogenetics. P, committee permission.

Clinical Laboratory: Immunology and Immunohematology (4-4) GC [Rpt./1] Serological methods used in the clinical laboratory and interpretation of results; blood banking procedures. P, committee permission.

Clinical Laboratory: Chemistry (6-6) GC [Apt./-1] Fundamental concepts of clinical laboratory chemistry including pathophysiology and clinical correlations. P, committee permission.

Clinical Laboratory: Microbiology and Parasitology (6-6) GC [Rpt./1] Clinical laboratory techniques to safely and accurately culture or isolate and identify pathogenic organisms; physiological consequences of parasitism and the role of the laboratory in treatment. P, committee permission.

Clinical Laboratory: Sciences (2) GC [Apt./1] I II Basic principles of instrumentation, laboratory mathematics, biostatistics, quality control, toxicology, nuclear medicine, laboratory management and laboratory safety. P, committee permission

Clinical Laboratory: Sciences (2) GC [Apt./1] II Basic principles of instrumentation, laboratory mathematics, biostatistics, quality control, toxicology, nuclear medicine, laboratory management and laboratory safety. P, committee permission

Proseminar
a. Senior Proseminar (2) II P, 387.

OCCUPATIONAL SAFETY AND HEALTH

The occupational safety and health program is concerned with training students in the recognition, evaluation and control of environmental factors and stresses arising from the work place and causing sickness, impaired health and well-being, or significant discomfort and inefficiency among workers or citizens of the community.

Students may elect a concentration in industrial hygiene or industrial safety.

Requirements for admission to the program: Engl. 102 or 103, 104, 308, H.R.P. 210, hum. option (four units)*, Sp.C. 112, Psyc. 100a-100b, Econ. 210, soc. sci. (three units)*, S.I.E. 170, Math. 117e, 125a-125b, Chem. 103a-103b, 104a-104b, 241a, 243a, G.Bio. 159a, Phys. 102a-102b or 103a-103b, 180a-180b, ph.ed. (two units).

The major: 69 units, including H.R.P. 301, 302, 460, O.S.H. 402, 410, 412, 486a-486b, 488, 495a or 499, Chem. 322, 323, 324, C.E. 479, S.I.E. 310, Tox. 452, 454, and twenty-one units of approved electives.

*See College of Arts and Sciences section of this catalog.

Industrial Hygiene Instrumentation and Analysis (3) GC II Introduction to field sampling instruments, concepts, quality control, and statistical analysis, with emphasis on instrument selection and calibration. 2R, 3L. P, Chem. 322, 323, O.S.H. 486a, CR Chem. 324.

Physical Exposures (3) GC II Recognition, evaluation, and control of physical exposures, including radiation, noise, vibration, and heat stress. Student is required to recognize potential exposures, use correct instrumentation to collect and evaluate data, and develop controls. 2R, 3L. P, O.S.H. 486a.

Hazardous Materials (3) GC II Recognition, evaluation, and control of exposure to environmental and industrial air contaminants. Students must submit a paper detailing hazards associated with a particular chemical. P, O.S.H. 486a.

Industrial Toxicology (2) GC II (Identical with Tox. 454)

Applied Industrial Safety (3) GC II Thorough study of technical safety topics such as fire technology, systems safety, manual materials handling; selected topics in construction and manufacturing safety. P, 486b.

Colloquium
HEALTH SERVICES ADMINISTRATION

(See Public Planning, Policy and Administration)

HEBREW

(See Oriental Studies)

HIGHER EDUCATION

Center for the Study of Higher Education

Professors Larry L. Leslie, Director, Don L. Bowen (Public Policy, Planning and Administration), Vine Deloria, Jr. (Political Science), Arthur T. Grant, Fred F. Harcleroad, Lawrence O. Nelson (Educational Foundations and Administration), F. Robert Paulsen (Educational Foundations and Administration)

Associate Professors Clifton F. Conrad, Donal M. Sacken (Educational Foundations and Administration)

The major objectives of the Center for the Study of Higher Education are the development and dissemination of knowledge about higher education policy and operation; instruction at the graduate level leading to graduate degrees; facilitation of research by faculty members and students; and research studies and service activities for state and institutional needs and national, international, and regional governmental units and organizations.

The Center offers programs leading to the Master of Arts, Master of Education, Doctor of Philosophy, and Doctor of Education degrees with a major in higher education. For admission and degree requirements, please see the Graduate Catalog.

560. 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.

602. Foundations of Student Personnel Work in Higher Education (3) I (Identical with Coun. 602)

607. The College Student (3) I (Identical with Coun. 607)

609. Organization and Administration in Higher Education (3) I Organizational theory, structures, systems, and administrative procedures in varied higher education institutions; patterns of governance and policy development.

610. History and Philosophy of Higher Education (3) II Historical backgrounds and philosophical bases for higher education from early beginnings, through the medieval period, the Renaissance and the Enlightenment, to the modern day.

615. Adult Learning and Development (3) I (Identical with Ed.P. 615)

617. Student Personnel Services in Higher Education (3) II (Identical with Coun. 617)

620. Curriculum in Higher Education (3) II Early classical curriculum; development and administration of general education and professional studies; modern curriculum developments and innovations.

621. Teaching in Higher Education (3) II Planning, organizing, and evaluating learning experiences for mature students.

625. Administration of Academic Programs (3) I Administration of all phases of the academic area, including curriculum, personnel, facilities, financing, planning, evaluation and accreditation, with attention to newer delivery systems, nontraditional education, contract plans and potential future developments. Field trips. P, 601 or 609.
630. **Continuing Education** (3) I 1983-84 Development and future trends in continuing education programs in higher education; cultural, social and economic factors affecting continuing education; characteristics of students and programs.

640. **Institutional Research and Planning** (3) I Development of institutional research programs for short-term and long-term planning; input and output measures.

641. **Computer Applications in Higher Education** (3) II Administrative uses of computers in higher education institutions; teaching with computers; computer as a research tool; information networks; public service applications. Field trips.

650. **Higher Education Finance** (3) I Historical patterns of financing private and public higher education; current sources and types of financial support; alternative methods of financing; social benefits and consumer theories. Field trips.

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. Field trips.

675. **The Law and American Education** (3) I (Identical with Ed.F.A. 675)

677. **Higher Education and the Law** (3) II Critical court decisions, past and present, affecting higher education; increasing role of the courts in decision making and policy development. Field trips. P, 601, 609, 610, 620 or 650, (Identical with Ed.F.A. 677)

693. **Internship**
   a. Administrative Internship (3 to 9) I II
   b. Instructional Internship (3 to 8) I II Biweekly seminar meetings required. P, bachelor’s degree plus twelve units, 621 (for students without a subject-field methods course), 615, 560.

695. **Colloquium**
   a. Community College Developments (1 to 3) I 1983-84 Field trips.
   b. Public Policy Issues in Higher Education (1) [Rpt.] I II
   c. Community Colleges in the Future (1) [Rpt.] II

696. **Seminar**
   a. Community College Administration (3) I II Field trips.
   d. Governance and Coordination (3) I II Field trips.

697. **Workshop**
   a. Collective Negotiations (1 to 3) I II Identical with Ed.F.A. 697a, which is home

796. **Seminar**
   a. Research in Higher Education Administration (3) I II Open to majors only.

**HINDI**

(See Oriental Studies)

**HISTORY**

Professors Donald Weinstein, **Head**, Ludwig W. Adamec (Oriental Studies), Herman E. Bateman (Emeritus), Robert P. Browder, Paul A. Carter, William G. Dever (Oriental Studies), Leonard Dinnerstein, James Donohoe, John W. F. Dulles, Harwood P. Hinton, Ursula Lamb, Murdo MacLeod, James M. Mahar (Oriental Studies), John V. Mering, Michael C. Meyer, Roger L. Nichols, J. Gregory Oswald, Thomas W. Parker (Emeritus), Boyd Shafter (Emeritus), Jing-shen Tao (Oriental Studies), J. Robert Vignery


Assistant Professors Karen Anderson, Michael E. Bonine (Oriental Studies), Douglas C. Chen (Oriental Studies), Richard M. Eaton (Oriental Studies), Timothy Lenoir, Kurt Yoshihiro Kuriyama (Oriental Studies), Norman Yoffee (Anthropology)

Lecturer William R. Noyes
The Department of History offers courses designed to provide broad perspectives on the human past, with more specialized instruction in particular areas and periods, and with theoretical and practical training in historical research.

The department offers the degrees of Bachelor of Arts, Master of Arts and Doctor of Philosophy with a major in history. A Bachelor of Arts in Education and a Master of Education with a teaching major in history are also available. For information on graduate degrees, please see the Graduate Catalog.

The major: 33 units, including 296a, three units in a course dealing with the period before 1500, and six units in each of three of the following areas: United States, Latin America, Europe, and comparative history. (Hist. 228a-228b, 247, 430, 458, and other courses the department may approve, including many special topics courses, may be counted toward the comparative area.) No fewer than fifteen units must be upper-division. No more than three units of independent study or six units of internship may be applied toward the major. Hist. 101a-101b or 104a-104b, but not both, may be applied toward the major.

The supporting minor should be selected from foreign languages, the humanities, the social sciences, and other subjects as may be individually justified.

The teaching minor: 21 units, including 101a-101b or 104a-104b, 130a-130b, 170a-170b, and one upper-division course in United States history.

Honors: The department participates in the Honors Program.

101a-101b. Introduction to the History of the Western World (3-3) CDT A survey of Western development from antiquity to the present, with emphasis on social and political institutions. 101a is not prerequisite to 101b.

104a-104b. Introduction to Western Civilization (3-3) A consideration of the cultural heritage of the West, with emphasis on art, philosophy and religion. 104a is not prerequisite to 104b.

117a-117b. History of England (3-3) Survey of the development of political, social, legal, and constitutional institutions in England from Roman Britain to the present. 117a is not prerequisite to 117b. Cosgrove

130a-130b. History of the United States (3-3) CDT Political, economic, and social history of the American people from the founding of colonial Jamestown in 1607 to world leadership in the 1970's. 130a is not prerequisite to 130b.

160. Colonial Latin America from 1492 to 1810 (3) I From the discovery through the Wars of Independence. Brubaker

161. The Latin American Republics, 1810 to the Present (3) II Struggle for political, social, and economic stability; international relations; cultural patterns. Brubaker

170a-170b. Introduction to Asian Civilizations (3-3) (Identical with Or.S. 170a-170b)

171. Ancient Civilizations of the Near East (3) (Identical with Or.S. 171)

172. Islamic Civilization: Traditional and Modern Middle East (3) (Identical with Or.S. 172)

204a-204b. The Ancient World (3-3) Emergence of civilization in the Aegean Bronze Age; history and culture of Greece; rise of Rome and its dominance of the Mediterranean world. 204a is not prerequisite to 204b. (Identical with Clas. 204a-204b) de Laix

214a-214b. History of Modern Europe (3-3) Emphasis on political, social and economic developments. 214a: From the Renaissance to Waterloo. 214b: From the Congress of Vienna to the present. 214a is not prerequisite to 214b. Sewell

215. The Two World Wars (3) I The origins and consequences of World War I and World War II. Oswald

228a-228b. The Evolution of Scientific Thought (3-3) The growth of scientific thought and achievement from antiquity to the 20th century, with emphasis on the social, cultural and intellectual factors instrumental in shaping modern science. 228a is not prerequisite to 228b. Lenoir

230. The History of Black America (3) I History of the Blacks in the United States from their African origins until the present. (Identical with Bl.S. 230)

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 M.A.S. 233)

236. Indians in U.S. History (3) II 1983-84 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. Nichols

244. Western America (3) Survey of the patterns of American expansion and settlement in the western United States. Nichols

245. Frontier America (3) Survey of the patterns of frontier expansion and settlement in the eastern and mid-western United States. Nichols
247. **Science and Society** (3) I The historical impact of science on society; selected examples of the interaction of science with religion, politics, art, literature, and social thought from the 16th century to the present. Lenoir

252. **American Ethnic History** (3) II A history of the various ethnic minorities in America from Colonial times to the present, with emphasis on adjustment, acculturation and degrees of assimilation. (Identical with BI.S. 252) Dinnerstein

253a-253b. **History of Women in the United States** (3) Changing role of women in American society from Colonial times to the present. (Identical with W.S. 253a-253b) Anderson

268. **Colonial Mexico** (3) I From discovery through the War for Independence. (Identical with M.A.S. 268) MacLeod/Meyer

269. **Mexico since Independence** (3) II Struggle for political, economic and social stability; international relations, cultural patterns. (Identical with M.A.S. 269) Meyer

296. **Proseminar**
   a. **Nature and Practice of History** (3) I II

347. **The Old South** (3) Social and political history from Jamestown to secession. (Identical with BI.S. 347) Gaines

348. **The South Since the Civil War** (3) From the Civil War to the present. (Identical with BI.S. 348) Mer- ing

370a-370b. **History of the Jews** (3-3) (Identical with Or.S. 370a-370b)

372a-372b. **History and Religion of Israel in Ancient Times** (3-3) (Identical with Or.S. 372a-372b)

374. **The Holocaust** (3) II 1984-85 (Identical with Or.S. 374)

375a-375b. **History of China** (3-3) (Identical with Or.S. 375a-375b)

401. **Ancient Mesopotamia** (3) GC 1984-85 (Identical with Anth. 401)

402. **History of Biology** (2) GC II Great writings in biology and medicine. (Identical with G.Bio. 402) Lenior

403a-403b. **History of Greece** (3-3) GC 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) de Laix

404a-404b. **History of Rome** (3-3) GC 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) de Laix

405a-405b. **Medieval Europe** (3-3) GC Major institutions and trends in Europe from the breakup of the Roman World to the 15th century. 405a is not prerequisite to 405b. (Identical with Reli. 405a-405b) Bernstein

406. **Medieval England** (3) GC I From the Roman conquest to the War of the Roses, with emphasis on political, economic, and cultural developments. Bernstein

407. **Intellectual History of Medieval Europe** (3) GC II Fusion of the Greco-Roman, Christian, and German traditions and analysis of major medieval cultural and intellectual achievements. (Identical with Reli. 407) Bernstein

408. **The Renaissance** (3) GC I Social, economic, cultural, and religious history of the 14th and 15th centuries; humanism, artistic revolution, and new world discoveries. (Identical with Reli. 408) Weinstein

409. **The Reformation** (3) GC II Social, economic, cultural, and religious history of the 16th and early 17th centuries; the Protestant revolt, Catholic Reformation and Counter-Reformation. (Identical with Reli. 409) Weinstein

412a-412b. **Intellectual History of Modern Europe** (3-3) GC Dominant themes in European intellectual history from the end of the Middle Ages to the Great War, with reading and discussion of texts taken from Petrarch and Ficino to Nietzsche and Freud. 412a is not prerequisite to 412b. Donohoe

413. **War and Peace in Europe** (3) GC II European background to contemporary international relations from the Congress of Vienna through the outbreak of World War II. Browder

416. **Tudor-Stuart England** (3) GC I An intensive study of English history from the accession of Edward IV to the Hanoverian dynasty. (Identical with Reli. 416) Cosgrove

417. **History of Modern Britain** (3) GC II An intensive study of English history from the accession of George III to the present. Cosgrove

418. **France under the Old Regime, 1589-1789** (3) GC I French political development, institutions, and culture from Henry IV to the eve of the French Revolution. Vignery

419. **The French Enlightenment** (3) GC I Cultural history of France in the 18th century, with emphasis on the works of the philosophes. Vignery

420. **The French Revolution and Napoleon** (3) GC II The origins and progress of the Revolution in France. Vignery
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>General Education Core</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>421a-421b</td>
<td>Modern Germany (3-3) GC Political, social, and intellectual history from the end of the Thirty Years War to the end of World War II. 421a is not prerequisite to 421b. Donohoe</td>
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<tr>
<td>422a-422b</td>
<td>Russia before the Bolshevik Revolution (3-3) GC Political, social, economic and cultural developments from the founding of the Russian state to 1917. 422a is not prerequisite to 422b. Kellogg</td>
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<td>423</td>
<td>Intellectual History of Russia (3) GC II The historical significance of social, political, and revolutionary thought in 19th- and 20th-century Russia. Oswald</td>
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<tr>
<td>424</td>
<td>The Russian Revolutions (3) GC I The era of reform and revolutions in Russia from 1890 to 1921, culminating in the formation of the Soviet regime. Browder</td>
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<tr>
<td>425</td>
<td>History of the Soviet Union (3) GC I The Bolshevik Revolution and problems of Soviet Russian history from 1917 to the present. Oswald</td>
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<td>426</td>
<td>Diplomatic History of the U.S.S.R. (3) GC II Problems and personalities in 20th-century Soviet diplomatic history. Oswald</td>
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<tr>
<td>427</td>
<td>Russian-American Relations: 1781 to the Present (3) GC II Diplomatic, social, economic and cultural relations between Russia and the United States. Browder</td>
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<tr>
<td>428</td>
<td>History of Byzantium (3) GC II Social, political, and cultural history of Byzantium and its impact on Europe and Asia Minor, A.D. 325-1453. (Identical with Clas. 428)</td>
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<tr>
<td>429</td>
<td>The Scientific Revolution, 1500-1700 (3) GC II The individuals, theories, and institutions that contributed to the rise of early modern science, in their relation to the intellectual and cultural trends of the period. Lenoir</td>
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<tr>
<td>430</td>
<td>Discovery and Exploration of the New World (3) GC I Voyages, trade and territorial acquisitions in America from Columbus to Captain Cook. Lamb</td>
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<tr>
<td>431</td>
<td>Colonial America (3) GC I The experience and evolving institutions of the North Atlantic colonists from the first landings to the end of the French and Indian War. Marietta</td>
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<tr>
<td>432</td>
<td>The Era of the American Revolution (3) GC II Origins, progress, and character of the struggle against Great Britain; internal political, constitutional, social, and economic developments; the problems of the &quot;Critical Period&quot; and the making of the Constitution. Marietta</td>
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<td>433</td>
<td>Jefferson and the New Nation, 1790-1825 (3) GC I The Federalists and the rise of the Republican party; a biographical, economic, political and social history of the early North, South and expanding West. Gaines</td>
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<td>434</td>
<td>The Jacksonian Era, 1825-1850 (3) GC I Political, social and economic developments in the United States from the adoption of the Monroe Doctrine through the Mexican War. Gaines</td>
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<td>435</td>
<td>The Coming of the Civil War, U.S. 1845-1861 (3) GC I Political, constitutional, social and economic developments in the U.S. from the Mexican War through the Civil War. (Identical with Bl.S. 435) Mering</td>
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<td>436</td>
<td>Civil War and Reconstruction, U.S. 1861-1878 (3) GC II Political, constitutional, economic, and military developments in the U.S. and the Confederacy during and after the Civil War. (Identical with Bl.S. 436) Mering</td>
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<td>437</td>
<td>U.S. 1876-1919 The Gilded Age and Progressive Era (3) GC Examination of economic, social and political developments in years of rapid industrialization from the end of Reconstruction through World War I. Carter</td>
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<tr>
<td>438</td>
<td>U.S. 1918-1945 From World War I through World War II (3) GC Prosperity, Depression and the New Deal in peace and war. Carter</td>
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<td>439</td>
<td>United States: 1945 to Present (3) GC I II American society and the role of the United States in world affairs from the Yalta Conference to the present. Dinnerstein/Schaller</td>
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<tr>
<td>442a-442b</td>
<td>History of American Society and Thought (3-3) GC Thought, arts, and agencies of cultural life from the 17th century to the present. 442a is not prerequisite to 442b. Carter</td>
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<tr>
<td>446</td>
<td>History of Arizona (3) GC I The history of Arizona from the entrance of the Spaniards in 1539 to its emergence as a modern state in the Southwest. Hinton</td>
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<tr>
<td>449a-449b</td>
<td>History of American Foreign Relations (3-3) GC 449a: A study of the American people in an Atlantic community during the 18th and 19th centuries. 449b: An examination of the United States as a world power in the 20th century. 449a is not prerequisite to 449b. Schaller</td>
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<tr>
<td>451</td>
<td>The United States and East Asia: 1840 to the Present (3) GC II 1984-85 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. (Identical with Or.S. 451) Schaller</td>
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<tr>
<td>453</td>
<td>History of Women and Work (3) GC I History of women and work in western and non-western nations from prehistoric times to the present. (Identical with W.S. 453) Anderson</td>
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<td>458</td>
<td>Feminism: A Comparative History (3) GC II International history of feminism as an ideology and a political movement from the 17th century to the present. (Identical with W.S. 458) Anderson</td>
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<td>459</td>
<td>Historical Archaeology (3) GC II (Identical with Anth. 459)</td>
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</table>
300 DEPARTMENTS AND COURSES OF INSTRUCTION

460. **History of the Hispanic Borderlands** (3) GC II The Spanish and Mexican experience in the Southwest from the 16th century to 1848. (Identical with M.A.S. 460)

461. **The Iberian Empires** (3) GC II The political and economic structure of the Spanish and Portuguese empires in America from Cortes to Bolivar. MacLeod

462. **Intellectual History of Latin America since 1810** (3) GC II 1984-85 Latin American thought from Independence to the 20th century; major Latin American thinkers and writers, and influences from Europe and the United States. Brubaker

463. **Marxism in East Asia** (3) GC I (Identical with Or.S. 463)

464. **History of Argentina** (3) GC I Survey of Argentine history and culture from the colonial era to the present. Guy

466a-466b. **History of Brazil** (3-3) GC Brazil's political, economic, social and intellectual development. 466a: Colonial origins to World War I. 466b: World War I to the present. 466a is not prerequisite to 466b. Guy/Dulles

467. **Contemporary Latin America** (3) GC II Revolution, social change and reaction in Latin America from 1930 to the present. Guy

468. **Asia and the West** (3) GC I (Identical with Or.S. 468)

471. **Introduction to Indic Civilization** (3) GC I (Identical with Or.S. 471)

472. **History of Medieval India** (3) GC I (Identical with Or.S. 472)

473. **History of Modern India and Pakistan: 1750-Present** (3) GC II (Identical with Or.S. 473)

474a-474b-474c. **History of Japan** (3-3-3) GC (Identical with Or.S. 474a-474b-474c)

475a-475b-475c-475d-475e. **Periods in Chinese History** (3-3-3-3-3) GC (Identical with Or.S. 475a-475b-475c-475d-475e)

476. **Modern Chinese History** (3) GC (Identical with Or.S. 476)

477a-477b. **History of the Middle East** (3-3) GC (Identical with Or.S. 477a-477b)

478. **Modern History of the Middle East** (3) GC I (Identical with Or.S. 478)

479. **The Ottoman Empire to 1800** (3) GC II 1984-85 (Identical with Or.S. 479)

480a-480b. **History of Iran and Central Asia** (3-3) GC (Identical with Or.S. 480a-480b)

482. **Social History of China** (3) GC (Identical with Or.S. 482)

489. **Women in East Asia** (3) GC I (Identical with Or.S. 489)

495. **Colloquium**
   a. Revolution in Chinese History (3) GC II (Identical with Or.S. 495a, which is home)
   b. Studies in Black America (3) GC I II (Identical with Bl.S. 495b)
   c. The Mexican American (3) GC I II (Identical with M.A.S. 495c)

496. **Proseminar**
   a. Historical Research and Writing (3) GC I II

505. **Colloquium**
   Certain colloquia in Oriental studies may be used for hist. grad. credit.
   a. Advanced Studies in United States History (3) I II
   b. Advanced Studies in Latin American History (3) I II
   c. Advanced Studies in European History (3) I II
   d. Applied History (3) I Field trips. (Identical with L.A.S. 595d)
   e. Advanced Studies in the History of Women (3) I II GRD (Identical with W.S. 595e)

506. **Seminar**
   Certain seminars in Oriental studies may be used for hist. grad. credit.
   a. Colonial U. S. History (3) I II
   b. Nineteenth-Century U. S. History (3) I II
   c. Twentieth-Century U. S. History (3) I II
   d. Ancient History (3) I II
   e. Medieval Europe (3) I II
   f. Early Modern Europe (3) I II
   g. Nineteenth-Century Europe (3) I II
   h. Twentieth-Century Europe (3) I II
   i. Colonial Latin America (3) I II
   j. Latin America: Modern Period (3) I II
   k. Historical Writing and Editing (3) I II
   l. History of Science (3) I II

507. **Workshop**
   a. College Teaching (1) I
HISTORY AND PHILOSOPHY OF SCIENCE

Committee on History and Philosophy of Science (Graduate)

Professors Leon Blitzer (Physics), William A. Longacre (Anthropology)
Associate Professors Henry C. Byerly (Philosophy), Chairman, Robert M. Harnish (Philosophy), Richard E. Michod (Ecology and Evolutionary Biology)
Assistant Professor Timothy Lenoir (History)

History of science deals with the origins and development of the human quest for understanding of the world in which we live. Philosophy of science treats the logical analysis of scientific reasoning, the clarification of fundamental scientific concepts, and methodological problems common to many fields of inquiry.

The committee offers a Doctor of Philosophy minor in the history and philosophy of science. For admission and degree requirements, please see the Graduate Catalog.

HOME ECONOMICS

Professors Robert R. Rice, Director, Victor A. Christopherson, Jean Ruley Kearns, Amy Jean Knorr, Alice B. Lowell (Emerita), Doris E. Manning, Naomi A. Reich, Carl A. Ridley, George Sproles, Mary Adele Wood (Emerita)
Associate Professors Arthur Avery, James R. Hine, Roger M. Kramer, Mary H. Marion, Mary Jean Wylie
Assistant Professors Kitty Abraham, Ellen Goldsberry, William Fasse, Donna Iams, Elizabeth Kendall, Leanne Lamke, Shirley J. O’Brien, Chet Ross, Luan Stewart, Mari Wilhelm, Mary E. Wyant
Instructors Brenda Brandt, Patricia L. Wylie
Lecturer Patricia Otten
Extension Specialists Beryl J. Burt, Bernice Epstein, Norma Redeker, Corinne I. Stinson (Emerita), Frank R. Williams

The School of Home Economics strives to research, create, and apply knowledge to improve the well-being of families and individuals and increase understanding of the reciprocal relationships among individuals, families, and their several environments. It deals with social, economic, aesthetic, managerial, health, and ethical aspects of family relations, child development, clothing, and housing.

The school offers the Bachelor of Science in Home Economics with majors in child development and family relations (emphasizing family studies, child studies, or a combination of the two); clothing and textiles; consumer service in food*; consumer studies and home management; early childhood education; food service management*; general home economics; home economics and journalism; home economics education; home economics extension education; human nutrition and dietetics*; interior design (design track or merchandising track); and merchandising and fashion promotion. A Master of Science with majors in dietetics*, home economics, and home economics education is also available, as are the Master of Education with a major in home economics and the Master of Home Economics Education with a major in home economics education.

*These majors are currently under review. For information contact the Department of Nutrition and Food Science.

Home Economics

129. Professional Development (3) I II Knowledge and attitudes generally needed by professionals in home economics or related fields; exploration of careers and cross specialization concepts.

696. Seminar
   z. Home Economics (1 to 3) [Rpt. / 1] I II
Child Development and Family Relations

Professor Ridley, Chairperson of the Division

The Division of Child Development and Family Relations focuses on generation and dissemination of basic and applied knowledge concerned with human development and family relations throughout the life span. Students major either in child development and family relations or in early childhood education, and may elect courses in consultation with faculty members to reflect additional emphasis in one of the following areas: child studies, family studies, or a combination of the two. The early childhood education major leads to certification for public school teachers. The Human Development Laboratory offers an excellent opportunity for practicum experiences.

The major in child development and family relations: Freshman year — Fall semester: Engl. 101 or 103; h.ec. 129; psyc. 100a; c.d.f.r. 117; humanities elective (3 units); ph.ed. (1 unit). Spring semester: Engl. 102; soc. 100; math. 116; *c.d.f.r. elective; **elective (3 units); ph.ed. (1 unit).

Sophomore year — Fall semester: c.d.f.r. 223; bio. or phys. sci. or math. (3-4 units); humanities elective (3 units); *c.d.f.r. elective; **elective (3 units). Spring semester: c.d.f.r. 247; humanities elective (3 units); communications (3 units); *c.d.f.r. elective; **elective (3 units).

Junior year — Fall semester: bio or phys. sci. or math. (3-4 units); Engl. 308; c.d.f.r. 337; *elective (3 units); electives (6 units). Spring semester: communications (3 units); beh. and soc. sci. elective (3 units); *c.d.f.r. elective; **elective (3 units); ***elective (3 units); elective (3 units).

Senior year — Fall semester: h.ec. elective outside major (3 units); *c.d.f.r. elective; **elective (3 units); ***elective (3 units); elective (3 units). Spring semester: c.d.f.r. 457; **elective (3 units); ***elective (3 units); electives (6 units).

*10-12 units to be chosen from 137, 327, 347R, 347L, 407, 427, 447, 467, 487; or n.t.s. 101; or c.s. 416; or h.e.e. 448.

**21 units to be chosen from anth., educ., h.ec., i.i.s., ph.ed., (non-activity course), psyc. p.p.p.a., soc.

***9 units from one area: humanities, behavioral and social sciences, or biology and physical sciences.

The major in early childhood education: In addition to the requirements listed under the College of Education section of this catalog, majors must take H.Ec. 129 and an upper-division h.ec. course outside the major, plus electives for a total of 130 units.

117. Human Development and Relations (3) I II Behavioral science approach to personal development and interpersonal competence through the life span.

137. Education for Marriage (3) I II Practical study of factors involved in courtship, mate selection, marital adjustment, and parenthood.

223. Child Development (3) I II Growth, development, and socialization of the child within the family setting, from conception to the middle school years; observations of infants and preschoolers. P, Psyc. 100a.

247. Adolescence (3) I II Growth, development and socialization of the child from the middle school years through adolescence. P, Psyc. 100a.

317. Women in Contemporary Society (3) I Interdisciplinary examination of women in families and society; review of recent research and analysis of selected topics: life styles, biology, artistic and professional roles; theological, moral, and legal views of status of women. (Identical with W.S. 317)

327. Parent Education and Guidance (3) I Theoretical perspectives and current literature applying to child guidance and parent education; practical considerations of principles and procedures involved in parent study programs. P, 117 or 223.

337. Family Relations (3) I II The modern family and its relationships. Comparative, functional, and institutional factors are examined.

347R. Preschool Education (2) I II Basic course in methods of teaching young children in groups; art, literature, music, science and play materials. P, 117 or 223.

347L. Preschool Education Laboratory (2) I II Preschool lab. experience. 1R, 3L. P, 327, 347R.

407. Problems in Child Development (3) GC II 1984-85 Special child-rearing contexts in contemporary society; poverty, minority group membership, social change, and special developmental considerations.

413. Issues in Aging (3) GC II Introductory course in gerontology, with emphasis upon contemporary issues.
427. Problems in Marriage and the Family (3) GC II 1983-84 Identification and analysis of major problem areas in marriage and the family, including economic, sexual, role conflict, emotional disorders, and childrearing.

447. Advanced Child Development (3) GC I In-depth examination of various dimensions of human growth and development. P. 223; 6 units of psyc.

457. Bio-Social Determinants of Socialization (3) GC II Bio-social factors related to socialization and the influence of various subcultures and contexts upon child-rearing practices. P. 223; 6 units of child dev. or soc. or psyc. (Identical with Soc. 457)

487. Readings in Family Relations (3) GCII 1984-85 Critical analysis of selected studies and research. P, 137, or 337, or Soc. 321.

507a-507b. Research Methods in Social Science (3-3) I II 507a: Problem selection, literature review, research design, data analysis, and other related topics, leading to the development of a research prospectus. 507b: Introduction to computer usage in social sci.; critical review of thesis writing by faculty and peers, including literature review, problem formulation, and research design.

517. Program Development and Evaluation in Micro-level Human Services (3) I Comprehensive review of human and family intervention projects and the procedures involved in developing, implementing, and evaluating these projects. All-day field trips. P. 507b.

527. Creativity and the Preschool Child (3) I 1984-85 Consideration of theory and interpretation of research in creative behavior, as related to the young child and the family.

547. Theories of Human and Family Development (3) I Analysis and integration of the major theories of individual and family development within a social context; evaluation of theoretical formulations in selected content areas of human relations and individual growth. P, 9 units of child dev., family relations, psyc. or soc.

557. Methods in Marital Therapy (3) I Theories and principles of counseling for premarital, marital, and group counseling situations. (Identical with Coun. 557 and Rhab. 557)

567. Administration and Supervision of Preschool Programs (3) I 1983-84 Curriculum planning, administration, supervision, and evaluation of preschool programs in relation to recommended standards and needs of communities.

573. Family Development (3) I 1983-84 Internal development of families over the life cycle, with emphasis on family goals, structure and functioning in the context of American society. P. 223, Soc. 100, or Psyc. 100a.

637. Trends in Human Relations (3) II 1984-85 Philosophy, content, and resources for understanding, teaching and working in the field of human relations.

Clothing, Textiles, and Interior Design

Professor Reich, Chairperson of the Division

The Division of Clothing, Textiles, and Interior Design provides instructional programs for clothing and textiles, merchandising and fashion promotion, and interior design. Majors in clothing and textiles and in merchandising and fashion promotion acquire expertise in coordinating complex economic, aesthetic, and sociological factors in dress as they prepare for professional careers. Majors in interior design acquire expertise in the various aspects of the design of the interior environment.

The major in clothing and textiles: Freshman year — Fall semester: c.t. 114; i.d. 115, Engl. 101 or 103; h.ec. 129; soc. 100; ph.ed. (1 unit). Spring semester: c.t. 145; Engl. 102; psyc. 100a; sp.c. 102; art 101a; ph.ed. (1 unit).

Sophomore year — Fall semester: sp.c. 112; chem. 101a, 102a; econ. 201a; art hist., hist., or hum. (3-4 units); c.t. 234. Spring semester: econ., mgmt., mktg., m.i.s. (3 units); c.t. 284R; c.t. 284L; art hist., hist., or hum. (3-4 units); chem. 101b, 102b; elective (3 units).

Junior year — Fall semester: *elective (3 units); c.t. 325; Engl. 307 or 308; c.t. 304; c.t. 344; econ., mgmt., mktg., m.i.s. (3 units). Spring semester: humanities elective (3 units); c.t. elective (3 units); c.t. 393b (1 unit); econ., mgmt., mktg., m.i.s. (3 units); Engl., jour., speech, educ. (3 units); c.t. 464.

Summer session: c.t. 393b (3-9 units recommended).
Senior year — Fall semester: art or art hist. (3 units); *elective (3 units); c.t. 454; h.e.e., c.s., or c.d.f.r. upper-division elective (3 units); c.t. 393b (1 unit recommended); c.t. elective (3 units). Spring semester: c.t. 444; *elective (3 units); econ., mgmt., mktg., m.i.s. (3 units); electives (3-5 units); engl., jour., speech, educ. (3 units).

*All electives must be chosen from one of the following: humanities, communication, behavioral and social sciences, biological and physical sciences.

The major in merchandising and fashion promotion: Freshman year — Fall semester: Engl. 101 or 103; c.t. 114; i.d. 115; h.ec. 129; soc. 100; ph.ed. (1 unit). Spring semester: c.t. 145; Engl. 102; art 101a; psych. 100a; sp.c. 102; ph.ed. (1 unit).

Sophomore year — Fall semester: sp.c. 112; chem. 101a; chem. 102a; econ. 201a; art hist., or hist., or hum. (3-4 units); elective (3 units). Spring semester: c.t. 284R; c.t. 284L; econ. 201b; art hist., hist., or hum. (3-4 units); math., bio. or phys. sci. (3-4 units); acct., mgmt., mktg. (3 units).

Junior year — Fall semester: c.t. 325; beh. and soc. sci. elective (3 units); Engl. 307; acct. 200; c.t. 304; mktg. 361. Spring semester: c.t. 393b (1 unit); beh. and soc. sci. elective (3 units); mktg. 364; c.t. 434 (II) or c.t. 454 (I).

Summer session: c.t. 393h (3-9 units recommended).

Senior year: Fall semester: mktg. 458; acct., mgmt., mktg., (3 units); c.t. 393b (1 unit recommended); c.t. 454 (I) or 454 (II); c.t., c.d.f.r., or c.s. elective (3 units); c.t. 445 (I) or c.t. 444 (II); c.s. 446. Spring semester: c.t. 444 (II) or c.t. 445 (I); mktg. 410, 450, 452 or 453 (3 units); electives (3-6 units); *upper-division elective (3 units); c.t., c.d.f.r., or c.s. elective (3 units).

*Choose from h.e.e., c.s., c.d.f.r., n.f.s.

The major in interior design requires a two-year preprofessional and a two-year professional phase. Prior to entering the professional phase, the student must select one of two tracks of study: design or merchandising. The design track focuses on the relationships between people and their interior environments: residential and contract. It draws from the humanities, behavioral and social sciences, and fine arts for support course work. The merchandising track focuses on the retailing, marketing and business aspects of the interiors profession providing expertise in coordinating complex economic, aesthetic and sociologic factors. An application for admission to the professional phase, design track, must be filed with the program chairman by the last day of classes of the spring semester preceding the intended fall admission. The application shall consist of a portfolio, a completed application form, and a transcript. Applicants will be evaluated on the basis of the following criteria: grade-point average (especially in design and related courses), course work, statement of intent, and creative endeavors. (It is highly unlikely that a student with a grade point average lower than 3.00 in design courses and 2.00 overall will be admitted to the design track.) For application the student must have completed sixty units, including 115, 155, 265a, 265b; Art 101a-101b; and art hist. (6 units) or Hist. 104a-104b (6 units) or Hum. 250a-250b-250c (8 units).

The major in interior design (design track): Freshman year — Fall semester: i.d. 115; h.ec. 129; art 101a; Engl. 101 or 103; soc. 100, ph.ed. (1 unit). Spring semester: i.d. 155; Engl. 102; psych. 100a; speech (3 units); art 101b; ph.ed. (1 unit).

Sophomore year — Fall semester: i.d. 265a; chem. 101a; chem. 102a; arch. 101; communications (3 units); art hist., hist., or hum. (3-4 units). Spring semester: i.d. 265b; c.t. 284R; econ. 201a; art hist., hist., or hum (3-4 units); elective (3 units).

Junior year — Fall semester: i.d. 335; i.d. 355a; c.s. 356; i.d. 375; lar. 345. Spring semester: i.d. course (3 units); i.d. 393h (1 unit); communications (3 units); beh. and soc. sci. elective (3 units); bio. and phys. sci. elective (4-5 units); elective (3 units).

Summer session: i.d. 393h (3-9 units recommended).

Senior year — Fall semester: i.d. 365; i.d. 475; beh. and soc. sci. elective (3 units); art elective (3 units); humanities elective (3-4 units); elective (3 units). Spring semester: i.d. 393h (1 unit recommended); i.d. 465; i.d. 485; *h.ec. upper-division elective (3 units); beh. and soc. sci. elective (3 units); i.d. 494h.

*Choose from c.t., h.e.e., c.s., c.d.f.r., n.f.s.

The major in interior design (merchandising track): Freshman year — Fall semester: i.d. 115; h.ec. 129; art 101a; Engl. 101 or 103; soc. 100; ph.ed. (1 unit). Spring semester: i.d. 155; Engl. 102; psych. 100a; sp.c. 102; math. 117e; ph.ed. (1 unit).
Sophomore year — Fall semester: i.d. 265a; chem. 101a; chem. 102a; econ. 201a; art hist., hist., or hum. (3-4 units); elective (3 units). Spring semester: c.t. 284R; acct. 200; econ. 201b; art hist., hist., or hum. (3-4 units); elective (3 units).

Junior year — Fall semester: i.d. 335; i.d. 355a; i.d. 375; mgmt. 361; mgmt. or mktg. (3 units); elective (3 units). Spring semester: c.t. 304; i.d. course (3 units); i.d. 393h (1 unit); beh. and soc. sci. elective (3 units); communications (3 units); art elective (3 units).

Summer session: i.d. 393h (3-9 units recommended).

Senior year — Fall semester: c.s. 356; i.d. 393h (1 unit recommended); elective (3 units); bio. and phys. sci. elective (1-2 units); communications (3 units); mktg. 458. Spring semester: i.d. 485; *h.ec. upper-division elective (3 units); beh. and soc. sci. elective (3 units); humanities elective (3 units); mgmt. or mktg. (3 units); elective (3 units).

*Choose from c.t., h.e.e., c.s., c.d.f.r., n.t.s.

Clothing and Textiles

114. Apparel Analysis (2) I II Fashion production terms and techniques; comparison and evaluation of apparel, quality, fit and appearance for intended consumer markets.

145. Fashion Concepts and Theory (3) I II Theories of consumer's choice and use of clothing and fashions.

234. Apparel Design (3) I II Application of intermediate apparel construction and fitting techniques to arrive at aesthetically pleasing and functional garments. 1R, 6L.


284L. Textile Science Laboratory (1) I II Lab. analysis of fibers and fabrics. P, 284R or CR.

304. Buying and Merchandising Fashions (3) I Development of merchandising policies and procedures used in retailing. P, 284R.

325. Historical Analysis of Dress and Fashion (3) I Western dress and the development of the fashion system from an historical perspective. P, Hist. 104a-104b or eight units of Hum. 250a-250b-250c or six units of Art 117, 118, or 119.

344. Advanced Apparel Design (3) I Experimental problems in advanced techniques of apparel construction, with emphasis on pattern alteration, modification, fitting and couture construction. 1R, 6L. P, 115, 234.

393. Internship
b. Merchandising, Textiles and Clothing (1 to 12) [Rpt./1] I II Open to clothing and textiles and to merchandising and fashion promotion majors only.


444. Dimensions of Clothing Behavior (3) GC II Analysis of psychological, social, cultural, historical, economic and aesthetic dimensions of clothing reported in literature. P, 145, Soc. 100, Psyic. 100a, Econ. 201a.

445. Clothing for Special Needs (3) GC I Clothing and accessories for special needs; based upon research.

454. New Developments in the Textile Field (3) GC I Fabric finishes, new fiber development, textured yarns, knits, and fabric use and care problems. P, 284R.

464. Aspects of Clothing Design (3) GC [Rpt./9 units] II Projects in the analysis and manipulation of design media to produce garments to meet selected needs and populations. 1R, 6L. P, 344, 145.

484. Textile Analysis (3) GC II 1983-84 Physical and chemical testing, dyes, microscopic analysis and use of textile testing equipment for fabric analysis. 1R, 6L. P, 454.

Interior Design

115. Fundamentals of Design (3) I II GRD Elements and principles of design; theory and exploration of design interpretation, historical and contemporary. Open to majors only or consult dept. before enrolling.

155. Social Awareness of Design (3) I II Programming and planning of design to focus on the psychological and sociological needs of individual and group units. P, 115 (for interior design majors).
306 DEPARTMENTS AND COURSES OF INSTRUCTION

265a-265b. Presentations (3-3) 265a: I Drafting mechanics, interrelationships of 2-d to 3-d composition; plans, sections, elevations; introduction to model-building skills. 265b: II 2-d and 3-d rendering techniques and technical illustrations; working drawings; model-building techniques. P, 115, Art 101a.

335. Interior Furnishings Industry (3) I Patterns of production and distribution in the interior furnishings industry, the market area, and in merchandising techniques. P, 155.

355. History of Design (3) I Period styles in interiors, classical through the 20th century. P, 6 units of art hist., Hist. 104a-104b or 8 units of Hum. 250a-250b-250c.

365. Housing (3) I Historical aspects of housing, providing housing, housing legislation, current issues and trends. Field trips.


393. Internship
h. Interior Design (1 to 12) [Rpt./1] I II Open to interior design majors only.

465. Advanced Housing (3) GC II Analysis of the social and psychological factors affecting family housing. P, Psyc. 100a, Soc. 100, H.Ec. 356.


485. Ethics and Practice for Interior Design (3) GC II Readings in the interior fields, with emphasis on individual professionalism. P, 375.

494. Practicum
h. Interior Design (3) I II S P, 375, 475.

Home Economics Education/Consumer Studies

Professor Knorr, Chairperson of the Division

The Division of Home Economics Education/Consumer Studies provides instructional programs for home economics education, home economics extension education, consumer studies and home management, home economics and journalism, and general home economics. Opportunities for field experiences are provided in all programs.

The major in home economics education prepares students to develop and implement educational programs in home economics and leads to certification for teaching in public schools. Candidates for admission to undergraduate programs in education and home economics education must present evidence of having completed 56 units of work applicable to the B.S. in H.E. degree with a grade-point average of 2.2500. Those who register for 389 and S.Ed. 338g must have a cumulative grade-point average of 2.5 in h.ec. course work.

The major in home economics education: Freshman year — Fall semester: Engl. 101 or 103; c.s. 116; h.ec. 129; c.t. 145; n.f.s. 101; math. elective (3 units); ph.ed. (1 unit). Spring semester: Engl. 102; chem. 101a; chem. 102a; i.d. 115; psyc. 100a or 100b; hist. 130a or 130b; ph.ed (1 unit).

Sophomore year — Fall semester: chem. 101b; chem. 102b; c.d.f.r. 223; humanities elective (3 units); econ. 201a; c.t. 234. Spring semester: c.t. 284R; c.t. 284L; pol. 110; humanities elective (3 units); n.f.s. 251; communications (3 units).

Junior year — Fall semester: c.d.f.r. 347R; c.d.f.r. 347L; communications (3 units); c.d.f.r. 337; n.f.s. 350; ed.p. 310. Spring semester: h.e.e. 288; c.d.f.r. 247 or ed.p. 302; c.s. 356; c.s. 346; ed.f.a. 350; c.s. 416 or 446.

Senior year — Fall semester: h.e.e. 338g; rdng. 435; c.s. 316; *h.ec. upper-division elective (3 units); elective (3 units). Spring semester: h.e.e. 308; h.e.e. 389; h.e.e. 499 (1 unit); h.e.e. 409 (recommended); s.ed. 494b.

*Choose from c.s, c.d.f.r., n.f.s., i.d., or c.t.

The major in home economics extension education prepares students for educational positions in such nonformal settings as the Cooperative Extension Service or in business or government.

The major in home economics extension education: Freshman year — Fall semester: Engl. 101 or 103; h.ec. 129; c.s. 116; psyc. 100a or 100b; i.d. 115; ph.ed. (1 unit). Spring semester: Engl. 102; chem. 101a; chem. 102a; n.f.s. 101; c.d.f.r. 223; humanities elective (3 units); ph.ed. (1 unit).
Sophomore year — Fall semester: ***bio. and phys. sci. (4 units); humanities elective (3-4 units); econ. 201a; c.t. 114 or 234; n.f.s. 251. Spring semester: anth. or soc. elective (3 units); humanities elective (3 units); h.e.e. 288; c.t. 284R; c.t. 284L; beh. and soc. sci. elective (3 units).

Junior year — Fall semester: a.ed. 301; agri. 422; c.s. 416; c.d.f.r. 337; *h.ec. elective (3 units); elective (3 units). Spring semester: h.e.e. 438; c.s. 356 or i.d. 365; ed.p. 310; c.s. 436; electives (4 units).

Summer session: h.e.e. 388 (6 units).

Senior year — Fall semester: h.e.e. 439; s.ed. 417; c.s. 446; beh. and soc. sci. elective (3 units); electives (4 units). Spring semester: h.e.e. 448; h.e.e. 497s; rdng. 435; **h.ec. upper-division elective (3 units); electives (4 units).

*Electives chosen from c.s., h.e.e., c.t., n.f.s., c.d.f.r., i.d.

**Electives chosen from c.s., c.t., c.d.f.r., n.f.s., i.d.

***Chem. 101b and 102b recommended.

The major in consumer studies and home management prepares students for careers as consumer affairs specialists in government or business, as consumer educators in adult or nonformal educational programs, and as personal and family financial advisers.

The major in consumer studies and home management: Freshman year — Fall semester: c.s. 116; h.ec. 129; Engl. 101 or 103; beh. and soc. sci. elective (3 units); humanities elective (3 units); ph.ed. (1 unit). Spring semester: Engl. 102; n.f.s. 101; communications (3 units); beh. and soc. sci. elective (3 units); ***bio. and phys. sci. (3 units); ph.ed. (1 unit).

Sophomore year — Fall semester: *h.ec. elective (3 units); econ. 201a; humanities elective (3 units); communications (3 units); ***bio. and phys. sci. elective (3 units); elective (3 units). Spring semester: *h.ec. elective (3 units); econ. 201b; humanities elective (3 units); communications (3 units); beh. and soc. sci. elective (3 units); ***bio. and phys. sci. (3 units).

Junior year — Fall semester: econ. 330; c.s. 356; c.s. 386; c.d.f.r. 337; *h.ec. elective (3 units); elective (3 units). Spring semester: c.s. 346; c.s. 416; *h.ec. elective (3 units); electives (7 units).

Senior year — Fall semester: c.s. 466; h.e.e. 428; **h.ec. upper-division elective (3 units); electives (6 units). Spring semester: c.s. 436; c.s. 446; h.e.e. 448; *h.ec. elective (3 units); elective (3 units).

*Electives chosen from c.d.f.r., c.s., h.e.e., i.d., n.f.s., c.t.

**Electives chosen from c.d.f.r., h.e.e., i.d., n.f.s., c.t. (must be from outside major).

***Math. 119 and 123 recommended.

The major in general home economics is for students interested in an emerging home economics career for which there is no formal program. Students should seek aid of an adviser in building an individualized program.

The major in general home economics: Freshman year — Fall semester: Engl. 101 or 103; h.ec. 129; c.s. 116; beh. and soc. sci. elective (3 units); humanities elective (3 units); ph.ed. (1 unit). Spring semester: Engl. 102; i.d. 115; n.f.s. 101; communications (3 units); *bio. and phys. sci. (4 units); ph.ed. (1 unit).

Sophomore year — Fall semester: c.t. 114, 145, or 234; n.f.s. 251; beh. and soc. sci. elective (3 units); *bio. and phys. sci. (4 units); communications (3 units). Spring semester: c.d.f.r. 223; c.t. 284R; c.t. 284L; beh. and soc. sci. elective (3 units); humanities elective (3 units); communications (3 units).

Junior year — Fall semester: c.d.f.r. 337; c.s. 446; **c.s. 316 (recommended); humanities elective (3 units); ****elective (3 units); elective (3 units). Spring semester: c.s. 356 or i.d. 365; ***h.ec. upper-division elective (3 units); ****elective (3 units); electives (9 units).

Senior year — Fall semester: h.e.e. 428; c.s. 466; c.s. 416; ****elective (3 units); elective (3 units). Spring semester: h.e.e. 448; c.s. 436; **h.ec. elective (3 units); electives (7 units).

*Chem. 101a, 102a, and 101b, 102b recommended.

**Choose from c.s., c.d.f.r., h.e.e., i.d., n.f.s., c.t.

***Choose from c.d.f.r., i.d., n.f.s., c.t. (must be from outside major).

****Choose from one category: behavioral and social science or biological and physical science or communications or humanities.

The major in home economics and journalism prepares students to use home economics and communications background for careers in all facets of the media, including newspapers, trade journals, magazines, television, and radio.
DEPARTMENTS AND COURSES OF INSTRUCTION

The major in home economics and journalism: Freshman year — Fall semester: Engl. 101 or 103; h.ec. 129; c.d.f.r. 117; beh. and soc. sci. elective (3 units); humanities elective (3 units); ph.ed. (1 unit). Spring semester: Engl. 102; c.s. 116; i.d. 115; beh. and soc. sci. elective (3 units); *bio. and phys. sci. (4 units); ph.ed. (1 unit).

Sophomore year — Fall semester: c.d.f.r. 223; c.t. 114 or 145; jour. 205, jour. 208; *bio. and phys. sci. (4 units). Spring semester: c.t. 284R; c.t. 284L; n.f.s. 101; jour. 206; beh. and soc. sci. elective (3 units); bio. and phys. sci. (3 units); humanities elective (3 units).

Junior year — Fall semester: c.s. 356 or i.d. 365; n.f.s. 251; jour. 401; jour. 411 or 413; electives (6 units). Spring semester: c.s. 446; **h.ec. elective (3 units); jour. 412; humanities elective (3 electives); electives (6 units).

Senior year — Fall semester: h.e.e. 428; c.s. 466; **h.ec. elective (3 units); jour. 420; elective (3 units). Spring semester: c.s. 436; **h.ec. upper-division elective (3 units); jour. 422; electives (6 units).

*Chem. 101a, 102a and 101b, 102b recommended.

* *Choose from c.d.f.r., c.s., h.e.e., i.d., n.f.s., c.t.

* * *Choose from c.d.f.r., i. d., n.f.s., c.t.

Consumer Studies

116. Personal Resource Management (2) I II GRD Principles of management as applied to individuals and home situations; time, money, and energy studies.


346. Household Equipment (3) II Principles of selection, use, and expected performance of household equipment; home wiring, lighting, interior surface materials; recent research findings related to each. 2R, 3L.

356. Social and Economic Aspects of Housing (3) II GRD Neighborhoods and sites, family requirements, characteristics of a good house, physical, psychological, and social environments, buying new and old houses; equipment and maintenance.

386. Consumer Relations (3) I II Study and application of principles involved in the relationships among consumers, businesses, and government agencies.

416. Management of Family Resources (3) GC I II GRD Resources available to families and the use of these resources to obtain family goals. P, Econ. 100a.

426. Work Analysis and Simplification (3) GC I 1983-84 Work simplification principles and techniques applied to work-area arrangements, use of equipment, storage, and methods of work in the home.

436. Economics of Aging (3) GC II Economic issues as they affect the aging individual, family, and society; economic demographics, consumer problems, and retirement financial planning.

446. The Consumer and the Market (3) GC I II GRD Consumer problems in the American economy under existing market conditions. P, Econ. 100a.

456. Technical Aspects of Housing (3) GC II 1984-85 Procedures and ethics of building; application of research results in preparation of data and requirements; plan analysis; design of areas of the house and storage; materials and finishes. 2R, 3L. P, 356.

466. Family Economics (3) GC I Analysis of the family as a consumer-decision-making unit within the larger economic system. P, Econ. 201b.


Home Economics Education

288. Observation/Participation in Home Economics Education and Extension (2) I II Functions of home economics educators in school- and community-based programs; characteristics of home economics programs; structuring learning settings to meet student/client needs. 1R, 3L.


338g. Teaching Home Economics (6) I Identical with S.Ed. 338g.

388. Supervised Field Experience in Extension Education (1 to 8) I II Identical with A.Ed. 388.
389. **Supervised Teaching in Home Economics** (1 to 8) II Teaching vocational home economics under supervision in approved programs in secondary schools in Arizona. Preregistration first semester of Jr. yr. P, S.Ed. 338g; CR H.E.E. 308 and 389 or teaching experience.

409. **Occupational Home Economics Programs** (3) GC II Purposes and methods of teaching home-economics-related occupations, with emphasis on cooperative home economics vocational education. P, S.Ed. 338g; CR H.E.E. 308 and 389 or teaching experience.


438. **Philosophy and Principles of Extension Education** (2) GC II (Identical with A.Ed. 438)

439. **Extension Education Methods** (2) GC I (Identical with A.Ed. 439)

448. **Extension Program Planning and Evaluation** (3) GC II Bases and procedures for program planning, implementation and evaluation in non-formal education programs such as the Cooperative Extension Service. Examination of issues and trends, observation and individual projects. P, A.Ed. 438, and H.Ec. 428 or A.Ed. 439. (Identical with A.Ed. 448)

493. **Internship**

  e. Supervised Work Experience in Home Economics (1 to 6) [Rpt./2] II S Open to h.ec.ed. majors only.

497. **Workshop**

  m.* Human Motivation in Extension Programs (1 to 2) [Rpt./2] (Identical with A.Ed. 497m, which is home)
  n.* Youth Development through 4-H Programs (1 to 2) [Rpt./2] (Identical with A.Ed. 497n, which is home)
  p.* Recent Advancements in Extension (1 to 2) [Rpt./2] (Identical with A.Ed. 497p, which is home)
  r.* Public Relations in Extension (1 to 2) [Rpt./2] GC (Identical with A.Ed. 497r, which is home)
  s.* Senior Workshop in Extension (2) GC II (Identical with A.Ed. 497s, which is home)

597. **Workshop**

  a.* Extension Communication (1 to 2) [Rpt./2] (Identical with A.Ed. 597a, which is home)
  b.* Extension Credibility and Accountability (1 to 2) [Rpt./2] (Identical with A.Ed. 597c, which is home)
  d.* Extension Supervision and Administration (1 to 3) [Rpt./2] (Identical with A.Ed. 597d, which is home)
  h.* Family Development through Home Economic Programs (1 to 2)
  i. Principles of Extension Training (1 to 3) I (Identical with A.Ed. 597i, which is home)
  u. Evaluation in Extension Education (1 to 3) I (Identical with A.Ed. 597u, which is home)
  v. Volunteer Staff Development in Extension (3) 2R, 3L. (Identical with A.Ed. 597v)
  x. Administration of Extension Programs (1 to 3) I (Identical with A.Ed. 597x, which is home)

*Offered only through the Cooperative Extension Service Winter School.

609. **Supervision in Vocational Education and Extension** (3) I Theory, principles and techniques of supervision in vocational and extension education.

610. **Investigation and Studies in Home Economics** (3) I Study and analysis of research literature, methods, techniques, and procedures for conducting investigations, selecting and developing plans for research problems.

618. **Evaluation in Home Economics Education** (3) II Application of theory to the selection and construction of evaluation instruments, their use and interpretation in home economics programs.

628. **Curriculum Theory in Home Economics** (3) I Theoretical bases and processes of curriculum building in home economics; current issues in home economics education.

For information concerning nutrition and food science, see the Department of Nutrition and Food Science elsewhere in this catalog.

**HOME MANAGEMENT**

(See Home Economics)

**HONORS PROGRAM**

The Honors Program exists to provide special opportunities to those students who demonstrate the highest levels of maturity, self-direction, creativity, intellectual curiosity, and scholarship. These opportunities include special classes, a variety of small group and independent study options, and certain academic privileges.
The University-wide Honors Program is jointly sponsored by the Honors Center and the various participating academic departments. All honors offerings are identified by the suffix "H" attached to the course number. Prior to registering for any course designated as an "H" section, students should check with the University-wide Honors Program to see if admission to the program is a prerequisite for the course. The courses listed below require such admission before registration in the course. The honors offerings sponsored by the Honors Program are as follows:

280H. Student Planning Board (1 to 3) [Rpt.] III Open to select honors students interested in working in the Honors Program organization.

295H. Honors Colloquium (2) [Rpt.] I II Small group discussion of special topics. Open to all honors students.

380H. Peer Leadership (3) I II Open to select upper-division honors students who are considering college teaching as a potential career.

In addition to the above Honors Center courses, honors courses are offered by individual departments. Certain of the departmental honors courses are standardized, and all departments participating in the Honors Program offer these courses:

299Ha-299Hb. Honors Readings (1 to 3) Selected topic readings under faculty supervision.
GRADES AVAILABLE: A, B, C, D, E, I, W

399Ha-399Hb-399Hc. Honors Independent Study (3-3-3) A three-semester sequence leading to "Graduation with Honors."
GRADES AVAILABLE: A, B, C, D, E, I, W

Individual departments will offer other honors courses in addition to those described above. Such courses might be 396H, Honors Proseminar; Ed.F.A. 495Ha, 495Hd, Ed.P. 495Hb; or Engl. 495Ha, 495Hb; or courses designated by any number followed by an "H". Students in the Honors Program should check catalog and schedule-of-hours listings to determine what offerings are available.

Additional information regarding departmental Honors Programs can be obtained by contacting departmental honors advisers or the Honors Center.

HORTICULTURE
(See Plant Sciences)

HUMAN SERVICES ADMINISTRATION
(See Public Policy, Planning and Administration)

HUMANITIES

Associate Professor Richard C. Jensen, Chairperson
Lecturer Donna E. Swaim

250a-250b-250c. Introduction to Humanities (4-4-4) The cultural life of the Western world as it developed in literature, art and philosophy from the Greeks to the present. P, Engl. 101, 102, 104; 102, 104; or 103, 104. 250a, 250b, and 250c are offered each semester.
HYDROLOGY AND WATER RESOURCES

Professors Nathan Buras, Head, Stanley N. Davis, Lucien Duckstein, Daniel D. Evans, Martin M. Fogel (Watershed Management), John W. Harshbarger (Emeritus), Simon Ince, Thomas Maddock, III, Shlomo P. Neuman, Sol D. Resnick (Water Resources Research Center), Eugene S. Simpson, David A. Woolhiser (Adjunct)

Associate Professors Michael D. Bradley, Donald R. Davis, Soroosh Sorooshian, Charles W. Stockton (Laboratory of Tree-Ring Research)

Assistant Professors Judith M. Dworkin, Glenn M. Thompson

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, groundwater and surface-water hydrology, mathematical and statistical methods in hydrology (including numerical modeling), and water resource planning, management and administration.

The department offers the Bachelor of Science in Hydrology, and the Master of Science and Doctor of Philosophy degrees with majors in hydrology and water resources administration. See College of Earth Sciences section of this catalog for the undergraduate requirements. For information regarding graduate degrees, please see the Graduate Catalog.

Honors: The department participates in the Honors Program.

Western Regional Collegiate Program: Students residing in the 13 western states may qualify for certain privileges if enrolled in the hydrology curriculum. Please contact the department for details.

Hydrology

101a-101b. Water and the Environment (4-4) Relation of physical and biological sciences to the understanding of the water cycle; man's impact on water resources, with emphasis on factors affecting the availability and quality of water in arid and humid regions. 3R, 3L. Field trips. 101a is not prerequisite to 101b. Open to nonmajors only.

150. Principles of Hydrology (3) II Basic principles of hydrology dealing with the chemical, physical, and biological aspects of water movement and mass transfer; techniques of measurement of hydrologic variables; relations used by man to develop water supplies. 2R, 3L.

296. Proseminar a. Hydrology (1) [Rpt./11]

350. Environmental Hydrology (3) II Chemical and physical properties of water in relation to man's use; transport and dispersion of pollutants in surface and subsurface water; chemical and transport models. 2R, 3L. Field trips. P, 150, Chem. 103a-103b, Math. 125b, S.I.E. 170 or 272.

405. Hydrology of Unsaturated Media (3) GC I Physical properties and processes of unsaturated media related to storage and movement of water and transport of contaminants. P, Phys. 103b, Math. 125b. (Identical with S.W.E. 405)

414. Field Hydrology (Summer Camp) (6) GC S Field methods of collection, compilation and interpretation of hydrologic data; geologic and geophysical methods; preparation of hydrologic reports. Lab. comprises daily field work. Fee.

423. Hydrology (3) GC I (Identical with C.E. 423)

435. Hydrogeology (3) GC I II GRD Geologic and hydrologic factors controlling occurrence and development of ground water. 2R, 3L. Field trips. P, Geos. 101a or 151. (Identical with Geos. 435)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Department</th>
<th>Prerequisites</th>
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</thead>
<tbody>
<tr>
<td>312</td>
<td>DEPARTMENTS AND COURSES OF INSTRUCTION</td>
<td></td>
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<tr>
<td>460</td>
<td>Watershed Hydrology (3) GC I (Identical with Ws.M. 460)</td>
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<tr>
<td>471</td>
<td>Water Quality Control (3) GC II (Identical with C.E. 471)</td>
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<tr>
<td>480</td>
<td>Hydrologic Systems (3) GC I</td>
<td></td>
<td></td>
<td>Major aspects of the hydrologic cycle are studied quantitatively, with emphasis on model construction and simulation. 2R, 3L. Field trips. P, 423 or 460.</td>
</tr>
<tr>
<td>481</td>
<td>Physical Oceanology and Limnology for Hydrologists (2) GC II</td>
<td></td>
<td></td>
<td>Origin, distribution, and characteristics of oceanic water; advective and convective processes; estuarine and shoreline processes; effect on coastal aquifers; classification and hydrologic regimen of lakes. P, Math. 125b.</td>
</tr>
<tr>
<td>502</td>
<td>Snow Hydrology (2) I</td>
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<tr>
<td>503</td>
<td>Subsurface Fluid Dynamics (3) I</td>
<td></td>
<td></td>
<td>Kinematics and dynamics of fluids in saturated porous and fractured media; introduction to free surface, unsaturated, and multiphase flows. P, A.M.E. 331a, Math. 422a.</td>
</tr>
<tr>
<td>504</td>
<td>Numerical Methods in Subsurface Hydrology (4) II</td>
<td></td>
<td></td>
<td>Finite difference and finite element methods for subsurface fluid flow and mass or energy transport; applications to aquifers, unsaturated soils, seepage through earth dams, geothermal systems. 3R, 3L. P, Math. 422a.</td>
</tr>
<tr>
<td>508</td>
<td>Water Quality Dynamics (3) II</td>
<td></td>
<td></td>
<td>Physical and chemical methods are used to study and predict dispersion of pollutants and water quality changes in ground and surface water, with emphasis on interpretation of water quality and the use of environmental tracers to understand the evolution of ground-water chemistry. P, 435.</td>
</tr>
<tr>
<td>536</td>
<td>Development of Ground-Water Resources (3) II</td>
<td></td>
<td></td>
<td>Analytic techniques to evaluate geohydrologic systems; case histories used to study management of ground- and surface-water resources; planning and design of regional water resource investigations. Field trips. P, 535. (Identical with Geos. 536)</td>
</tr>
<tr>
<td>540a-540b</td>
<td>Advanced Surface Water Hydrology (3-3)</td>
<td></td>
<td></td>
<td>Fluvial dynamics and flood routing; flood hydrology; hydrology of water supply; classical and numerical methods. P, 423.</td>
</tr>
<tr>
<td>545</td>
<td>Advanced Statistical Hydrology (3) I</td>
<td></td>
<td></td>
<td>1984-85 Advanced application of statistics and probability to hydrology and water resources; multivariate modeling, choice of models and parameters, simulation, Bayesian decision theory. P, 445.</td>
</tr>
<tr>
<td>554</td>
<td>Isotope Hydrology (3) I</td>
<td></td>
<td></td>
<td>(Identical with Geos. 564)</td>
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<tr>
<td>556</td>
<td>Hydrochemistry (3) II</td>
<td></td>
<td></td>
<td>1983-84 (Identical with S.W.E. 565)</td>
</tr>
<tr>
<td>596</td>
<td>Seminar</td>
<td></td>
<td></td>
<td>p. Hydrogeology (1 to 3) [Rpt./2] II (Identical with Geos. 596p)</td>
</tr>
<tr>
<td>603</td>
<td>Well Hydraulics and Pumping Test Analysis (2) II</td>
<td></td>
<td></td>
<td>1984-85 Flow to wells in aquifers, with emphasis on design and interpretation of pumping tests; confined, unconfined, and leaky aquifer systems; fractured rocks; automatic curve matching. P, 503 or 535, Math. 422a.</td>
</tr>
<tr>
<td>605</td>
<td>Soil Water Dynamics (3) II</td>
<td></td>
<td></td>
<td>1984-85 (Identical with S.W.E. 605)</td>
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<tr>
<td>643</td>
<td>Stochastic Methods in Hydrology (3) II</td>
<td></td>
<td></td>
<td>1983-84 Event-based and time series analysis of hydrologic phenomena; use of stochastic process models of streamflow, river networks, aquifers, evaporation, reservoirs, precipitation.</td>
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<tr>
<td>695</td>
<td>Colloquium</td>
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<tr>
<td>a.</td>
<td>Hydrology (1 to 3) [Rpt./1] I</td>
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<tr>
<td>696</td>
<td>Seminar</td>
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<tr>
<td>b.</td>
<td>Unsaturated Flow (2 to 3) II</td>
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<td>c.</td>
<td>Regional Hydrologic Analysis (1 to 3) II</td>
<td></td>
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<td>P, 423, 435.</td>
</tr>
<tr>
<td>d.</td>
<td>Desert Hydrology (1 to 3) [Rpt./2] I</td>
<td></td>
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<td>1984-85</td>
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<td>e.</td>
<td>Pollutants in the Hydrologic Environment (1 to 3) I</td>
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</table>
INTERDISCIPLINARY PROGRAMS

Water Resources Administration

401a-401b. Water Resource Management (3-3) GC The ecological relation of water in the biosphere with special reference to the human role; the role of behavioral sciences (social, legal, economic, political, and psychological) in the development, conservation, regulation, and utilization of water resources; analysis of case-study materials to develop principles of resource management. 401a is not prerequisite to 401b. Identical with Geog. 401a-401b

461. Population and Resources (3) GC I (Identical with Geog. 461)

476. Natural Resource Economics (3) GC II (Identical with A.Ec. 476)

480. Forest Policy and Administration (3) GC II (Identical with Ws.M. 480)

481. Environmental Policy (3) GC II (Identical with Pol. 481)

501a-501b. Water Resources Policy and Administration (3-3) Institutional and policy aspects of water resources administration; management, organizational theory, and international problems of water use and development; ground-water management and policy. 501a is not prerequisite to 501b.

544a-544b. Quantitative Methods in Water Resources Administration (3-3) Applications of quantitative methods to water resource management; benefit-cost analysis, and optimization. 544a: Structure and basis of planning process; Principles and Standards. 544b: Operations research methods (linear, quadratic, and dynamic programming). P, FORTRAN, microeconomics, Math. 125a. 544a is not prerequisite to 544b.

556. Finite State Methods in Water Resources Management (3) II 1984-85 Finite state methods; applications to natural resource systems as arise in hydrology, ecology, and earth sciences, including the modeling of interfaces such as socioeconomic processes. P, Math. 254, S.I.E. 272. (Identical with S.I.E. 556)

576a-576b. Advanced Natural Resource Economics (3-3) (Identical with A.Ec. 576a-576b)

643. Water Resources Systems Analysis (3) I Applications of mathematical programming to the analysis of interactions of hydrology, engineering, economics, and socio-institutional environment in regional water resources systems. P, 544b or consult dept. before enrolling.

695. Colloquium
   b. Water Resources Administration (1 to 3) [Rpt. /1] II

696. Seminar
   h. Long-Range Resource Planning (1 to 3) [Rpt./2] I
   i. International Water Resource Management (1 to 3) [Rpt./2] I
   k. Coupled Physical-Social Resource Models (1 to 3) II

INTERDISCIPLINARY PROGRAMS

The Office of Interdisciplinary Programs coordinates both interdisciplinary programs and courses. Such programs are described under "Office of Interdisciplinary Programs" in the General Divisions of the University section of this catalog. They include applied mathematics, biomedical engineering, history and philosophy of science, and statistics, each of which is also described under its respective heading in this section of the catalog.

In most cases, interdisciplinary courses are listed under a "home" department and crosslisted in a variety of other departments. Such courses would not appear in this section. Those interdisciplinary courses for which no department acts as "home" are listed below.

596. Seminar
   u. Interdisciplinary Environment-Behavior-Design (3) I (Identical with Arch. 596u, Geog. 596u, L.Ar. 596u, Psyc. 596u, and U.Pl. 596u).

INTERIOR DESIGN
(See Home Economics)
ITALIAN
(See French and Italian)

JAPANESE
(See Oriental Studies)

JOURNALISM

Professors Donald W. Carson, Head, Philip C. Mangelsdorf, George W. Ridge, Jr.
Associate Professors Ford N. Burkhart, Abraham S. Chanin, William F. Greer, James W. Johnson
Assistant Professors Edith Sayer Auslander, Rosalie F. Carroll, Sheryl R. Kornman, C. Bickford Lucas

The study of journalism is designed to balance a student’s development in the theory and practice of news presentation with an equal emphasis on a broad-based education in humanities, arts and sciences. Toward this end, the department offers instruction in the basic newsgathering and writing skills necessary to begin a news career, plus instruction aimed at giving the student an overall sense of the media and their roles in society. The department offers special programs combining the major in journalism with that in Oriental studies or in Latin American studies.

The degrees of Bachelor of Arts and Master of Arts with a major in journalism are offered. A Bachelor of Arts in Education with a teaching major in journalism is also available.

The major: 25 units, including 205, 206, 208, 420, 401, 411, 413, 470 and 450. Jour. 450 may be repeated with special permission. Students interested in community jour. are encouraged to take 364 and 402; those interested in magazine jour., to take 402 and 422; those interested in photojour., to take 402 and 403. No more than 33 units of journalism will count toward the 125 units needed for the degree.

All majors must complete at least six units in the social or natural sciences in addition to those units required by the College of Arts and Sciences. All majors must complete at least nine units in Engl. writing or lit. in addition to the freshman Engl. units required by the College.

The supporting minor: Students are strongly advised to minor or obtain a second major in econ., Engl. writing or literature, hist., pol., a modern language, anth., psyc., soc. or the natural sciences.

The teaching major: Thirty units, including 205, 206, 208, 420, 422, 401, 411 or 413; 450, 470.

The teaching minor: Twenty units, including 205, 206, 401, 420, 422, 470.

Honors: The department participates in the Honors Program.

The Arizona Journalism Institute: The department sponsors the Arizona Journalism Institute, a permanent center for study and conference among professional journalists in the state.

Freedom of the Press Award: Each year the department gives a plaque, under the name the John Peter Zenger Award, to a journalist whose professional work has made an outstanding contribution to the preservation of freedom of the press and the people’s right to know.

Publications: The department publishes the local edition of The Tombstone Epitaph; the South Tucson Independiente; and The Pretentious Idea, a media review. In addition, the department operates the Community News Service, a program in which students report on state government and the legislature for 50 community newspapers. During the spring semester, the department awards the Don Bolles Fellowship to permit one student to work full time in Phoenix covering the legislature.
Guadalajara Exchange: Students interested in Latin American reporting are offered a one-year exchange program with the School of Journalism at the Autonomous University of Guadalajara in Mexico.

The Department of Journalism is accredited by the American Council on Education for Journalism and Mass Communications.

151. News in Mass Communications (3) I II Designed to acquaint the nonjournalist with communications techniques used by newspapers, wire services, information agencies, news magazines and broadcast news; analysis of social and historical influence on the news media.


206. Advanced Reporting (3) I II Comprehensive and accurate news presentation, with emphasis on interview techniques and coverage of major news stories. P, 205.

208. Law and Ethics of Journalism (3) I Libet; introduction to press freedom and responsibility.

364. Creative Advertising (3) I I (Identical with Mktg. 364)

366. Public Relations (3) I I (Identical with Mktg. 366)

401. Photojournalism (2) GC I II Reporting and interpreting the news through pictures.

402. Photojournalism Laboratory (1) GC I II Open to majors only. P, CR 401.

403. Advanced Photojournalism (3) GC I II Open to majors only. P, 401, 402.

405. The Study of News (3) GC I II Critical study and problem analysis of the media. Field work may include publication of conclusions.

411. News Features (3) GC I II Writing the basic news feature article; specialized reporting and rewriting techniques. P, 206.


413. Reporting Public Affairs (3) GC 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, 208.

414. The News Agency: Arizona News Service (1) GC [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.

415. The Editorial Page (3) GC I II Critical study of opinion-makers, with emphasis on editors and public-affairs columnists; analysis of editorial pages in a changing society; writing of editorials. P, 206.

420. Editing (2) GC 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.


423. Modern Production Methods (1 to 2) GC [Rpt./1] I II Comparative study of print production methods, with lab. application. P, 206.

450. Community Journalism: The Tombstone Epitaph (3) GC [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, 401, 420, discussion of preparation with instructor.


470. The Press and Society (3) GC I II Critical study of press performance in current affairs; changing requirements for socially responsible and professional journalism in a democracy.

471. International Communications (3) GC I II Study of world news systems, including newsgathering agencies, role of the foreign correspondent, the foreign press, and factors influencing international news flow.

473. Readings in Mass Communications (3) GC [Rpt.] I II Individual course of readings approved by instructor to cover subject specialty not available in other course offerings.

497. Workshop
a. Color Photography (2) [Rpt./1] GC S Two-week field trip with fee.
502. **Freedom of Expression** (3) II Analysis of access and barriers to information and communication at local, state, national and international levels; intensive study of the legal relationship between mass media and society. Open to majors only.

506. **Seminar**
   a. History of Mass Media (3) I II
   b. International Communications (3) I II
   c. Reporting Governmental Affairs (3) I II
   d. Magazines (3) I II
   e. Electronic Media (3) I II
   f. Community Journalism (3) I II
   g. Journalism Education (3) I II
   h. Latin-American Press (3) I II
   i. News Analysis (3) I II
   j. Media Organization (3) I II

**LANDSCAPE ARCHITECTURE**
(See Renewable Natural Resources)

**LATIN**
(See Classics)

**LATIN AMERICAN STUDIES**
Latin American Area Center

Director: Michael C. Meyer
Assistant Director: Susan M. Deeds

*Committee on Latin American Studies*

Professors Michael C. Meyer (History), *Director*, Donald W. Carson (Journalism), Lanin A. Gyurko (Spanish and Portuguese), Boris S. Kozolchyk (Law), Murdo J. MacLeod (History), Edward J. Williams (Political Science)

Associate Professor Celestino Fernández (Sociology)
Assistant Professor Susan M. Deeds

The Latin American Area Center offers an interdisciplinary program designed primarily for students planning government, business, teaching, or other careers. The Center offers a Bachelor of Arts degree, a Master of Arts degree, and a doctoral minor in Latin American studies. A student with an interest in the Latin American area selects a concentration in one department and enriches that concentration with related studies, cultural or professional, in other departments.

Students admitted to the B.A. program must complete a minimum of thirty upper-division units (courses numbered 300 and above) and choose a concentration from one of the following: anthropology; economics; geography and regional development; history; political science; Portuguese; and Spanish. A minimum of twelve upper-division units must be chosen from the concentration.

A minimum of eighteen upper-division units, with no fewer than six in any one department, must be selected from two or three departments offering related studies: agricultural economics; anthropology; art history; business and public administration; economics; English as a second language; educational foundations and administration; geography and regional development; history; home economics; journalism; music; political science; Portuguese; sociology; and Spanish. A student may not duplicate in related studies the department chosen for the concentration. L.A.S. 495a must be taken once; upon consultation with an adviser, credit for this course may be applied toward the concentration or the related studies.

The student must demonstrate proficiency in either Portuguese or Spanish, depending upon the student's career goals, by completion of Port. 202b or Span. 305 with a grade of "B," or by an equivalency exam.

456. **Southwest Studies I** (3) GC (Identical with Sw.C. 456)
457. **Southwest Studies II** (3) GC (Identical with Sw.C. 457)
LAW

495. Colloquium
   a. Latin American Studies (3) GC IIP, Span. or Port. proficiency.

595. Colloquium
   d. Applied History (3) I (Identical with Hist. 595d, which is home)

596. Seminar
   a. Latin American Studies (3) I P, Span. or Port. proficiency.

LAW


Associate Dean Armando Rivera
Associate Professors Mark L. Ascher, Elizabeth Buchanan, Thomas A. Mauet, Thornton E. Robison
Clinical Instructor Andrew Silverman

The College of Law offers course work leading to the Juris Doctor degree. The course program has been thoroughly revised and expanded to include a modernized set of required courses and a wide variety of problem-method courses, seminars and clinical programs. For course descriptions and degree requirements, please see the College of Law Catalog.

600. Contracts (5)
601a-601b. Introduction to Legal Process and Civil Procedure (3-2)
602. Criminal Procedure (4)
603. Research and Writing (2)
604a-604b. Torts (2-3)
605. Property (5)
606. Constitutional Law (4)
607. Appellate Practice and Moot Court (1)
608. Evidence (4)
609. The Legal Profession (2)
610. Decedents' Estates (2) I
611. Trusts and Fiduciary Administration (4) II
612. Family Law (2) II
613. Law and Medicine (2) II
614. Workers' Compensation (2) II
616. Private Corporations (3) I
617. Corporate Finance (2) II P, 616.
618. Antitrust Law (3) II
620. Immigration Law (2) I
621. Administrative Law (3) I
622. Law Review (1 to 3) I II
623. Conflict of Laws (3) II
624. Labor Law (3) I
626. Jurisprudence (3) I
628. Comparative Law (3) I
630. Legal Process (3) II
631. Indian Law (2) I
633. Commercial Transactions (4) I II
318 DEPARTMENTS AND COURSES OF INSTRUCTION

634. Products Liability (2) II
635. Insurance (2) I
636. Federal Tax Procedure (2) II P, 646.
638. Real Estate Transactions (3) II
639. Community Property (2) I
640. Mining and Public Land Law (3) I
641. Water Law (3) I
642. Federal Jurisdiction (3) II
643. Arizona Civil Procedure (3) II
644a-644b. Remedies (1-3)
645. Trial Practice (2) I II P, 608, 609.
646. Federal Income Taxation (4) I
647. Corporate Taxation (3) II P, 646.
648. Estate and Gift Taxation and Basic Estate Planning (3) I P, 610, 611.
649. Torts II (3) II
650. Criminal Law (3) II
651. Accounting and the Law (2) II
652. Income Taxation of Estates and Trusts (2) II P, 611, 646.
653. Advanced Appellate Practice and Moot Court (2) II
654. The First Amendment (3) II
655. Civil War Amendments (3) I
656. Law of the Elderly (2) I
658. Securities Regulation (3) II
659. Growth Management (3) II 1984-85 (Identical with U.Pi. 659, which is home)
660. Land-Use Planning (3) II
661. Moot Court Board (2) I II
662. Creditors’ Remedies (2) I
663. Bankruptcy (2) II
665a-665b. Interviewing, Counseling and Negotiation (1-1) 665a is not prerequisite to 665b.
666. Preservation of Historic Environments (3) II 1983-84 (Identical with U.Pi. 669, which is home)
666. Seminar
   c. Juvenile Delinquency (2) I P, 609.
   d. Business Planning (3) II P, 616, 647.
   f. Current Constitutional Problems (3) I
   g. Mass Communication (2 to 3) II
   j. Child, Family and State (3) I
   m. Landlord and Tenant (2) I
   o. Law and Psychiatry (3) I
   t. Law and Technology (3) I II
   bb. Advanced Civil Procedure (3) I
   cc. Clinical Practice (2) I II P, 608, 609, 645.

LAW ENFORCEMENT ADMINISTRATION
(See Public Policy, Planning and Administration)

LIBRARY SCIENCE
(Graduate Library School, College of Education)

Professors Ellen Altman, Director, Donald C. Dickinson, Robert K. Johnson (Emeritus), Margaret F. Maxwell, Allan D. Pratt, Arnulfo D. Trejo, Lawrence Clark Powell (Emeritus), Elinor C. Saltus (Emerita)
The Graduate Library School offers programs for students who wish to follow a professional career in library work. Courses emphasize the basic aims of the profession: to acquire, organize, and make information available to the public.

Advanced degrees available are the Master of Education with a major in school library science and the Master of Library Science. For admission and degree requirements, please see the Graduate Catalog.

417. Visual and Auditory Aids in Teaching (3) GC I II (Identical with S.Ed. 417)
441. Children's Literature in Spanish (3) GC I (Identical with Span. 441)
443. Mexican-American Literature (3) GC II (Identical with Span. 443)
480. Literature for Children (3) GC I II Literature to promote literary appreciation and to meet the interests and needs of elementary school children. (Identical with Rdng. 480)
485. Literature for Adolescents (3) GC I II Literature to meet recreational and developmental needs of the junior and senior high school age, including some books for adults. Reviewing and book talks. (Identical with Rdng. 485)
486. Oral Presentation of Children's Literature (2) GC II Principles and techniques of storytelling and of reading aloud to children; stories for different age groups, presentation of picture stories; practice in reading and telling stories and in planning the story hour. P, 480.
487. Microcomputers in Education (3) GC I II S (Identical with Ed.F.A. 487)
503. Library Collection Development (2) I II Principles of collection development; evaluation and review of materials; selection tools; acquisition of materials; problems in selection, including censorship.
504. Foundations of Library and Information Services (2) I II Elements of librarianship, historical backgrounds, types of libraries, the role of the library in American life, current issues.
505. Basic Reference (3) I II Survey of general reference sources; discussion of reference technique.
506. Research Methods (2) I II Need and opportunities for research in librarianship; types of research; research methodology; study of research design; elementary statistics.
507. Library Management (3) I II Introduction to management concepts, the organizational structure of libraries, systems analysis, financial administration and the utilization of library personnel.
510. Introduction to Information Science (3) Methods, theories, and technology of information science; elements of computer programming and systems design; implementation and management of computer systems in libraries and information centers.
511. Information Storage and Retrieval (3) I II Student involvement in on-line, interactive systems. P, 510.
512. Automation in Libraries (3) I II Introduction to automated procedures currently in use in libraries, including systems analysis of actual technical services and planning for their automation. P, 510.
515. Library Cooperation and Networks (3) Study of the background and state of the art of library cooperative systems, networks, and bibliographic utilities.
520. Technical Service Problems (3) I Examination of problems in acquisitions, cataloging, serials, and other areas related to activities in academic, public, school, and special libraries; consideration of developing technology. P, 502.
522. Automated Alternatives to the Library Catalog (1) I II Alternatives to the card catalog with consideration given to type of library function, size, and budget; comparisons of card, printed book, on-line, and micro-image catalogs. Field trips. P, 502, 505.
523. Indexing and Abstracting (3) I I Theory and current practices for compiling manual and computer-produced indexes; vocabulary control and thesaurus construction; production and evaluation of indexes and abstracts.
528. **Introduction to Bibliography** (3) Introduction and critical examination of various styles of bibliographic description; practical application in construction of a systematic bibliography. P, 505.

530. **Public Librarianship** (3) I Administration of tax-supported libraries serving the general public, including problems of governmental relationships, community responsibilities, financial support, buildings, personnel, collections. P, 507.

531. **Outreach: Library Service for Special Groups** (3) I Survey of library services and resources for the aged, handicapped, non-English speaking, disadvantaged, adult learners, A.B.E. students, and institutionalized patrons. (Identical with M.A.S. 531)

534. **Library Service to Children and Young Adults** (1) I Investigation of the programs and materials useful in working with children and young adults in libraries. P, 480.

540. **Academic Librarianship** (3) I Present trends in academic libraries, including financial administration, collection evaluation, personnel requirements and building needs. P, 507.

550. **Special Librarianship** (3) II Mission, organization and administration of the special library. P, 507 or equivalent experience.

551. **Management of Health Sciences Libraries** (3) Management functions applied within the context of the biomedical communication network; includes NLM classifications, design of buildings, audiovisual usage, and recent innovations. P, 502, 505, 507 or equivalent experience.

560. **History of Books and Printing** (3) I Survey of the history of books and printing from early times to the present, including development of the alphabet, manuscript books, the invention and dissemination of printing and modern printing techniques.

561. **History of Children's Literature** (3) II Survey of literature for children in England and America from earliest times to the close of the 19th century, together with study of cultural and social values reflected in the literature. (Identical with Elem. 561, Engl. 561, and Rdng. 561)

562. **Communication in Libraries: Public Relations** (1) II Essentials for library public information activities, brochures, news releases, and public service announcements for radio and television.

563. **Communication in Libraries: Public Service** (1) II Problems of face-to-face communication at public service desks.

564. **Communication in Libraries: Organization** (1) II Group dynamics and organizational communication as related to libraries.

567. **Information Sources and Services in the Sciences** (3) I Creation, organization, and dissemination of scientific and technical literature; reference function and problems of bibliographic control. A science background is not required. P, 505.

571. **Information Sources in the Social Sciences and Humanities** (3) II Advanced bibliographic and reference sources in the humanities and social sciences, with emphasis on the structure of knowledge in the various disciplines and evaluation of user services. P, 505.

573. **Government Publications** (3) II Examination of the varieties of government publications available from municipal, county, state, national and international agencies, with emphasis on selection and use of publications of the U. S. government.

580. **Current Trends in Children's Literature** (3) I Topical approach to juvenile publishing, requiring analysis and reaction. Among trends examined are controversial subject matter, racism and sexism, internationalism, books in audiovisual formats. P, 480.

581. **School Library Administration and Organization** (3) II Services, finances, personnel, evaluation, quarters, organization and technical services in the school library. P, 502.

582. **Audiovisual Materials in Libraries** (2) I Introduction to AV information resources for the library.

600. **Introduction to Graduate Study in Music** (3) (Identical with Mus. 600)

616. **Coordination of Instructional Media Programs** (3) II (Identical with S.Ed. 616)

617. **Preparation of Instructional Materials** (3) II (Identical with S.Ed. 617)

693. **Internship**
   a. **Academic Library** (2 to 4) [Rpt. / 1] II S. P, 502, 503, 505, 507, CR 540.
   b. **Special Library** (2 to 4) [Rpt. / 1] II S. P, 502, 503, 505, 507, CR 550.
   c. **Public Library** (2 to 4) II S. P, 502, 503, 505, 507, CR 530.
   d. **School Library** (2 to 4) [Rpt. / 1] II P, 480 (elementary only) or 485 (secondary only), 502, 503, 505, CR 581.
   e. **Community College Library** (2 to 4) [Rpt. / 1] II S. P, 503, 504, 507.

695. **Colloquium**
   a. **Theory of Classification** (1 to 3) II
   g. **Laboratory in Library Communications** (1 to 3) II
LINGUISTICS

Professors Adrian Akmaian, Head, Richard Demers, Robert Michael Harnish (Philosophy), Adrienne Lehrer
Associate Professors Susan Steele, Richard T. Oehrle

Linguistics is a science concerned with the nature of human language. Individual linguists may concentrate their studies on a particular language or a small number of languages, but the ultimate goal is to acquire an understanding of the universal properties of human language.

The Department of Linguistics offers programs leading to a Bachelor of Arts, a Master of Arts, and a Doctor of Philosophy with a major in linguistics. For graduate admission and degree requirements, please see the Graduate Catalog.

The major for the B.A.: Thirty units in ling., including 101, 495a, one year of coursework in a non-Indo-European language, and different courses chosen from each of the following fields: (1) Syntax (200 or 400). (2) Phonology: (200, 412, or 413). (3) Phonetics: (260, 412, or Sp.H. 367). (4) Semantics: (422, 475, or 477). (5) Historical Linguistics: (430, 480, or Engl. 405). (6) Language Structure: (210, Span. 423a-423b, Or.S. 411a-411b, 420a-420b, 426). Majors are urged to continue their foreign language study beyond the minimum 16 units required by the college.

Coursework for the supporting minor is selected in consultation with the undergraduate adviser.

101. Introduction to Linguistics (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) I S Introduction to descriptive linguistics for Native Americans; practical linguistic and social issues in Native American languages; phonetics and phonology; orthography; dialects and language change; classroom applications. (Identical with A.In.S. 102)

200. Fundamentals of Linguistic Analysis (3) II The basic nature of linguistic investigation with the aim of discovering some of the regularities of language structure. P, 101.

203a-203b. Elementary Navajo Language (4-4) Speaking, reading, writing, understanding and transcribing. (Identical with A.In.S. 203a-203b)

207a-207b. Elementary Papago Language (3-3) GRD Speaking, reading, writing, and oral comprehension in the Papago language. 3R, 1L. (Identical with A.In.S. 207a-207b)

210. Native Languages of North America (3) I Genetic and typological diversity of North American native languages; areal features, i.e., characteristics spread over a geographical region; and the history of the study of these languages, concentrating on individuals and the problems of classification. (Identical with A.In.S. 210)

260. Speech Science (4) II (Identical with Sp.H. 260)

276. The Nature of Language (3) I II (Identical with Anth. 276)

376. Introduction to the Philosophy of Language (3) I 1984-85 (Identical with Phil. 376)

400. Foundations of Syntax (3) GC I Theory of generative grammar and its implications for linguistics; examination of phrase structure, transformational and interpretive rules.

411a-411b. Modern Japanese Grammar (3-3) GC (Identical with Or.S. 411a-411b)

412. Fundamentals of Phonological Theory (3) GC Principles which underlie current theories of phonology, concentrating on sound patterns and alternations and the relationship of these topics to linguistic rules.

413. Linguistic Phonetics (3) GC Articulation and acoustics of the wide range of sounds used in human languages, with extensive practice in discrimination, transcription, and production.

417a-417b. Sanskrit Grammar and Texts (3-3) GC 1984-85 (Identical with Or.S. 417a-417b)

420a-420b. Linguistic Structure of Modern Chinese (3-3) GC (Identical with Or.S. 420a-420b)

422. Linguistic Semantics and Lexicology (3) GC II 1984-85 Study of word and sentence meanings, relationship between the lexicon and the grammar, idioms, metaphor, etymology, and change of meaning. P, one course in ling. (Identical with Phil. 422)

423a-423b. Theory of Spanish Syntax (3-3) GC (Identical with Span. 423a-423b)

426. Introduction to Arabic Linguistics (3) GC (Identical with Or.S. 426)
322  DEPARTMENTS AND COURSES OF INSTRUCTION

427. Applied Spanish Linguistics (3) GC I (Identical with Span. 427)

429. Pedagogical Linguistics: Applied Linguistics for Language Teachers (3) GC II (Identical with Or.S. 429)

430. Language Variation (3) GC I 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 ling.


450. Language and Social Issues (3) GC II S 1983-84 Systematic investigation of selected topics in social issues involving language from a linguistics perspective; "standard" versus "nonstandard" language, minority dialects, language attitudes and prejudice, and the role of language in the educational system.

451. Acquisition of Speech and Language (3) GC II (Identical with Sp.H. 451)


473. Speech Production and Comprehension (3) GC II 1984-85 (Identical with Phil. 473)

475. Semantics (3) GC II 1983-84 (Identical with Phil. 475)

476. Language in Culture (3) GC II (Identical with Anth. 476)

477. Pragmatics (3) GC I 1983-84 Study of language use, its relationship to language structure and context; topics such as speech acts, presupposition, implication, performatives, conversations. (Identical with Phil. 477)

480. Historical Comparative Linguistics (3) GC I (Identical with Anth. 480)

495. Colloquium a. Linguistics (1) [Rpt./3] GC I

500. Linguistics for Nonmajors (3) I Conceptual foundations, methodology, and current theoretical frameworks. Students will carry out actual linguistic analysis. For students in fields other than linguistics.


502. Advanced Syntax (3) I Analysis of various grammatical constructions; treatments of the distinction between local and nonlocal dependencies. P, 501.

540. Language Change and Reconstruction (3) II Introduction to the methods in, theory of, and problems in reconstruction of phonology, syntax, and semantics. Data will be drawn from a variety of the world's language families, but will concentrate on American Indian languages and languages with little or no written record.

544. Language Universals (3) I Consideration, from a typological viewpoint, of aspects of the phonological, syntactic, and semantic systems of a representative sample of the world's languages.

583. Sociolinguistics (3) I (Identical with Anth. 583)

596. Seminar u. Case and Paninian Grammar (3) [Rpt.] II 1983-84 (Identical with Or.S. 596u, which is home)

600. Current Issues in Linguistic Research (3) [Rpt./1] Current research in linguistics, with emphasis on relationships among syntax, semantics, and phonology.

MANAGEMENT

Associate Professors Nicholas J. Aquilano, John W. Dickson, Marvin Fortman, Hollis K. Martin, David A. Tansik, Robert E. Tindall
Assistant Professors J. Richard Harrison, Margaret A. Neale, Gregory B. Northcraft, Gustavo A. Vargas
Lecturers Paul Baker, Louie B. Chester, Herbert Muller, William W. Wissler

The Department of Management is being reorganized. For information contact the department head.

The Department of Management is responsible for course work focusing on the task of integrating human and material resources in the development and pursuit of organizational strategies. Instruction in data analysis and in the legal environment of business is also given through the department.

The following undergraduate degrees are offered: Bachelor of Science in Business Administration with majors in operations management and personnel management. For degree requirements, please see the College of Business and Public Administration section of this catalog. The Master of Science with a major in management is also available, and the department participates in the Master of Business Administration and Doctor of Philosophy degrees with a major in business administration. For admission and degree requirements, please see the Graduate Catalog.


305.* Management and Organizational Behavior (3) I II GRD Integration of classical and organizational behavior approaches to management in private and public organizations in various cultures. P, Econ. 201b; Mgmt. 275.

320.* Business Law (3) I II Nature and sources of business law; the judicial system; contract, sales, and agency law; unfair trade practices.

330.* Personnel Management (3) I II GRD Policies and current practices in utilizing human resources effectively at all organizational levels.

373.* Basic Operations Management (3) I II GRD Quantitative techniques applied to design, operation, control and updating of operating systems. P, 275, Math. 123.


420.* Advanced Business Law (3) GC I II GRD Negotiable instruments, partnerships, corporations, and property rights. P, CR 320 or admission to BPA graduate programs.

426.* Wills, Estates, and Trusts (3) GC I Wills, inheritances, estates, and trusts; the administration of estates, including the duties and liabilities of executors and trustees; basic estate and gift tax laws applicable to estate planning.

430.* Personnel Policies (3) GC II An integrative, case-oriented course focusing on problems and policies in the procurement, development, compensation, and motivation of personnel. P, 330 and six units in personnel mgmt. major.

435.* Sociotechnical Systems (3) GC I Theory and practice of installing high-commitment work systems to increase productivity and improve the quality of working life.


473a-473b.* Production and Operations Management (3-3) GC Productive systems, including service type industries; activities entailed in selecting, designing, operating, controlling, and updating systems. 473a: General coverage, including planning, scheduling and control systems. 473b: Case analyses in a manufacturing environment. P, 373.

474.* Work Simplification (3) GC I II Work simplification and motion economy; methods of increasing productivity of employees; flow process charts and flow diagrams; appraisal of fatigue in business and industry. P, 305.
476.* **Management of Service Operations** (3) GC I Application of operations management concepts to service organizations and interaction with other functional areas; case analyses of banks, airlines, health care, motels, food service, others. Field trip. P. 373.

477.* **Materials and Logistics Management** (3) GC I Organization, management, and control of material flow processes; logistical strategies and relationships of procurement, handling, warehousing, transportation, and inventory control. P. 373, 473a.

480.* **Women Entering Management** (3) I II An integrative course for women who are aspiring to be managers and for men who expect to be dealing with female managers. P. 305. (Identical with W.S. 480)

*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. **Business Case Analysis and Presentation** (3) Written analysis of cases and other reports; development of skills in analysis, decision making, and written and oral presentation, with emphasis on the total situation of each case considered. Open only to students admitted to BPA graduate programs.

502. **Organization Theory and Behavioral Relations** (3) I II The interactions, effects, and interrelationships of managers, employees, and organizational structures and systems. Open only to students admitted to a BPA graduate program.

521. **Legal Environment of International Business** (3) I Legal institutions and processes affecting international business.

552. **Statistical Decision Making** (3) I II Probability and statistical analysis; random variables, sampling distributions, hypothesis testing, Bayesian analysis, time series, statistical investigation. Open only to students admitted to a BPA graduate program. P. M.I.S. 500, or Math. 119 and 123.

554. **Research Methodology** (3) I Behavioral research techniques; bias, validity, reliability, and applicable statistical techniques; critiques of research articles and reports. P. 552.

571. **Business Strategy** (3) I II Case method approach to problems and policies facing top management. May only be taken in the final semester of the M.B.A. program. P. 500b, 502, Fin. 511, Mktg. 500.

572. **Operations Management** (3) I Intended for students without a background in production management. Survey of techniques useful in operating both manufacturing and service industries.

573. **Business and Society** (3) I II Relationships between business organizations and economic, social and political processes; business responsibilities to various interest groups. P. 305 or 502.

577. **Business Policy and Performance Simulation** (3) I II Management experience vicariously achieved by students serving as executives of competing companies; decisions are computer processed.

580a-580b. **Theory of Management and Organization** (3-3) 580a: Analysis of behavior in organizational systems; review of classical, behavioral, and contingency theories of management with a focus on internal systems phenomena. 580b: Organizations in their environments; analysis of organizations in the context of their environmental interfaces. P. 305 or 502. 580a is not prerequisite to 580b.

582a-582b. **Multivariate Analysis in Business** (3-3) 582a: Multiple, polynomial, stepwise regression including indicator variables, inference, remedial measures. 582b: Analysis of variance and covariance, principal components, discriminant analysis, canonical correlation. P. 275 or 552. 582a is not prerequisite to 582b.

585. **Material Requirements Planning and Control** (3) II Material management with emphasis on forecasting and inventory theory within a dependent demand environment.

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. Relevant material drawn from social psychology, sociology, anthropology, and political science.

603. **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.

604. **Organization Development and Change** (3) II Concepts and skills relevant to persons concerned with problem diagnosis and organizational development and change. P. 305 or 502.

696. **Seminar**
   c. Ethics in American Business (2 to 4) I II
   d. International Business Management (2 to 4) I II
   e. Research Design: Statistical Methods (2 to 4) I II
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.

The department offers the Bachelor of Science in Business Administration with a major in management information systems. Interested students should follow the program of studies in the College of Business and Public Administration section of the catalog. Nonbusiness students who desire a minor in management information systems should contact the head of the department for a list of courses.

A Master of Science with a major in management information systems is also available, and management information systems is a part of the Master of Business Administration and Doctor of Philosophy degrees with a major in business administration.

111. Introduction to Computing (3) I II Description of computer hardware and software; computer terminology; program design; with emphasis on problem definition and flowcharting; introduction to a general purpose programming language. (Identical with C.Sc. 111)

121. Business Programming (3) I II GRD Cobol programming language; file organization and retrieval of data from magnetic tape and disc storage media; internal and external sorting techniques; problems of file maintenance and file updating. P, 111. (Identical with C.Sc. 121)

122. Scientific Programming (3) I II (Identical with C.Sc. 122)

123. Nonnumerical Programming (3) I II (Identical with C.Sc. 123)

301. Program and Data Structures (3) I II Application system development techniques, fundamental data structures, design and analysis of selected software procedures for business applications. P, 121, Math. 123.

327.* Comparative Programming Languages (3) I II (Identical with C.Sc. 327)

331.* Data Management Systems (3) I II Techniques of retrieval systems; generalized data management systems; CODASYL, relational, hierarchical, distributed data bases; query interfaces; security. P, 301. (Identical with C.Sc. 331)

341.* Information Systems Analysis and Design (3) I II 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. P, 301.

342.* Data Structures (3) I II (Identical with C.Sc. 342)

400. Quantitative Methods for Administrators (3) I II S Applications of quantitative techniques to problems in administration; functions, time value of money, compound interest systems of linear equations and inequalities, matrix algebra; sequences and limits, applications of differential calculus. Open only to M.B.A. and M.P.A. degree candidates. (Identical with P.P.P.A. 400)

411.* Information Systems in Society (3) I II Societal implications of computerized information systems; positive and negative effects of computer utilization; selected applications of computer systems in society and future prospects.

421.* Simulation Modeling and Analysis (3) GC Modeling and analysis of probabilistic real-world systems by means of simulation; building simulation models in FORTRAN and in a simulation language such as SLAM or GPSS; introduction to the analysis of simulation output data. P, Mgmt. 275, M.I.S. 301. (Identical with C.Sc. 421)

422. Mathematical Programming and Applications (3) GC Formulation and solution of mathematical programming models with applications to decision problems involving profit maximization or cost minimization. Topics include linear programming, network flow programming, and integer programming. P, 301, Math. 119. (Identical with C.Sc. 422)

441.* Information System Design and Implementation (3) I Design of program structures, subsystems, user interfaces; hardware/software selection and evaluation; system configuration and modeling; system implementation, conversion, performance evaluation. P, 341.
Advanced Business Programming Techniques (3) GC I Large scale business systems, advanced file organization concepts and programming, advanced COBOL features, software testing and debugging support tools, programming language generics. P, 301.

Accounting Information Systems (3) GC I II (Identical with Acct. 461)

Policy Formation and Management Information Systems (3) II Integration of the M.I.S. function with the overall operations of the business organization; decision-making relative to planning, organizing, actuating, and controlling; on-site analysis of local business organizations. Field trips. P, 301.

*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.

Management Information Systems (3) I II Computer problem solving using BASIC and canned programs; conceptual and practical foundations of information processing support for management and decision-making functions; cost benefit analysis. Open only to students admitted to BPA graduate programs.

Behavioral and Economic Aspects of Information Systems (3) I Data validation and data completeness; comparison of centralized and decentralized systems; computer pricing policies and cost allocation; economies of scale; legal considerations and computer frauds; security considerations; problems of changing computer systems. Open only to students admitted to BPA graduate programs. P, 441 or 501.

Advanced Systems Modeling and Simulation (3-3) Optimization models of information systems; application of graph theory and integer programming; branch and bound; simulation of operating systems, computer networks, file organizations, memory management and relevant areas involving M.I.S. policy decisions. Open only to students admitted to BPA graduate programs. P, 501, Mgmt. 552, Math. 119. (Identical with C.Sc. 521a-521b)

File Organization and Data Base Management (3-3) Data and storage structure; file design and analysis of data organization techniques; indexed sequential, clustered, multilist and inverted files; D.B.M.S. design and implementation of network (CODASYL), hierarchic and relational data bases. Open only to students admitted to BPA graduate programs.

Computer-Aided Information Systems Analysis and Design (3-3) Analysis and logical design of M.I.S. and management control systems; techniques for stating and analyzing information systems requirements; optimization models of subsystems; hardware/software selection and evaluation; system implementation and performance evaluation. Open only to students admitted to BPA graduate programs. (Identical with C.Sc. 541a-541b)

Business Systems Programming Methods (3-3) Business systems programming environment; structured COBOL; sequential and indexed sequential files; program management standards; advanced features of COBOL; direct and multi-key files; RPG; access methods. Open only to students admitted to BPA graduate programs. P, 501.

Operations Analysis (3) II Modeling techniques for decision-making in operations analysis and production; applications include production mix, lot size, logistics, factory and warehouse location, inventory management, queueing processes, scheduling, PERT/CPM, and strategic policy decisions. Open only to students admitted to BPA graduate programs. P, Mgmt. 552.


Nonlinear Mathematical Programming (3) I II S Introduction to the formulation, solution, and implementation of nonlinear mathematical programming models; main methodological areas of nonlinear programming; representative applications; Medium-scale models will be run on the computer. P, 421a.

Systems Design for Management (3) I Application of computer technology to distributed processing; computer-aided tools in support of administration; electronic mail, telecommuting. P, 501.

Mathematical Programming Software Design and Construction (3) II Fundamentals of modeling systems, with emphasis on the business applications of mathematical programming solutions; techniques for the design and construction of mathematical programming software. P, 421a.

Seminar
a. Computers in Auditing (3) I II P, 341 or Acct. 461. (Identical with Acct. 596a)

Seminar
c. Data Communications and Distributed Processing (3) I II P, 531.
d. Advances in Optimization Theory (3) I II P, 421a.
e. Recent Advances in Management Science (3) I II P, 421a.
Seminar
a. MIS Research Projects (3) [Rpt./6 units] Open to majors only.

**MARKETING**

Associate Professors James M. McCullough, Richard A. Scott, Robert A. Westbrook
Assistant Professors William C. Black, Jerry N. Conover, Karen L. LeMasters, Michael D. Reilly,
Sushila Umashankar, Melanie R. Wallendorf
Lecturers Charles A. Boyd, Jeffrey A. Nordensson

Marketing involves understanding the changing wants of individuals and organizations, the development and distribution of goods and services to meet those wants, and the maintenance of satisfactory customer relationships. Graduates may qualify for positions in product, brand and service management, marketing research and planning, advertising and promotion, sales and sales management, retailing and international marketing.

An undergraduate major in marketing is offered within the Bachelor of Science in Business Administration described in the *College of Business and Public Administration* section of this catalog. The Master of Science degree with a major in marketing is offered, and the department participates in the Master of Business Administration and Doctor of Philosophy degrees with a major in business administration.

*Honors:* The department participates in the Honors Program.

**361.* Introduction to Marketing** (3) I II Role of marketing in the economy and in business and nonprofit organizations; environmental factors affecting marketing; nature of marketing management decisions. P, Econ. 100a or 201a or CR.

**364.* Creative Advertising** (3) I II Use of visual and audio techniques to plan, create and produce effective advertising campaigns. Not acceptable for credit toward mktg. major. (Identical with Jour. 364 and R.T.V. 364)

**366.* Public Relations** (3) I II The nature, role and management of public relations. Case problems and projects give practical experience in developing public relations programs. Not acceptable for credit toward mktg. major. (Identical with Jour. 366 and R.T.V. 366)

**410.* Small Business Marketing and Management** (3) GC I II Planning, organizing, and establishing a small business; evaluation of existing businesses and franchise operations; market feasibility studies; preparation of a business development plan. P, 361.

**420.* Marketing for Nonprofit Organizations** (3) GC 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. 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, Mgmt. 375.

**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.

**451.* Marketing Data Analysis and Decision Models** (3) GC II Applications of advanced statistical techniques of analysis, inference and quantitative models for marketing management decisions. P, 440.

**452.* Advertising and Promotion Management** (3) I II Role of advertising and special promotions in the economy and business and nonprofit organizations, concepts and strategy for programs, budgets, media selection, evaluation of effectiveness. P, 361.

**454.* Management of Sales Operations** (3) GC I The sales function and its relationship to the total marketing program; sales strategies and objectives; development and administration of sales organizations; control and evaluation of sales operations. P, 361.

**455.* Management of Distribution Systems** (3) GC I Nature and operation of channels in the distribution of goods and services; economic and behavioral problems in wholesaling and retailing; marketing logistics. P, 361.

**456.* International Marketing Management** (3) I I Marketing operations for foreign environments; cultural, political and economic factors affecting the international marketer. P, 361.
458.* Retailing Management (3) GC I II Management of the retail store, its environment, personnel, buying, merchandising, pricing, advertising, promotion, selling, expense control and customer service. P, 361; Acct. 200.

459.* Product Management (3) GC II Product (services) strategy for achieving financial growth; evaluating opportunities; generating ideas; launching new offerings; managing the product (services) portfolio. P, 361.

470.* Marketing and Public Policy (3) GC I Trends in public opinion, legislation and practices of governmental regulatory bodies; implications for marketing decision making; role of marketing research in public policy development. P, 361.

471.* Marketing Policies and Operations (3) I II An integrative, capstone course focusing on comprehensive marketing problems; development, control, and auditing of marketing organizations and operations. P, 440, 450; three additional units of mktg. at the 400 level.

*Open only to students who meet the requirements for advanced standing as specified in the College of Business and Public Administration section of this catalog.

500.* Marketing Management (3) I II Scope, environment and nature of marketing management; customer and market analysis for product, service, price, promotion and distribution decisions. Open only to students admitted to BPA graduate programs.

530. Management of Marketing Communications (3) I Application of communications theory and research findings in advertising, sales promotion, publicity, personal selling; planning, conduct and administration of programs of information and persuasion. P, 500.

550. Consumer and Organizational Buyer Behavior (3) II Nature of the purchase decision process for goods and services. Theories, concepts and research methods and findings are examined for use in management and public policy decision making. P, 500.

560. International Marketing (3) II Marketing planning and strategies for foreign environments; cultural, political, economic factors affecting the international marketer, multinational corporation and multinational market groups. P, 500.

572. Research and Marketing Management (3) I Specification of management information needs, evaluation of research proposals and findings, methods of gathering and analyzing data, administrative aspects of research and decisions. P, 500, Mgmt. 552.

601. Behavioral Science Applications in Management (3) II Applications of behavioral science theories, concepts and methods in the study of problems in management. P, Mgmt. 600.

696. Seminar
a. Marketing Research Methodology (3) I II P, 500, Mgmt. 552.

MATERIALS ENGINEERING

Committee on Materials Engineering (Graduate)

Professors Robert H. Chambers (Physics), Bernhard O. Seraphin (Optical Sciences), Morton E. Wacks (Nuclear and Energy Engineering), Donald H. White (Chemical Engineering), Frank Wiersma (Soils, Water and Engineering)

Associate Professors Reginald L. Call (Electrical and Computer Engineering), Paul H. Wirshing (Aerospace and Mechanical Engineering)

Assistant Professor Krishna Seshan (Metallurgical Engineering)

The Committee on Materials Engineering administers programs of study for an interdisciplinary doctoral minor in materials engineering. For further information, contact the dean's office, College of Mines, or the head of the Department of Metallurgical Engineering.
MATHEMATICS


Assistant Professors Christopher Jones, John N. Palmer, Peter Tannenbaum, Robert Valentini Lecturers Robert C. Dillon, John L. Leonard, Stephen G. Tellman

The department offers courses in pure mathematics, applied mathematics, probability and statistics, computer mathematics, mathematics education, and engineering mathematics. Planned minors in numerous professional fields are available; interested persons may receive additional information on request.

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), Bachelor of Arts in Education and Bachelor of Science in Education (College of Education), Master of Arts, Master of Science, Master of Education and Doctor of Philosophy.

The major for the B.A. and B.S. has four options, each consisting of 40 units which includes the following core courses: 125a-125b, 145 (first year); 215, 225, 255, 275 (second year); 423 (third year). The options are described below.

The comprehensive mathematics option: 40 units including the core above; 415a; 415b or 413; 425; and six additional units of 400-level math. courses (except 404, 405, 410, 422a-422b, 461). For a B.S. degree the supporting minor must be chosen from Group VI or systems engineering or computer science. For a B.A. degree the minor may be chosen from any discipline (other than mathematics) available at the University.

The applied mathematics option: 40 units including the core above; 424; a one-year sequence chosen from 454 and 455, 454 and 456, 464 and 466, or 475a-475b; and at least six additional units of 400-level math. courses (except 404, 405, 410, 422a-422b, 461), at least one of which must be 420, 421, 443, 454, 455, 456, 464, 466, 473, 475a, 475b, 478, 479 or 484. Also required are six units of physics with calculus and a minor, to be approved by a departmental adviser, in a subject which significantly uses mathematics.

The computer science option: 40 units including the core above; C.Sc. 115 and 227 (first year); C.Sc. 237 (second year); 475a-475b; 415a and either 443 or 447 or 479; C.Sc. 327, 342, 430, and one additional 3-unit computer science elective; and at least one additional 3-unit, 400-level math. course (except 404, 405, 410, 422a-422b, 461). A computer science minor is included in this program.

The probability and statistics option: 40 units including the core above; 464, 466 and 468; and at least six additional units chosen from 400-level math. courses (except 404, 405, 410, 422a-422b, 461), Stat. 465, S.I.E. 405, 422, and 440. The minor, to be approved by a departmental adviser, must be in a subject which significantly uses mathematics.

Students planning to do graduate work in mathematics should select the comprehensive mathematics option or include 415a and 425 in their program.

A minor in mathematics with the College of Arts and Sciences: a minimum of 20 units including 125a-125b, 215, 223 or 225, and at least six upper-division units.

The teaching major (for prospective secondary school teachers): 34 units, including 125a-125b, 145, 215, 275, 305, 330, either 362 or 461 or 464, 396a (one unit), 397a (one unit), and one from each of the following: 404, 405, 430; and 413, 415a, 423, 446. One additional course should be selected in consultation with a departmental adviser.
The teaching minor: A minimum of 24 units, including 125a-125b, 215, 275, 305, 330, and at least two electives from the following: 362 or 404, 405, 410, 430, 446, 461.

The elementary education major area of specialization: 105a-105b; or 105a and 106, and a minimum of 14 units selected from 119 or 145, 122, either 123 or 125a-125b, 160, and 305.

The engineering mathematics major: Requirements are given in the College of Engineering section.

Readiness tests in elementary courses: Students enrolling in elementary algebra courses 116 and 117a through 117f and in calculus courses 123 and 125a will be given readiness tests to determine whether they are adequately prepared.

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. The department strongly recommends that students not enroll in any prerequisite for courses in which they have already received credit.

Honors: The department participates in the Honors Program.

101a-101b. Survey of Mathematical Thought (4-4) A study of the nature of mathematics and its role in civilization, utilizing historical approaches and computational examples. Not applicable to the math. major. P, fulfillment of University entrance requirements in math. without deficiency.

105a-105b.* Mathematics for Elementary School Teachers (3-3) Development of a basis for understanding the common processes in elementary mathematics. 105a: Concepts of number. 105b: Concepts of geometry and probability. 2R, 3L. Open to elem. majors only. P, fulfillment of University entrance requirements in math. without deficiency.

106.* Ideas in Mathematics for Elementary School Teachers (3) II The basic ideas behind arithmetic, algebra, and geometry are examined from a conceptual point of view. Open to elem. majors only. P, 105a.

116. Intermediate Algebra (3) I II Not applicable to the math. major. Linear and quadratic equations in one and two variables, systems of two equations, polynomials, algebraic fractions, exponents, radicals, logarithms, and inequalities.

116a-116b-116c. Intermediate Algebra (1-1-1) The sequence 116a-116b-116c is equivalent to 116. Unless a student has already passed 116a or 116b, he or she should enroll in 116. A student who has already passed one or more of the parts, 116a or 116b, should enroll in the remaining part or parts. Not applicable to the math. major. 116a, 116b and 116c are offered each semester.

117a. Introduction to Algebraic Skills (1) I II Review of 116. Includes notation, factoring, graphing, solving equations or inequalities. Not applicable to math. major or minor. P, 116 or 116c or an acceptable score on the departmental readiness test.

117b. Introduction to Functions (1) I II Linear and quadratic functions, polynomial and rational functions, exponential and logarithmic functions. Not applicable to math. major or minor. P, 116 or 116c or 117a or acceptable score on the departmental readiness test.

117c. Introduction to Finite Mathematics (1) I II Systems of linear equations; sequences, series; combinatorial algebra and probability. Not applicable to math. major or minor. P, 117b or acceptable score on the departmental readiness test.

117d. Introduction to Trigonometry (1) I II Trigonometric functions, identities, trigonometric equations, inverse trigonometric functions. Not applicable to math. major or minor. Students with credit in 117i or 118 will obtain no graduation credit for 117d. P, 117b or an acceptable score on the departmental readiness test.

117e. College Algebra (3) I II Equivalent to and duplicates the sequence 117a-117b-117c. Not applicable to math. major or minor. P, 116 or 116c or an acceptable score on the departmental readiness test.

117f. Precalculus (4) I II Equivalent to and duplicates the sequence 117a-117b-117c-117d. Intended for students planning to take 125a. Not applicable to math. major or minor. Students with credit in 117d or 118 will obtain only three units of graduation credit for 117f. P, 116 or 116c or an acceptable score on the departmental readiness test.

118. Plane Trigonometry (2) I II Not applicable to the math. major or minor. Students with credit in 117d or 117i will obtain only one unit of graduation credit for 118. P, one entrance unit in geometry, and either 1½ entrance units in algebra, or 116 or 116c.

119.* 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, 117e.

122. Scientific Programming (3) I II (Identical with C.Sc. 122)

123.* Elements of Calculus (3) I II Introductory topics in differential and integral calculus. P, 117e.
125a-125b. Calculus (3-3) Differentiation and integration of trigonometric, logarithmic, and exponential functions, techniques of integration, applications of differentiation and integration, sequences, convergence or series, power series, indeterminate forms. Some sections may include an integrated introduction to elementary FORTRAN and numerical work using the departmental computer. P, 117f, or 117e and 118, or acceptable score on the departmental readiness test. 125a and 125b are offered each semester.

145.* Discrete Mathematics (3) II Topics to be selected from elementary combinatorics, probability theory, graph theory, and finite geometry. Not recommended for jrs. or srs. P, CR 125a.


160.* Introduction to Statistics (3) I II Basic probability, uses of numerical data, useful probability distributions, estimation and hypotheses testing. Not applicable to the math. major. P, 117e.

200. Problem-Solving Laboratory (1) [Rot. /4] I II Development of creative, mathematical, problem-solving skills, with challenging problems taken from calculus, elementary number theory and geometry. P, 125b.

202. Symbolic Logic (3) I II (Identical with Phil. 202)


223.* Vector Calculus (4) I II Vectors, differential and integral calculus of several variables, P, 125b. Credit may be received for this course or 225, but not for both.

225.* Functions of Several Variables (4) I II Functions of several variables, directional and partial derivatives, vector fields, multiple and line integrals, Stokes' Theorem. P, 215. Credit may be received for this course or 223, but not for both.

†Students with the appropriate prerequisites may enroll in 125a, 125b, 215 and 225, or 125a-125b, depending upon the student's major departmental requirements.


254.* Introduction to Ordinary Differential Equations (3) I II Solution methods for ordinary differential equations, qualitative techniques; applications drawn from physical, biological or social sciences. P, 125b.

255.* Analysis of Ordinary Differential Equations (3) I II Basic solution techniques for linear systems, qualitative behavior of nonlinear systems, numerical methods, computer studies; applications drawn from physical, biological and social sciences. P, 215, and 275 or knowledge of FORTRAN.

*†The ordinary differential courses differ in the following way: (1) 253: linear algebra taught and used, but no computing required; (2) 254: linear algebra and computing neither included nor required; (3) 255: linear algebra and a knowledge of FORTRAN required.

263.* Statistical Methods in Biological Sciences (3) I II An introduction to descriptive and inferential statistical techniques, with special emphasis on analysis of biological and clinical data. P, 117e.


305. Fundamental Concepts of Mathematics (3) I II Set theory, cardinal numbers, construction of number systems, elementary number theory, theory of algebraic equations; examples of groups, rings, fields, and vector spaces. P, 125b.

322. Mathematical Analysis for Engineers (3) I II Laplace transforms, vector analysis, line and surface integrals, Fourier series, partial differential equations. Credit allowed for this course or 422a, but not for both. P, 223 or 225; 253 or 254 or 255.

330. 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, 125b.

362. Introduction to Probability Theory (3) I II Sample spaces, random variables and their properties, with considerable emphasis on applications. P, 123 or 125b.

396. Proseminar a. Problems in Mathematics Education (1) I II Open only to teaching majors in math. P, 305.

397. Workshop a. Mathematics Education (1) I I Open only to teaching majors in math. P, 305.

402. Mathematical Logic (3) GC I Sentential calculus, predicate calculus; consistency, independence, completeness, and the decision problem. Designed to be of interest to majors in math. or phil. P, 125a or Phil. 325. (Identical with C.Sc., 402 and Phil. 402)
332 DEPARTMENTS AND COURSES OF INSTRUCTION

403. Foundations of Mathematics (3) GC II 1984-85 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)

404. History of Mathematics (3) GC 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.

405. Mathematics in the Secondary School (3) GC Not applicable to the math. major in the College of Liberal Arts. (Identical with S.Ed. 405)

410.* Matrix Analysis (3) GC II General introductory course in the theory of matrices. Advanced-degree credit not available to math. majors. P. 123 or 125b.

413.* Linear Algebra (3) GC II Vector spaces, linear transformations and matrices, eigenvalues, bilinear forms, orthogonal and unitary transformations. P. 215.


420. Calculus of Variations (3) GC I 1983-84 Euler equations and basic necessary conditions for extrema, sufficiency conditions, introduction to optimal control, direct methods. P. 225, and 253 or 254 or 255.

421. Fourier Series and Orthogonal Functions (3) GC II Linear spaces, orthogonal functions, Fourier series, Legendre polynomials and Bessel functions. P. 225 for undergraduates.

422a-422b. ** Advanced Analysis for Engineers (3-3) GC Laplace transforms, Fourier series, partial differential equations, vector analysis, integral theorems, matrices, complex variables. Credit allowed for 422a or 322, but not for both. P. 223 or 225, and 253 or 254 or 255. 422a is not prerequisite to 422b. Both 422a and 422b are offered each semester.

423. Intermediate Analysis (3) GC I II Elementary manipulations with sets and functions, properties of real numbers, topology of the real line, continuity, differentiation, and Riemann integration of real valued functions of a real variable, with emphasis on proving theorems. Not applicable to graduate programs in math. P. 223 or 225.

424. ** Elements of Complex Variables (3) GC I II Complex numbers and functions, conformal mapping, calculus of residues. P. 223 or 225. **Credit will be allowed for only one of 424 or 422b. 422a-422b will not be considered a two-semester course at the 400 level in the Master of Arts degree program.


426. Advanced Calculus of Several Variables (3) GC II Differentiation of functions of several variables, implicit function theorem, multiple integrals, differential forms, line and surface integrals. P. 425.

430. Second Course in Geometry (3) GC II Topics to be selected from projective geometry, hyperbolic geometry, such areas as metric geometry, and combinatorial topology. P. 215.

434. Introduction to Topology (3) GC II Properties of metric and topological spaces and their maps; topics selected from geometric and algebraic topology, including the fundamental group. P. 423.

436. Metric Differential Geometry (3) GC II Differential geometry of surfaces; nonintrinsic geometry: fundamental forms, Gaussian and mean curvatures; intrinsic geometry: Theorema Egregium, geodesics, Gauss-Bonnet theorem. P. 223 or 225, and 253 or 254 or 255.


447. Combinatorial Mathematics (3) GC II 1984-85 Enumeration and construction of arrangements or designs, theorems on existence and nonexistence of designs, applications to design of experiments and error correcting codes. P. 415a.


455.* Elementary Partial Differential Equations (3) GC I Theory of characteristics for first order partial differential equations; second order elliptic, parabolic, and hyperbolic equations. P. 225, and 253 or 254 or 255.

*Credit allowed for only one from each of the following groups: 117a, 117e, or 117f; or 117b, 117e, or 117c, 117e, or 117f or 117d or 117f; 119 or 145; 223 or 225; 253 or 254 or 255; 455 or 456; 415b or 413.

461. Elements of Statistics (3) GC I II Probability spaces, random variables, standard distributions, point and interval estimation, parametric and nonparametric hypothesis testing. Math. majors will not receive grad. credit. P, 123 or 125b. (Identical with Stat. 461)


473. Theory of Computation (3) GC I II (Identical with C.Sc. 473)

475a-475b. Mathematical Principles of Numerical Analysis (3-3) GC Introduction to theoretical numerical analysis with applications to errors, interpolation, approximations, numerical integration and differentiation, roots of polynomial equations, numerical quadrature, solution of ordinary differential equations. P, 223 or 225, and 253 or 254 or 255, and 275 or knowledge of scientific computer programming. (Identical with C.Sc. 475a-475b)

478. Computational Methods of Linear Algebra (3) GC II Numerical methods involved in the solution of linear systems; matrix inversion, eigenvalue problems, ill-conditioned matrices. P, 410 or 413 or 415b, and 275 or C.Sc. 122 or knowledge of scientific computer programming. (Identical with C.Sc. 478)

479. Game Theory and Mathematical Programming (3) GC II 1983-84 Linear inequalities, games of strategy, minimax theorem, optimal strategies, duality theorems, simplex method. P, 410 or 413 or 415b. (Identical with C.Sc. 479)

484. Operational Mathematics (3) GC II Basic concepts of systems analysis, Fourier and Laplace transforms, difference equations, stability criteria. P, 421 and 442, or 422b.

515a-515b. Modern Algebra (3-3) Structure of groups, rings, modules, algebras; Galois theory. P, 415a-415b.

516a-516b. Algebraic Number Theory (3-3) 1983-84 Dedekind domains, complete fields, class groups and class numbers, Dirichlet unit theorem, algebraic function fields. P, 515b.

517a-517b. Group Theory (3-3) 1984-85 Selections from such topics as finite groups, noncommutative groups, abelian groups, characters and representations. P, 515b.

518. Topics in Algebra (3) [Rpt.] I II Advanced topics in groups, rings, fields, algebras; content varies.

519. Topics in Number Theory and Combinatorics (3) [Rpt.] I II Advanced topics in algebraic number theory, analytic number theory, class fields, combinatorics; content varies.


524a-524b. Real and Complex Analysis (3-3) Functions of bounded variation; Riemann—Stieltjes, Lebesgue and Lebesgue—Stieltjes integral; real and complex Lp spaces; differentiation of real and complex functions; basic theory of analytic functions. P, 425.


529. Topics in Modern Analysis (3) [Rpt.] I II Advanced topics in measure and integration, complex analysis in one and several complex variables, probability, functional analysis, operator theory; content varies.

534a-534b. Topology (3-3) 1984-85 Point set topology, homotopy, homology. Applications, such as manifolds, duality, fixed point theorems, solutions to differential equations. P, 415a and 434.

536a-536b. Calculus of Tensors and Exterior Differential Forms (3-3) 1984-85 Affine tensors, tensor analysis on differentiable manifolds, calculus of exterior differential forms; calculus of variations, Riemannian geometry, applications to field theories. P, 423.


538. Topics in Geometry and Topology (3) [Rpt.] I II Advanced topics in point set and algebraic topology, algebraic geometry, differential geometry; content varies.
539. **Algebraic Coding Theory** (3) II 1983-84 Construction and properties of error correcting codes; encoding and decoding procedures and information rate for various codes. P, 415a. (Identical with E.C.E. 539)

555a-555b. **Partial Differential Equations** (3-3) 1983-84 Theory and examples of linear equations; characteristics, well-posed problems, regularity, variational properties, asymptotics. Topics in nonlinear equations, such as shock waves, diffusion waves, and estimates in Sobolev spaces. P, 525a or 585a.

556a-556b. **Dynamical Systems and Chaos** (3-3) 1983-84 Qualitative theory of dynamical systems, phase space analysis, bifurcation, period doubling, universal scaling, onset of chaos. Applications drawn from atmospheric physics, biology, ecology, fluid mechanics and optics. P, 422a-422b or 454.


567a-567b. **Statistical Inference** (3-3) 1983-84 A decision theoretic approach to estimation and hypothesis testing, sequential methods, large sample methods. P, 423, and 464 or 564a.

575a-575b. **Numerical Analysis** (3-3) Techniques for the solution of partial differential equations: finite difference methods, finite element methods, spectral and pseudo-spectral methods, multigrid and other advanced methods. Error analysis: convergence proofs and concepts of consistency and stability. P, 475b, 455, or 456. (Identical with C.Sc. 575a-575b)

579. **Topics in Applied Mathematics** (3) I II Advanced topics in asymptotics, numerical analysis, approximation theory, mathematical theory of mechanics, dynamical systems, differential equations and inequalities, mathematical theory of statistics; content varies.


585a-585b. **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 525a.

586. **Case Studies in Applied Mathematics** (1 to 3) [Rpt./6 units] I II In-depth treatment of several contemporary problems or problem areas from a variety of fields, but all involving mathematical modeling and analysis; content varies.

587. **Perturbation Methods in Applied Mathematics** (3) I 1984-85 Regular and singular perturbations, boundary layer theory, multiscale and averaging methods for nonlinear waves and oscillators. P, 422a-422b or 454.

588. **Topics in Mathematical Physics** (3) [Rpt.] I II Advanced topics in field theories, mathematical theory of quantum mechanics, mathematical theory of statistical mechanics; content varies.

589. **Nonlinear Wave Motion** (3) II 1984-85 Nonlinear partial differential equations describing wave phenomena in water, gases, plasmas, lasers; shocks, modulated wave trains, parametric resonance, solitons and exactly solvable equations. P, 422b or 456 or 455.

596. **Seminar**

a. **Topics in Mathematics** (3) [Rpt./1] S

636. **Information Theory and Coding** (3) II 1984-85 (Identical with E.C.E. 636)

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**MECHANICAL ENGINEERING**

*(See Aerospace and Mechanical Engineering)*

**MEDICAL TECHNOLOGY**

*(See Microbiology; see also Health-Related Professions)*
MEDICINE

Interdepartmental

495. Colloquium
   a. Introduction to the Neurosciences I (2) GC P, Consult dept. before enrolling. (Identical with Anat. 495a and Psio. 495a)
   b. Introduction to the Neurosciences II (2) GC P, 495a or consult dept. before enrolling. (Identical with Neur. 495b, Psio. 495b and Psyi. 495b)

596. Seminar
   Many interdepartmental seminars are numbered at both the 500 and the 800 levels. See 896 below for a complete listing.

801. Preparation for Clinical Medicine (1 to 12) I II No grade is given until the full 12 units are completed.

802. Human Behavior and Development (6) I II

896. Seminar
   a. Introduction to Forensic Pathology (1 to 3) II
   b.* Epidemiologic Methods (1 to 3)
   c. Approaches to Managing Behavior Problems of Children and Adolescents (2)
   d.* Host Defense to Disease (2)
   e.* Occupational and Environmental Health (1 to 3)
   f. The Doctor-Patient Relationship (2)
   g.* Professionalization of Issues Concerning Illness and Death (2)
   j.* Cardiovascular Pharmacology (2)
   m.* Principles of Medical Education (2) I II
   s.* Fluid and Electrolyte Balance and Renal Immunology (2)
   t.* Pathophysiology of Respiratory Diseases (2)
   u.* Current Issues in Health Services (2)
   a. Introduction to Computers in Medicine (2)
   bb.* Geriatrics-Gerontology (1 to 3) II
   cc.* Community and International Nutrition (1 to 3) II (Identical with N.F.S. 596cc)
   dd.* Maternal/Child Health (1 to 3)
   ee.* Clinical Epidemiology (2)
   gg.* Medical Jurisprudence (2)
   hh.* Pathogenesis of Rheumatic Diseases (2)
   mm. Renal Physiology in Clinical Medicine (2)
   pp. Human Sexuality (2)
   ss.* Tropical Disease Problems (2)
   uu. Physical and Biological Basis of Nuclear Medicine (2)
   yy.* Basic Principles of Epidemiology (2) [Rpt./1]
   zz.* Pathogenesis and Approach to Immunological Diseases (2)

*Available as both 596 and 896.

Anatomy

See Anatomy elsewhere in this catalog.

Anesthesiology

Professors Burnell R. Brown, Jr., Head, Casey D. Blitt, Robert W. Vaughan
Associate Professors R. Dennis Bastron, I. Glenn Sipes, Charles W. Otto
Assistant Professors John B. Bentley, Jerry M. Calkins, Randall C. Cork, Stuart R. Hameroff
Instructors John P. Williams
Lecturers Reynolds J. Saunders, Kathleen M. Schrader, Harry B. Walker

800. Research (1 to 6) [Rpt./1]

810. Clerkship
   a. Anesthesiology (1 to 18)
Subspecialty
p. Critical Care Medicine (1 to 18) (Identical with I.Med. 815p)

Preceptorship
a. Anesthesiology and Subspecialties (1 to 18)
b. Special Clinical Subjects (1 to 18)
c. A.S.A.-Sponsored Preceptorship (1 to 18)

Biochemistry
See Biochemistry elsewhere in this catalog.

Family and Community Medicine
Professors Anthony F. Vuturo, Head, Herbert K. Abrams, George D. Comerci, Melvin H. Goodwin, Andrew W. Nichols, James R. Shaw, William A. Stini, Hugh C. Thompson
Associate Professors Peter J. Attarian, Robert W. Buckingham, Gail G. Harrison, Theodore H. Koff, Daniel O. Levinson, Douglas H. Lindsey

Poverty and Health (3) II (Identical with Nurs. 487)

Research (2 to 16) [Rpt./2]. P, basic science courses.

Clinical Anthropology (3) I II (Identical with Nurs. 588)

Seminar
a. Research Topics and Methodologies in Family and Community Medicine (1) [Rpt./1] I II Consult dept. before enrolling.

Research (2 to 16) [Rpt./2].

Clinical Clerkship (6 to 9)

Subspecialty
b. The Dying Patient (1 to 6) [Rpt./1]
d. Community Health Problems (6 to 12)

Preceptorship
a. Primary Care (6 to 12)
f. Clinical Preceptorship in International Health (6 to 12)

Seminar
Internal Medicine


Instructors Alan R. Rosenfeld

Lecturers Robert L. Brooks, Benjamin Burbank, James Corrigan (Pediatrics), William Faris, Mary L. Fines, David Flieger, Gerald Goldstein, Robert Heusinkveld (Radiology), Margaret Miller, Susan Newman (Social Services), Milan Novak, Donald Ridenour, Gail E. Riggs, Hans F. Stein

500. Research (2 to 16) [Rpt./1]

555. Cancer Biology (3) II (Identical with M.Mic. 555)

800. Research (2 to 16) [Rpt./1]

803. Clinical Clerkship (12)

810. Clerkship
a. Internal Medicine (6)
b. Ambulatory Diagnosis and Therapeutics (1 to 18)
c. Geriatrics and General Medicine Extended Care (6) [Rpt./1] P, 803.

815. Subspecialty
a. Clinical Cardiology Elective (6)
b. Clinical Dermatology (1 to 6)
c. Endocrinology (6)
d. Clinical Gastroenterology (6)
e. Hematology-Oncology (6)
f. Immunology, Arthritis and Allergy (6)
g. Infectious Diseases (1 to 6)
j. Pulmonary Laboratory and Consultation Service (3 to 6)
k. Nephrology, Renal Diseases (6)
l. Clinical Allergy (1 to 6) (Identical with Ped. 815i)
m. Medical Subspecialties (1 to 18) [Rpt.]
p. Critical Care Medicine (1 to 18) (Identical with Anes. 815p)

891. Preceptorship
a. General Medicine and/or Subspecialties (1 to 18) [Rpt./2]

Molecular and Medical Microbiology

See Molecular and Medical Microbiology elsewhere in this catalog.

Neurology

Professors Peggy Ferry (Pediatrics), William A. Sibley

Associate Professors Colin R. Bamford, Acting Head, Stuart R. Snider

Assistant Professor Enrique L. Labadie

Lecturer Robert H. Hamilton
495. **Colloquium**
   b. Introduction to Neurosciences II (2) GC (Identical with Med. 495b, which is home)

500. **Research** (2 to 16) [Rpt./1]

800. **Research** (1 to 12) [Rpt./1]

803. **Clinical Clerkship** (3 to 6).

810. **Clerkship**
   a. Neurology (1 to 18).

891. **Preceptorship**
   a. Neurology (1 to 18) [Rpt./2]

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Obstetrics — Gynecology

Professors C. D. Christian, **Head**, Lewis Shenker
Associate Professors Diane S. Fordney, William C. Scott, Earl Surwit, Louis Weinstein
Assistant Professor Herbert E. Pollock

800. **Research** (1 to 18) [Rpt./1]

803. **Clinical Clerkship** (6 to 9)

810. **Clerkship**
   a. Preparation for Practice (1 to 18)

891. **Preceptorship**
   a. Obstetrics and Gynecology (1 to 18)
   b. Gynecology-Endocrinology (6)

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Ophthalmology

Associate Professor Jonathan Herschler, **Head**
Assistant Professors Dean C. Brick, Barrett Katz
Lecturer Dennis J. Makes

815. **Subspecialty**
   a. Ophthalmology (3 to 6)

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Pathology

Associate Professors James M. Byers, III, Peter C. Johnson, Douglas H. McKelvie, Richard E. Sobonya, Philip D. Stansifer, David C. White
Assistant Professors Anna R. Graham, Thomas M. Grogan, Mary Jane Hicks, Ronald Schifman, Karen K. Steinbronn
Lecturers Louis Hirsch, Paula F. Lowe, Claire M. Payne

489. **Introduction to Forensic Science: Pathology, Anthropology, Toxicology and Law** (2) GC I II
   Opportunity for the criminal investigator and attorney with a background in forensic pathology to better understand the results of trauma, toxic substances and environmental catastrophes. Taught off campus only.

801. **General and Systemic Pathology** (10) I II

810. **Clerkship**
   a. Anatomic Pathology (1 to 18)
   b. Clinical Pathology (1 to 18)
   c. Special Topics (1 to 18) [Rpt.] P, 801.

891. **Preceptorship**
   a. Pathology (1 to 18) [Rpt./2]
Pediatrics


Associate Professors Sergio A. Bustamante, Burris Duncan, Marilyn J. Heins, John J. Hutter, Jr., Richard J. Lemen, Michael J. Schumacher, Elsa Sell, Lynn M. Tausig, Alayne Yates

Assistant Professors William Banner, John R. Britton, Ronald S. Fischler, Ronald Hansen, Gail G. Harrison, H. Robert Harrison, Stanley Lee, Wayne J. Morgan, Paul F. Pollack, Yvonne E. Vaucher

Instructor Alice Carroll

800. Research (1 to 18)

803. Clinical Clerkship (6 to 9)

810. Clerkship
c. Pediatric Care in a Cross-Cultural Setting (6)
d. Inpatient Pediatrics (6)

811. Subinternship
a. Ambulatory Pediatrics (1 to 18)
b. Behavioral and Developmental Pediatrics (1 to 18)

815. Subspecialty
a. Advanced Neonatology (6)
b. Pediatric Infectious Diseases (6)
e. Pediatric Cardiology (6)
f. Pediatric Neurology (6)
g. Pediatric Hematology/Oncology (6)
k. Pediatric Clinical Pharmacology (1 to 12) [Rpt./1]
l. Clinical Allergy (1 to 6) (Identical with I.Med. 815l, which is home)
p. Pediatric Endocrinology (1 to 18)

891. Preceptorship
a. Pediatrics (1 to 18)
b. Preparation for Practice (1 to 18)

Pharmacology

See Pharmacology elsewhere in this catalog. Toxicology courses are listed under Pharmacology and Toxicology.

Physiology

See Physiology elsewhere in this catalog.
Psychiatry

Professors Alan I. Levenson, Head, Allan Beigel, Larry E. Beutler, Henry W. Brosin, John C. Racy, Stephen C. Scheiber

Associate Professors Diane S. Fordney (Obstetrics and Gynecology), Alfred Kaszniak, Stephen B. Shanfield, Henry I. Yamamura (Pharmacology), Alayne Yates

Assistant Professors Peter J. Attarian (Family and Community Medicine), Shirley N. Fahey, Milton Frank, John S. LaWall, Russell D. Martin, John J. Misiaszek, Catherine Shisslak


495. Colloquium
   b. Introduction to Neurosciences II (2) GC (Identical with Med. 495b, which is home)

800. Research (1 to 12)

803. Clinical Clerkship (6 to 9) [Rpt./1].

810. Clerkship
   a. Clinical and Community Psychiatry (1 to 18)
   b. Child Psychiatry (1 to 18).

815. Subspecialty

91. Preceptorship
   a. Psychiatry (1 to 18) [Rpt./2] P, 803.

Radiology


Associate Professors Silvio A. Aristizabal, George T. Bowden, Tom Cetas, William G. Connor, Eugene W. Gerner, Kai Haber, Robert Henry, Bruce Hillman, Tim Hunter, Bruce Magun (Anatomy), Gerald Pond, Bryan Westerman, James M. Woolfenden

Assistant Professors John C. Bjelland, Raymond Carmody, Michael Moore, James Oleson, Del Steinbronn

Instructors Mark Chernin, Jon Kotler

Lecturers Randy Brodgen, Richard Claypool, Jack N. Hall, Douglas McKelvie (Animal Resources), Hugh Murrell

501. Radiation Biology (3) II Basic principles of radiation effects in mammalian cell and tissue systems, with emphasis on biochemical aspects, such as DNA damage and DNA repair, and cellular responses, such as cell kinetics defects and radiation repair and recovery; radiation and chemical (especially radiomimetic drugs) carcinogenesis. P, intro. bio. and chem.

555. Cancer Biology (3) II (Identical with M.Mic. 555)

596. Seminar
   h. Control of Proliferation in Animal Cells (1 to 2) I P, permission of instructor. (Identical with M.Mic. 596h)

800. Research (1 to 6) [Rpt./1]
Subspecialty
a. Diagnostic Radiology (6)
b. Nuclear Medicine (1 to 6)
c. Radiation Oncology (1 to 16).

Preceptorship
a. Radiology (1 to 18) [Rpt./1]

Seminar
h. Control of Proliferation in Animal Cells (1 to 2) I (Identical with M.Mic. 896h)

Surgery
Assistant Professors Robert B. Dzioba, Kenneth V. Iserson, Keith R. Kaback, Marc Kobernick, James M. Malone, Kenneth E. McIntyre, Roger W. Miller, Arthur B. Sanders, H. Thomas Sethney, Del V. Steinbronn
Instructors David W. Campbell, Ralph L. Ely, James K. Fuller, Jack M. Kashtan
Lecturers Bernard M. Cohen, Bob T. Foster, Anthony C. Guzauskas, Kathleen V. Kintner, Joseph M. Leal, Donald B. Lewis, John D. Lewis, Mary A. McAfee, Steven A. Seifert, Holly A. Tyson, Jerold A. Winter, Walter P. Work

Research (1 to 12) P, 803.

Clinical Clerkship (6 to 9)

Specialty Clerkship (3) P, basic science courses.

Clerkship
a. General Surgery (6)

Subspecialty
a. Urinary Stone Disease (6)
b. Cardiothoracic Surgery (6)
c. Neurosurgery (6)
d. Surgical and Medical Problems in Fluid and Electrolyte Balance (1 to 3) [Rpt./1]
e. Urology (6)
f. Orthopedics (3 to 6)
g. Cardiovascular Physiology and Research (1 to 12)
h. Lymphvascular System in Health and Disease (6 to 12)
j. Otorhinolaryngology (3)
k. Sports Medicine (Section of Orthopedic Surgery) (1 to 6) [Rpt./1]
q. Rehabilitation Services (1 to 6)
f. Emergency Medicine (3 to 12)

Preceptorship
a. Surgery and Subspecialties (1 to 18) [Rpt./3]

MEDIEVAL STUDIES

Committee on Medieval Studies (Graduate)

Professors Sigmund Eisner (English), Chairperson, Dana A. Nelson (Spanish and Portuguese)
Associate Professors Alan E. Bernstein (History), Richard C. Jensen (Classics)
Assistant Professors Pack Carnes (German), Donald K. Garfield (Art)

The Graduate Committee on Medieval Studies does not offer any major at this time. Programs constituting appropriate minors are available for doctoral students with majors in other disciplines. For further information concerning the minor, please see the Graduate Catalog.
METALLURGICAL ENGINEERING

Professors William G. Davenport, Head, Louis J. Demer, Kenneth L. Keating, Thomas M. Morris (Emeritus), Daniel J. Murphy (Emeritus), Sigmund L. Smith (Emeritus)
Associate Professor David R. Poirier
Assistant Professors Arturo Bronson, Srini Raghavan, Krishna Seshan

Metallurgical engineering is concerned with all scientific and engineering aspects of the production of metals and inorganic materials from minerals, their refining and processing into useful shapes and parts, and their behavior as principal materials of modern civilization. Thus, the metallurgical engineer is responsible for the development, operation and supervision of new processes for metal production, metal fabrication and material selection in a wide variety of industries, ranging from mineral resource development companies through virtually all manufacturing companies to electronic firms.

At the undergraduate level, the department offers an ABET-accredited curriculum leading to the degree of Bachelor of Science in Metallurgical Engineering. The department offers graduate study leading to the Master of Science and Doctor of Philosophy degrees with a major in metallurgy.

The prescribed curriculum for the B.S. in Met.E. is found in the College of Mines section of this catalog.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
<th>Course Description</th>
<th>Notes</th>
<th>Co-requisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>422</td>
<td>Extractive Metallurgy of Nonferrous Metals (2)</td>
<td>GC II</td>
<td>Extractive metallurgy of selected nonferrous metals considered from the standpoint of an economic and process analysis. P, 420R.</td>
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<tr>
<td>423</td>
<td>Electrometallurgy (3)</td>
<td>GC I</td>
<td>Principles and applications of electrometallurgy in aqueous and fused salt solutions. 2R, 3L. Open to Ch.E. or Met. majors only.</td>
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<tr>
<td>424</td>
<td>Ceramic and Refractory Materials (2)</td>
<td>GC I</td>
<td>Nonmetallic materials used in high temperature applications. P, 331R, 430aR or Chem. 480b, or CR.</td>
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<tr>
<td>426</td>
<td>Hydrometallurgy (3)</td>
<td>GC II</td>
<td>Principles of hydrometallurgy; chemical and physical classifications of processes; liquid-solid separation techniques; solution purification and concentration and metal recovery technology. P, 224R, 401R, 412.</td>
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<tr>
<td>430aR-430bR</td>
<td>Physical Metallurgy (3-3)</td>
<td>GC</td>
<td>The structure and behavior of metals and alloys; correlation with fundamental theory of metallurgical phenomena. P, 310 or CR; Phys. 103b; Chem. 103b, 104b; C.E. 217 or CR.</td>
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<tr>
<td>430aL-430bL</td>
<td>Physical Metallurgy Laboratory (1-1)</td>
<td>GC</td>
<td>Fundamental lab. techniques for the preparation, examination, and interpretation of microstructures of metals and alloys; correlation with physical and mechanical behavior under applied conditions. P, 430aR-430bR or CR.</td>
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<tr>
<td>432</td>
<td>X-Ray Methods in Metallurgy (3)</td>
<td>GC II</td>
<td>Fundamentals of X-ray diffraction and fluorescence analysis; application of X-ray techniques to metallurgical problems. 2R, 3L. P, 430bR or CR.</td>
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<tr>
<td>435</td>
<td>Corrosion (2)</td>
<td>GC II</td>
<td>The science of corrosion reactions and their application to engineering problems. P, 331R; 412 or Chem. 480b or CR. (Identical with Ch.E. 435)</td>
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<tr>
<td>441</td>
<td>Metallurgical Engineering Design Economics (2)</td>
<td>GC I</td>
<td>Principles of process design, plant design, and economics involving equipment design, preliminary process design, and capital and operating cost estimation. P, CR 442a.</td>
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<tr>
<td>442a-442bL</td>
<td>Metallurgical Plant Design (2-1)</td>
<td>GC</td>
<td>Practice in the application of engineering principles to the design of a metallurgical process. 442a: 1R, 2L. 442b: 3L. P, CR 441.</td>
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<tr>
<td>450R</td>
<td>Unit Operations in Metal Processing (3)</td>
<td>GC I</td>
<td>Unit operations employed in the solidification and mechanical working of metals. P, 331R, 430aR; 411 or A.M.E. 340b; C.E. 217. (Identical with A.M.E. 450R)</td>
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<tr>
<td>450L</td>
<td>Metal Processing Laboratory (1)</td>
<td>GC I</td>
<td>Lab. experiments in metal processing, including solidification and mechanical forming processes. Field trip. P, CR 450R. (Identical with A.M.E. 450L)</td>
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<tr>
<td>451</td>
<td>Advanced Metal Processing (3)</td>
<td>GC II</td>
<td>Consideration in detail of modern refining, casting, and surface treatment processes, with emphasis on the relation between process variables and product properties. P, 450R.</td>
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<tr>
<td>452</td>
<td>Nondestructive Testing of Metals (3)</td>
<td>GC II</td>
<td>Introduction to the field of nondestructive testing of metals, with emphasis on application of magnetism, penetrants, radiography, ultrasonics, electronics, and other methods of evaluation. 2R, 3L. P, 331R, 430bR or Nu.E. 331.</td>
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<tr>
<td>457</td>
<td>Integrated Circuit Technology Laboratory (3)</td>
<td>GC I</td>
<td>(Identical with E.C.E. 457)</td>
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<tr>
<td>460</td>
<td>Health Hazards in the Mine Environment (2)</td>
<td>GC II</td>
<td>(Identical with Mn.E. 460)</td>
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<tr>
<td>461</td>
<td>Accident Prevention in the Mine Environment (2)</td>
<td>GC II</td>
<td>(Identical with Mn.E. 461)</td>
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<tr>
<td>501</td>
<td>Advanced Mineral Processing (3)</td>
<td>GC II</td>
<td>Advanced study of mineral processing theory and applications, and analysis of mineral processing systems. P, 401R.</td>
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<tr>
<td>510</td>
<td>Advanced Metallurgical Thermodynamics (3)</td>
<td>GC I</td>
<td>Treatment of thermodynamics of condensed phase multicomponent systems, with emphasis on metallurgical applications. P, 310.</td>
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<tr>
<td>513</td>
<td>Advanced Phase Diagrams (3)</td>
<td>GC I</td>
<td>Multicomponent constitution diagrams involving metals and ceramic materials. P, Chem. 430aR.</td>
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<tr>
<td>520</td>
<td>Advanced Metallurgical Process Engineering (3)</td>
<td>GC II</td>
<td>Analysis and synthesis, from a thermodynamic, kinetic, and transport phenomena viewpoint, of a variety of ferrous and nonferrous metallurgical processes. P, 310, 411.</td>
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<tr>
<td>532</td>
<td>Solid-Fluid Reactions (3)</td>
<td>GC I</td>
<td>(Identical with Ch.E. 532)</td>
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<tr>
<td>533</td>
<td>Imperfections in Metals (3)</td>
<td>GC I</td>
<td>Nature, causes and behavior of imperfections in the crystal structure of metals, of microscopic and macroscopic discontinuities in polycrystalline metal aggregates; their effects on various properties. Field trip. P, 430bR, Math. 253.</td>
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<tr>
<td>534</td>
<td>Advanced Electronic, Magnetic and Optical Materials (3)</td>
<td>GC II</td>
<td>1984-85 Advanced topics in processing and properties of electronic, magnetic, and optical materials from the metallurgical viewpoint. P, 434. (Identical with E.C.E. 534)</td>
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</tbody>
</table>
535. **Advanced Microstructural Characterization** (3) I Theory and applications of modern techniques for characterizing chemical and microstructural features of solids; transmission and scanning electron microscopy, microprobe, and Auger analysis. 2R, 3L. P, 430aR, 432.

595. **Colloquium**
   a. Metallurgical Colloquium (1) [Rpt./5] II

**MEXICAN AMERICAN STUDIES**

*Mexican American Studies and Research Center*

Professors Jose D. García (Physics), James Officer (Anthropology), Cecil Robinson (English), Renato I. Rosaldo (Emeritus), Arnulfo Trejo (Library Science), Thomas Weaver (Anthropology), Roger Yoshino (Sociology)

Associate Professors Macario Saldate IV (Educational Foundations and Administration), Director, Manuel Escamilla (Elementary Education), Celestino Fernández (Sociology), John A. García (Political Science), Juan García (History), Roseanne González (English), Eliana S. Rivero (Spanish and Portuguese), Carlos Vélez (Anthropology), William Vélez (Mathematics)

Assistant Professors Eddie Auslander (Journalism), Arminda Fuentevilla (Educational Foundations and Administration), Lou Holscher (Sociology), Richard López (Elementary Education), Marcello Medina, Jr. (Educational Foundations and Administration), Armando Miguélez (Spanish and Portuguese), Adela A. Stewart (Reading)

Lecturers Adalberto M. Guerrero (Spanish and Portuguese), Martha Fimbres (Medicine)

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:* Thirty units in M.A.S., including 180a-180b and nine units chosen from 161, 233, 332, and 443 or 477b. At least fifteen units must be in upper-division courses. Group III requirement must be fulfilled in Span.

*The minor:* A supportive minor in Mexican American studies to augment other academic areas or majors is encouraged. The minor requires 21 units, including 180a-180b and 6 units chosen from 161, 233, 332, and 443 or 477b.

**160. Minority Relations and Urban Society** (3) I II (Identical with Soc. 160)

**161. The Chicano in American Society** (3) II (Identical with Soc. 161)


**213. Oral Communication in Spanish** (4) I II (Identical with Span. 213)

**233. History of the Mexican American** (3) I (Identical with Hist. 233)

**268. Colonial Mexico** (3) I (Identical with Hist. 268)

**269. Mexico Since Independence** (3) II (Identical with Hist. 269)

**303. Comprehensive Spanish for the Bilingual** (4) I II (Identical with Span. 303)

**325. Foundations of Bilingual Education** (3) I (Identical with Ed.F.A. 325)

**330. Minority Groups and American Politics** (3) I (Identical with Pol. 330)

**332. Politics of the Mexican American Community** (3) II (Identical with Pol. 332)

**373. Intermediate Grammar for the Bilingual** (3) I II (Identical with Span. 373)

**404. Sociology of the Southwest** (3) GC I (Identical with Soc. 404)

**406. Foundations of Reading Instruction in Spanish** (2) GC II Student must be registered in the College of Education. (Identical with Rdng. 406)

**411. Public Administration and the Mexican American** (3) GC I (Identical with P.P.P.A. 411)

**419. Mexican American Culture** (3) GC I (Identical with Anth. 419)

**423. Peoples of Mexico** (3) GC II (Identical with Anth. 423)
441. Children's Literature in Spanish (3) GC I (Identical with Span. 441)
443. Mexican-American Literature (3) GC II (Identical with Span. 443)
447. Contemporary Mexican Literature (3) GC II S (Identical with Span. 447)
448. Government and Politics of Mexico (3) GC I (Identical with Pol. 448)
453. Mesoamerican Archaeology (3) GC I (Identical with Anth. 453)
456. Southwest Studies I (3) GC (Identical with Sw.C. 456)
457. Southwest Studies II (3) GC (Identical with Sw.C. 457)
460. History of the Hispanic Borderlands (3) GC II (Identical with Hist. 460)
461. Race and Ethnic Relations (3) GC I II (Identical with Soc. 461)
473. Spanish for the Bilingual Classroom Teacher (3) GC II (Identical with Span. 473)
477b. Ethnic Literature (3) (Identical with Engl. 477b)
495. Colloquium c. The Mexican American (3) GC I II (Identical with Hist. 495c, which is home)
508. Bilingual Reading (3) I Student must be registered in the College of Education. (Identical with Rdng. 508)
515a-515b. Mexican Art and Architecture (3-3) 1982-83 (Identical with Art 515a-515b)
531. Outreach: Library Service for Special Groups (3) I Student must be registered in the College of Education. (Identical with L.S. 531)
625. Educating the Bilingual Learner (3) I S (Identical with Ed.F.A. 625)
684. Administration of Bilingual Education Programs (3) S (Identical with Ed.F.A. 684)
695. Colloquium r. Bilingualism in the United States (3) [Rpt./3] S (Identical with Ed.F.A. 695r, which is home)

MICROBIOLOGY

Professors Wayburn S. Jeter, Head, Peter H. Bartels, Rein Kilkson, Peter P. Ludovici, George B. Olson, Irving Yall
Associate Professors Charles P. Gerba, Robert J. Janssen, Norval A. Sinclair, James T. Sinski
Lecturer Lee M. Kelley

Microbiology is the study of microscopic living organisms, including their life processes and relationships with the environment. The responses of higher organisms to microbes and other environmental stimuli (immunology) also constitute a proper area of departmental consideration.

The department offers the Bachelor of Science, Master of Science, Specialist in Microbiology, and Doctor of Philosophy degrees with a major in microbiology.

The major: 45 units, including 102, 103, 104, 122, 217, 327R, 328, 417R, 419, 420, 429, 495a; or 46 units including 102, 104, 110, 122, 217, 327R, 328, 417R, 419, 420, 429, 495a. The remaining units must be chosen from the following: 417L, 423R, 423L, 425R, 427L, 428R, 428L, 430, 435, 438, 450, 470, 471 and 489. Chem. 103a-103b, 104a-104b, 241a-241b, 243a-243b and 325 and 326 or 322 and 323, and 460 or N.F.S. 406a or 406b, Phys. 102a-102b and eight units of math. are also required.

In addition to the courses listed below, the Department of Microbiology is prepared to offer courses in the following areas, subject to faculty availability and student interest: animal virology, advanced pathogenic microbiology, hematology, cellular recognition methodology, immunobiology, aerobiology, and immunoc hemistry.

102. Fundamentals of Ecology and Evolution (4) I II (Identical with Ecol. 102)
103. Biology of Cells (4) I II Principles of microbiology, cell biology and molecular biology, with emphasis on cell structure and function. 3R, 3L. P, Chem. 103a, 104a. (Identical with Cell. 103, Ecol. 103, and G.Bio. 103)
104. Organismic Biology (5) I II (Identical with G.Bio. 104)
110. Introduction to Microbiology (5) I II Introduction to general, applied, and pathogenic microbiology and immunology. 4R, 4L.
122. Microscopy (2 to 3) II Microscopy of amplitude and phase structures: bright field, phase, fluorescence, polarized light and interference microscopy; microspectrophotometric, microfluorometric and microinterferometric measurements. P, four units of micr.

210. Introduction to the Health Field (3) I II (Identical with H.R.P. 210)

217. General Microbiology (5) II Characteristics of microorganisms and their activities in natural and applied settings. 3R, 6L. P, 103, Chem. 241a, 243a, CR 241b, 243b.

327R. General Mycology (3) I General mycology, with emphasis on the microfungi. P, four units of micr.


357. Communicable Diseases (3) I II The nature and prevention of communicable diseases. Open to nonmajors only.

417R. Microbial Physiology (3) GC II Biochemical and physiological activities of microorganisms. P, 217.

417L. Microbial Physiology Laboratory (2) GC II Lab. methods in microbial physiology. P, CR 417R.

418a-418b. Scientific Illustration-Photography (2 to 4 - 2 to 4) GC (Identical with G.Bio. 418a-418b)

419. Introductory Immunology (4) GC I II Principles of serology, humoral immunity and cell-mediated immunity. 3R, 4L. P, four units of micr., Chem. 241b, 243b.

420. Pathogenic Microbiology (4) GC I II Characteristics, isolation and identification of microorganisms pathogenic for men and animals. 3R, 4L. Advanced degree credit available for nonmajors only. P, four units of micr., Chem. 241b, 243b. (Identical with V.Sc. 420)

422R. General Pathology (3) GC II (Identical with V.Sc. 423R)

423L. General Pathology Laboratory (1) GC II (Identical with V.Sc. 423L)


427L. General Mycology Laboratory (2) GC I General mycology lab., with emphasis on the microfungi. P, CR 327R.

428R. Advanced Microbial Genetics (3) GC II (Identical with Cell. 428R)

428L. Advanced Microbial Genetics Laboratory (2) GC II (Identical with Cell. 428L)

429. Introductory Virology (3) GC II Essential features of viruses, Chlamydiae and rickettsiae and their relationships to the diseases of man, animals, plants and microorganisms. P, 4 units of micr., Chem. 241b, 243b.

430. Introduction to Biophysics (2) GC I (Identical with Phys. 430)

433. Advanced Scientific Illustration (4) GC S (Identical with G.Bio. 433)

435. Soil Microbiology (3) GC I (Identical with S.W.E. 435)

438. Control of Infectious Disease (3) GC II Factors involved in the occurrence and prevention of epidemic diseases in the community. P, 419 or 420.

450. Medical Mycology (4) GC II The isolation and identification of fungi of medical importance. 2R, 6L. P, 103 or 110. (Identical with V.Sc. 450)

470. Food Microbiology and Sanitation (3) GC II (Identical with N.F.S. 470)

471. Food Microbiology and Sanitation Laboratory (2) GC II 1984-85 (Identical with N.F.S. 471)

489. Parasitology (4) GC S (Identical with G.Bio. 489)

495. Colloquium

a. Senior Colloquium (1) [Rpt. / 1] I II

503. Quantitative Microbiology (2) I Theory, design, and application of the instruments employed in microbiological research. P, twelve units of micr.

521. Tissue Culture (3) II 1984-85 Techniques for the in vitro study of cells and tissues; research application. 1R, 6L. P, four units of micr.

527. General Virology (4) I Chemical and physical properties of viruses; the viral replication cycle; cellular response to infection. 3R, 4L. P, 328, 419, Chem. 460.

530. Biophysical Theory (2) II (Identical with Phys. 530)

550. Molecular Mechanisms of Microbial Pathogenesis (3) II 1984-85 (Identical with M.Mic. 550)

596. Seminar

a. Current Problems in Molecular Biophysics (1) I II (Identical with Phys. 596a, which is home)

601. Experimental Surgery (2) II (Identical with V.Sc. 601)

630. Immunology (4) II 1984-85 Immunological and immunochemical concepts and techniques. 2R, 6L. P, twelve units of micr., Chem. 460 or N.F.S. 406a.
Military science and Aerospace Studies

Military science (Army) 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. Students are required to wear uniforms during class and laboratory sessions and official department functions. 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 and Aerospace Studies or contact the department.

Military Science

Professor Paul A. Baltes, Jr.

100a-100b. First Year GMS* (2-2) Organization and history of ROTC and the U.S. Army; principles and techniques of applied leadership; customs, traditions and military courtesy; basic rifle marksmanship; leadership laboratory. 2R, 1L.

200a-200b. Second Year GMS* (2-2) U.S. military history, 1775 to the present; the impact of technology and leadership on the development of the U.S. Army; staff organization, conduct of military briefings; leadership lab. 2R, 1L.

300a-300b. Third Year GMS* (3-3) Land nav.; methods of instruction; ind. tactical skills; small-unit tactics and opns.; class and field tng. exer.; leadership dev. lab.; physical fitness tng.; adv. camp prep. 3R, 1L.

400a-400b. Fourth Year GMS* (3-3) Officer accession; DoD, DA, and Div. org. and mission; small-unit tactics; logistics, personnel, and legal systems; leadership; leadership lab. 3R, 1L.

*General Military Science

Military Aerospace Studies

Professor James M. Fitzsimmons
Assistant Professors Gregory D. Hofacre, Randy K. Lake, Kathleen D. Paini, Andrew E. Randles

100a-100b. First Year GMC*, U.S. Military Forces (2-2) Survey of the doctrine, mission, and organization of the U.S.A.F.; U.S. strategic offensive and defensive forces; U.S. general purpose and aerospace support forces. 100a is not prerequisite to 100b.

200a-200b. Second Year GMC*, History of Aviation (2-2) Survey of the development of aviation from the advent of the air age to the present, with emphasis on military aviation and its relationship with political and economic aspects of historical world situations. 200a is not prerequisite to 200b.

300a-300b. Third Year POC**, Leadership and Management (3-3) Theory and application of leadership and management, with emphasis on human relations, motivation, communication for managers, organizational behavior and management processes.

400a-400b. Fourth Year POC**, American Defense Policy (3-3) Critical analysis of various aspects of the military in American society and its application and effects on the world political and economic environment.

*General Military Course
**Professional Officer Course
348 DEPARTMENTS AND COURSES OF INSTRUCTION

Naval Science

The University expects to begin a Naval Science program in the Fall of 1984. For information please contact the Registrar.

MINES

The following mines courses are for students who are not necessarily majors in the College of Mines: Ch. E. 101, 102, 201, 202, 445, 485; G. En. 120, 311; Met. 122, 224R, 224L, 221, and Mn. E. 120, 426. They are designed to enable the nonengineering student to better understand the role of engineering and mineral technology in modern society. For details regarding these courses, please see the individual departments specified.

MINING AND GEOLOGICAL ENGINEERING

Professors Jay C. Dotson, DeVerle P. Harris, Y. C. Kim, Richard Newcomb, William C. Peters (Emeritus), Michael Rieber
Associate Professors Charles E. Glass, Head, Jack J. K. Daemen
Assistant Professors Meliton Garcia (Adjunct), Pinnaduwa Kulatilake
Instructor James E. Lonergan
Lecturer Harry F. Hillman

Geological Engineering

Geological engineering entails the use of geological principles in the analysis and design of engineering programs and structures in such fields as mineral exploration, mineral economics, mining, ground control and stabilization, earthquake engineering and other applications that are affected by natural geologic forces and processes. Graduates in geological engineering are usually employed in the search for economic mineral deposits, or in the construction engineering field in such areas as foundation design, site examination for dams and power plants, water resource development, and urban planning.

The department offers the Bachelor of Science in Geological Engineering, Master of Science and Doctor of Philosophy degrees with a major in geological engineering.

Undergraduate degree requirements are listed in the College of Mines section of this catalog.

120. Introduction to Geological Engineering (2) II Survey of current geological engineering technology applied to the development of mineral resources and to the interaction of man and the environment.
302. Geostatistics (3) II Introduction to univariate statistical methods and their applications to sampling and analysis of geological data. P, Math. 223. (Identical with Mn. E. 302)
311. Engineering Ethics (1) I II Professional responsibilities of mining and geological engineers to employer, client, profession, society and self; conflict of interest situations; professional codes of ethics. (Identical with Mn. E. 311)
325. Principles of Health and Safety in the Mineral Industry (2) I (Identical with Mn. E. 325)
330. Introduction to Remote Sensing (3) I (Identical with Geos. 330)
407. Photogeology (3) GC II Use of aerial photographs in geologic mapping. 1R, 6L. P, Geos. 221. (Identical with Geos. 407) Glass
410. Mining Geology (2) GC II Collection, analysis, and utilization of geologic data in the production of minerals; includes surface and underground mapping. 6L. P, Geos. 412.
420. Geophysical Exploration (4) GC I (Identical with Geos. 420)
422. Geophysical Engineering (3) GC I Applied geophysics as employed in engineering problems, including geophysical methods and interpretation of results in mineral exploration, earthquake studies, and site examination. P, Phys. 103b, Math. 223.
424. Fundamentals of Geotechnics (3) I Fluid, soil and rock mechanics relations to geologic features influencing design, construction, environmental effects, and maintenance of highways, dams, foundations, and underground openings. P, 302, C. E. 217, Geos. 221, CR G. En. 420 or 422.
425. Geotechnical Investigations (3) GC II Investigation and analysis of geologic factors in the design and construction of engineering projects. 1R, 6L. P, 424.
427. Geomechanics (3) GC I (Identical with Mn.E. 427)
428. Ore Search (3) GC I Analysis of guides and techniques leading to location and delimitation of ore bodies. Field trips. 2R, 3L. P, Geos. 303, CR 420 or 422.
438. Design of Exploration Programs (3) GC II Geologic and economic principles applied to the design of mineral exploration programs and to the evaluation and development of prospects. P, 428.
460. Health Hazards in the Mine Environment (2) GC II 1983-84 (Identical with Mn.E. 460)
461. Accident Prevention in the Mine Environment (2) GC II 1984-85 (Identical with Mn.E. 461)
507. Applied Multispectral Imagery (3) II Application to mineral exploration, engineering geology, groundwater location, and pollution monitoring. 6L. P, 407. (Identical with Geos. 507) Glass
527. Fundamentals of Geomechanics (4) II (Identical with Mn.E. 527)
528. Subsurface Exploration Methods (3) I 1984-85 Advanced geological and engineering methods applied to the location and delimitation of deep ore bodies from mine workings and boreholes. 1R, 6L. P, 428.
538. Simulation Gaming in Exploration (3) I 1983-84 Integrated approach to ore search involving modeling, decision making, and sequential field operations. 1R, 6L. P, 438.
660a-660b. Estimation of Mineral Resources by Quantitative Methods (3-3) 1983-84 (Identical with Mn.Ec. 660a-660b)
696. Seminar
   a. Research Seminar (1 to 3) [Rpt.] II

**Mineral Economics**

Mineral economics is an emerging field of applied economics encompassing the interface of minerals engineering and earth science with the business of mineral production and the welfare of society. Mineral economists are employed in such fields as mineral investment analysis, planning and forecasting for mineral development, mineral commodity supply and demand analysis, and statistical modeling of exploration and mining ventures.

The Master of Science and Doctor of Philosophy degrees are offered with a major in mineral economics. For admission and degree requirements, please see the Graduate Catalog.

418. Mine Investment Analysis (3) GC II (Identical with Mn.E. 418)
426. Minerals and Environmental Conservation (3) GC I 1984-85 (Identical with Mn.E. 426)
550. Economics of the Metal Industries (3) II Reserves, resources, and major deposits, production technologies, market structure, industrial organization, consumption trends, recycling, foreign trade, and geopolitics of selected industries. P, A.Ec. 504.
560. Economics of the Nonmetals (3) II 1984-85 Technology of production, raw materials, uses and markets, industrial organization, market structure, economics of production, pricing, and marketing practices for nonmetallic minerals. P, A.Ec. 504.
584. Economics of Coal, Nuclear, and Alternative Energy Sources (3) I Reserves and resources, economics of production, utilization and conversion, externalities, market structure, policy issues for alternative energy sources such as oil shale, tar sands, coal gasification, and solar. P, A.Ec. 504.
586. Economics of Petroleum and Natural Gas (3) I Reserves and resources of petroleum and natural gas, production technology, market structure, industrial organization, pricing, competitive behavior, consumption trends, and policy issues. P, A.Ec. 504.
650. Readings in Mineral Economics (3) II Selected readings in the economics of mineral resource exploration and exploitation, environmental protection, national mineral policy, world mineral development, and international trade. P, Econ. 361.

650a-650b. Advanced Principles of Mineral Economics (3-3) Risk analysis; optimum production, depletion and exhaustion; productivity and technical change; imperfect competition in mineral markets; resource distribution, trade and mineral policy. P, Econ. 501a or A.Ec. 504.


656. Seminar
a. Research Seminar (1 to 3) [Rpt./3 units] I II
b. Advanced Topics in Mineral Evaluation and Risk Analysis (1 to 3) [Rpt./3 units] I II
c. Mineral and Energy Policy Analysis (1 to 3) [Rpt./3 units] I II
d. Advanced Mineral Commodity Analysis (1 to 3) [Rpt./3 units] I II
e. Topics in Mineral and Energy Supply (1 to 3) [Rpt./3 units] I II
f. Decision Analysis and Operations Research in Mineral Exploration (1 to 3) [Rpt./3 units] I II
g. Process Analysis and Costing (1 to 3) [Rpt./3 units] I II

Mining Engineering

Mining engineering is that branch of engineering responsible for the planning, design, development and operation of mining facilities for the production of mineral resources. Employment opportunities available to mining engineering graduates may be found in the fields of design and development of both underground and surface mining systems, management of mining operations and heavy construction projects, heavy equipment development and finance.

The degrees of Bachelor of Science in Mining Engineering, Master of Science and Doctor of Philosophy are offered with a major in mining engineering.

Undergraduate degree requirements are listed in the College of Mines section of this catalog.

120. Elements of Mining (2) I II Historical development of mining; unique problems of the extractive industry; introduction to minerals industry technology. Field trip.

203. Underground Mining Systems (2) I Underground development, unit operations, shafts, drifts, raises, stoping methods, and costs. 1R, 3L. Field trip. P, 120.

210. Mine Surveying (3) II Mine surveying problems and practices; closed traverse of underground mine; shaft plumbing, stope and raise surveying. Includes two-week session at end of second semester. P, 120, C.E. 151. Dotson

302. Geostatistics (3) II (Identical with G.En. 302)

304. Mine Atmosphere Control and Safety (3) II Quality and quantity control of respirable air in mining operations. One inspection trip and twelve hours in mine rescue. 2R, 3L. Dotson

311. Engineering Ethics (1) I II (Identical with G.En. 311)

315. Rock Fragmentation (2) I Theory, properties, and uses of industrial explosives, blasting devices and nuclear devices for rock fragmentation. Field trips. Dotson

321. Surface Mining Systems (3) I Engineering and economic factors in selection and design of surface mining systems. 2R, 3L. Field trip. P, 203. Dotson

325. Principles of Health and Safety in the Mineral Industry (2) I Fundamental concepts of loss control in the mineral industry; includes a review of state and federal regulations and standards and instruction in program management, industrial hygiene, safety, toxicology, fire protection, workers' compensation and mine rescue. All-day field trip. (Identical with G.En. 325 and Met. 325) Garcia


397. **Workshop**
a. Unit Operations (1-3) II P, 203.

401. **Analysis of Mine Operations** (2) GC I Use of Operations Research principles and techniques to analyze production, distribution and valuation problems in mine operations, with emphasis on deterministic cases. 1R, 3L. P, 302. Kim

404. **Mine Management** (2) II Organization and management of mining enterprises. Open to mn.e. and g.en. majors only.

418. **Mine Investment Analysis** (3) GC II Economic factors, including taxation, mineral depletion allowance, and finance in the mining industry; includes fundamentals of engineering economics, capital budgeting, and risk analysis. P, 430. (Identical with Mn.Ec. 418)

420. **Mine Design** (3) GC II Design of a modern mine; feasibility study, reservation estimate, mine planning, hoisting, compressed-air distribution and drainage. 2R, 3L. Field trips. P, 304, 321, 430, or CR. Kim

426. **Minerals and Environmental Conservation** (3) GC I 1984-85 Importance of producing minerals and of maintaining a suitable environment; impact of mining on environment; management of mine wastes and reclamation practices. Field trips. (Identical with Mn.En. 426) Dotson

427. **Geomechanics** (3) GC I Mechanical behavior of rock and rock masses; response to load changes: deformations, failure, discontinuity slip; in situ stress state; rock testing; geomechanical classifications; engineering applications: slopes, pillars, tunnels; reinforcement design. 2R, 3L. P, C.E. 217, Geos. 221. (Identical with G.En. 427) Daemen


431. **Solution Mining** (2) I Principles and techniques used to recover fuels and minerals from the subsurface by drilling and physicochemical changes of raw materials in situ. P, 203.

437. **Geomechanics Applications in Mining** (2) GC II 1984-85 Application of geomechanic principles to geological mining problems: rock excavation, subsidence, mine pillar design, tabular excavations, rock bursts. All-day field trip. P, 427.

447. **Geomechanics Applications in Construction** (2) GC II 1983-84 Application of geomechanic principles to geotechnical engineering problems: tunneling and underground construction, rock slope engineering, foundations on rock. All-day field trip. P, 427.

460. **Health Hazards in the Mine Environment** (2) GC II 1983-84 Case histories in recognition, evaluation and control of health hazards in mine environments. All-day field trip. P, 325 or consult dept. before enrolling. (Identical with Met. 460 and G.En. 460)

461. **Accident Prevention in the Mine Environment** (2) GC II 1984-85 Concepts and case histories in recognition, evaluation and control of occupational safety hazards common to the mine environment. All-day field trip. P, 325 or consult dept. before enrolling. (Identical with Met. 461 and G.En. 461)

500. **Economics of Mineral Resource Development and Production** (4) I (Identical with Mn.Ec. 500)

501. **Analysis of Management Decisions** (3) II 1983-84 Use of O. R. principles and advanced O. R. techniques to evaluate management decision problems in the mineral industry, with emphasis on probabilistic cases. P, 302, 401. Kim

527. **Fundamentals of Geomechanics** (4) II Mechanical behavior of geological materials: stress and strain analysis: friction; elasticity, strength and failure; discontinuity slip. Laboratory testing and applications to selected mining or geological problems. 3R, 3L. P, 427 or C.E. 340, Geos. 221. (Identical with G.En. 527) Daemen

622a-622b. **Advanced Design of Mining Systems** (3-3) 1983-84 Use of geostatistics, operations research, mining economics, and computer techniques in the analysis, design, and operation of modern mining systems. 2R, 3L. P, 302, 401, 420, S.I.E. 272.


696. **Seminar**
a. Research Seminar (1 to 3) [Rpt.] I II
MOLECULAR BIOLOGY
(See Molecular and Medical Microbiology)

MOLECULAR AND MEDICAL MICROBIOLOGY

Professors John Spizizen, Head, Harris Bernstein, William Meinke, David Mount, Dianne Russell (Pharmacology)
Associate Professors Carol Bernstein (Adjunct), George T. Bowden (Radiology), Eugene Gerner (Radiology), Junetsu Ito, Thomas Lindell (Pharmacology), David O. Lucas, Bruce Magun (Anatomy), Frank Myskens (Medicine)
Assistant Professors John Duffy (Adjunct), Marilyn Halonen (Adjunct), Ruthann Kibler, John Little (Biochemistry), Geraldine Meinke (Adjunct), Richard Rest, Jeffry Trent (Adjunct)

The Department of Molecular and Medical Microbiology, in cooperation with molecular biologists from various departments, offers programs leading to the Master of Science and Doctor of Philosophy degrees with a major in molecular biology. Concentrations are available in cancer biology, genetic engineering, genetic regulation, immunology, molecular genetics, pathogenesis, radiation biology and virology.

Admission generally depends upon the completion of a bachelor’s degree with undergraduate credit in general biology, and most of the following: physiology, microbiology, genetics, cell biology, developmental biology and biochemistry. Generally mathematics through calculus, and introductory physics are required.

The master’s degree program is designed to provide the student with a broad background in molecular biology and cognate sciences. A thesis is normally required. A doctoral degree program will include those courses deemed necessary to proper training in the major and minor areas as determined by the student’s guidance committee.

In addition to those offered by the department, other courses applicable to the programs are: Bioc. 568a-568b; Cell. 410a-410b, 416, 417, 428R, 428L, 456, 518, 530, 612; Ecol. 435, 488; G.Bio. 467R, 467L, 522, 670; Radi. 501; Phcl. 551; Phys. 530; P.I.S. 627, 635. Refer to the appropriate department for course descriptions.

Students wishing further information on the M.S. or Ph.D. degrees with a major in molecular biology should contact the Chairman of the Molecular Biology Committee, Department of Molecular and Medical Microbiology.

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 lab. experiments. P, G.Bio. 101b, Chem. 241b, Bioc. 501.

540. Topics in Microbiology (1) [Rpt.] I II Variable content. Open to majors only.

550. Molecular Mechanisms of Microbial Pathogenesis (3) II 1984-85 Review of current concepts in specific areas of microbial pathogenesis, including action of exo- and endotoxins, cell surface interactions, phagocytosis and host microbicidal functions. P, Bioc. 460. (Identical with Micr. 550)

555. Cancer Biology (3) II Fundamental biological aspects of neoplastic growth at the organ, cellular, and molecular levels; emphasis on the etiology, behavior, and therapy of neoplasms. (Identical with Anat. 555, I.Med. 555, and Radi. 555)


561. Immunobiology (3) I II 1984-85 Cells and cellular events involved in humoral and cell-mediated immune responses; morphologic, physiologic and biochemical characterizations of the lymphoreticular system. P, Bioc. 462a-462b. Lucas

570. Molecular Genetics (3) I 1983-84 Molecular genetics and biology of the bacterial viruses; molecular mechanisms of gene regulation, DNA replication, DNA repair, mutation and genetic recombination; current research in bacterial genetics (lysogeny, transduction, conjugation, use of transposons and gene fusions in genetic analysis and transformation); introduction to gene cloning and its uses in analysis of gene structure and regulation. Mount/Bernstein
571. **Molecular Gene Cloning** (3) II 1984-85 Current gene cloning technology; restriction endonucleases, cloning vehicles (plasmid vectors, bacteriophage vectors, and single-stranded phage vectors), gene amplification and expression of cloned genes.

580. **Molecular Virology** (3) II 1983-84 The current status of basic research in virology at the molecular level. P. Chem. 460. Meinke

595. **Colloquium**
   a. Molecular Biology (1) [Rpt./2] II

596. **Seminar**
   a. Molecular and Cellular Immunology (1) I II
   b. Immunopathology (1) I II
   c. Molecular Genetics of Microorganisms (1) I II
   d. Tumor Virology (1) I II
   e. Host-Parasite Interactions (1) I II
   f. Control of Proliferation in Animal Cells (1 to 2) I (Identical with Radi. 596h, which is home.)

801. **Medical Microbiology** (6)

896. **Seminar**
   h. Control of Proliferation in Animal Cells (1 to 2) I (Identical with Radi. 896h, which is home.)

**MUSIC**


Associate Professors Koste A. Belcheff, Gary D. Cook, John A. Denman, Elizabeth Thompson Ervin, John R. Fitch, Keith M. Johnson, Jean-Louis Kashy, James Keene, Rodney M. Mercado, Michael Rogers

Assistant Professors Terry Barham, Paula Fan, Jeffrey Haskell, Carrol McLaughlin, Karl Miller, Thomas Patterson, Jeffrey Showell

Lecturers Curtis Burris, Thomas R. Ervin, Alexander Heller, Dana Rothlisberger

The School of Music, a division of the College of Fine Arts, offers course work leading to the following degrees: Bachelor of Music with majors in jazz studies, music education, performance, and theory and composition; Bachelor of Arts in Music; Master of Music; Doctor of Musical Arts; and Doctor of Philosophy. The School of Music participates with the Department of Drama and the dance program of the Department of Physical Education in providing course work for the musical theatre option within the Bachelor of Fine Arts major in general fine arts studies. The musical theatre option is described in the Faculty of Fine Arts section of this catalog. 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 freshman and transfer music majors (except piano and organ performance majors) must audition for placement in class or group piano instruction. These courses must be taken concurrently with 120a-120b and 220a-220b. Students desiring the B.A. in Music or the B.M. with a major other than performance must meet the requirements for registration in 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 Mus. 181 level requires minimum performance skill equivalent to at least two yrs. of recent private study and/or four yrs. of recent membership in school or community organizations. Admission to the Mus. 185 level requires a minimum of five yrs. 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 yrs. of undergraduate study. Detailed information regarding entrance and degree requirements is available from the Director of the School of Music (Music Bldg. Room 109).
RESIDENCY REQUIREMENTS: Majors must complete a minimum number of units in residence, as specified in the following schedule: performance — 21 units in the major; jazz studies — 22 units in the major; music education — 19 units in the major, plus S.Ed. 459a; and theory and composition — 23 units in the major.

ENSEMBLE PARTICIPATION: All students enrolled in performance studies are required to participate in a conducted ensemble (200, 500) unless excused by the Director of the School of Music. (Accompanying or coached ensembles may fulfill this requirement for keyboard majors per the degree requirements.)

SPECIAL REGULATIONS: Credit for private or group instruction is granted only to students who are eligible to register for regular University credit. Students registered for performance studies may be assigned to private or group instruction and required to attend master classes and recitals as arranged by the instructor. Students may, at the discretion of their major adviser or performance instructor, be required to register for Mus. 201 and to appear in and attend performances as arranged by their instructor. Lessons missed by the student will not be rescheduled unless the instructor has been notified by the student 24 hours before the regular time of the lesson. Lessons missed by the instructor will be rescheduled within the semester. Lessons falling on a legal holiday will not be rescheduled.

DEGREE PROGRAMS: The curricula for the B.M. include a common core of studies which is intended to coordinate all aspects of musical training in a program of comprehensive musicianship.

The teaching minor: 24 units, including 110a-110b, 111, 120a-120b, 130a-130b, 338m, 370 or 371, 451, two units of conducted ensemble.

/ BACHELOR OF MUSIC

Common First Year Curriculum: All B.M. majors will complete the following core of courses during the freshman yr.: 110a-110b (except keyboard majors), 120a-120b, 130a-130b, three to eight units in the major instrument or voice, one to four units of conducted ensemble, and twelve to fourteen units of Group Unit requirements, as outlined under the Bachelor of Music degree in the Faculty of Fine Arts section of this catalog.

Students should apply for admission to a specific major field of study prior to registration for sophomore courses.

Basic Requirements: All candidates for the B.M. must complete the following basic requirements: (1) Group Units required, as outlined under the Bachelor of Music degree in the Faculty of Fine Arts section of this catalog. (2) 110a-110b, 120a-120b, 130a-130b, 210a-210b, 220a-220b, 320, 330a-330b. (3) One of the majors outlined below.

The MAJOR IN PERFORMANCE includes the following four areas of specialization:

Keyboard Instrument — major instrument, 28-32 units (minimum entrance level: Mus. 185. Graduation requirement — eight units of 485); *ensemble — one semester of conducted, four semesters of accompanying, two semesters of coached, one semester of elective; Mus. 410a-410b, 420a-420b, 421, 433a-433b, four units of music electives and a senior recital. Additional general academic electives are also required. Minimum total units — 126.

String Instrument — major instrument, 28-32 units (minimum entrance level: Mus. 185. Graduation requirement: eight units of 485); *ensemble — eight semesters of conducted, six semesters of coached; Mus. 370, 410a, 421, six units of music electives; a senior recital; additional general academic electives. Minimum total units — 126.

Voice — voice, 28-32 units (minimum entrance level: Mus. 185. Graduation requirement: eight units of 485); *ensemble — eight semesters of conducted; four units of piano beyond the general requirement listed above; Mus. 211a-211b, 410a-410b, 430a-430b, 431a-431b, three units of music electives; a senior recital; additional general academic electives (foreign language recommended). Minimum total units — 130.

Wind Instrument or Percussion — major instrument, 28-32 units (minimum entrance level: Mus. 185. Graduation requirement: eight units of 485); *ensemble — eight semesters of conducted (minimum: three orchestra, three band, two jazz — if appropriate instrument); six semesters of coached; Mus. 370, 410a, eight units of music electives; a senior recital; additional general academic electives. Minimum total units — 125.

The MAJOR IN JAZZ STUDIES: Major instrument, sixteen units of two units/semester (minimum entrance level: Mus. 181. Graduation requirement: four units of 385); minor instru-
ment or voice, six units of one unit/semester; *ensemble — six semesters of 200r, four semesters of 200 (excluding 200r), two semesters of coached ensemble electives; Mus. 321a-321b, 331, 421, 422, six units of music electives; additional general academic electives. Minimum total units — 127.

The MAJOR IN MUSIC EDUCATION (CHORAL): Voice, eight semesters of two units/semester (minimum entrance level: Mus. 181. Graduation requirement: eight units of 185); keyboard, three semesters beyond 210b; *ensemble — seven semesters of conducted; Mus. 211a-211b, Mus. 250a-250b, 370, 372, 450, 451; Ed.P. 311; S.Ed. 329, 330, 338m, 435, 493a, 494. Minimum total units — 125.

The MAJOR IN MUSIC EDUCATION (INSTRUMENTAL): Major instrument, seven semesters of two units/semester (minimum entrance level: Mus. 181. Graduation requirement: six units of 185); *ensemble — seven semesters of conducted (including one unit of 200r, if appropriate instrument), one semester of coached; Mus. 111a, 153, 250a-250b, 350, 351, 370, 371, 421, 450, 451; Ed.P. 311; S.Ed. 329, 330, 338m, 435, 493a, 494. Minimum total units — 133.

The MAJOR IN THEORY AND COMPOSITION: Major instrument or voice, seven semesters of two units/semester (minimum entrance level: Mus. 181. Graduation requirement: six units of 185); *ensemble — six semesters of conducted, two semesters of coached; Mus. 240a-240b, 340a-340b, 370, 420a-420b, 421, 440 (six units), four units of music theory or composition, five units of music electives; additional general academic electives. Minimum total units — 132.

BACHELOR OF ARTS IN MUSIC

This degree program is designed for students interested in music history who may wish to pursue a graduate degree in musicology or for those whose interest in music is essentially avocational.

The major. In addition to the Group Units required, as described under the Bachelor of Arts in the Faculty of Fine Arts section of this catalog, the following course work is required: 110a-110b, 120a-120b, 130a-130b, 210a-210b, 220a-220b, 320, 330a-330b, 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: Mus. 181. Graduation requirement: two units of 185) and four semesters of *ensemble (including two semesters of Collegium Musicum). A twenty-unit minor is also required (see Faculty of Fine Arts section of this catalog). To meet the Group Unit requirement in a foreign language, German or French is recommended. Minimum total units — 125.

*In all music degrees the term "semester" in the ensemble requirement indicates that the student is required to register for the number of successive semesters of ensemble listed.

100. Basic Musicianship (3) I II CDT Introduction to the rudiments of musical notation, harmony, rhythm, and melody.

101a-101b. Class Piano for General College Students (1-1) 101a: Introduction to basic keyboard skills for the general college student, with emphasis on literature of current interest to students. 101b: [Rpt./3] Development of piano skills with options for emphasis in areas such as playing by ear, improvising, harmonizing, transposing, repertory of different styles or idioms. 101a and 101b are offered both semesters.

102a-102b. Class Guitar for General College Students (1-1) 102a: Introduction to basic guitar playing techniques for the general college student, with emphasis on literature and styles of playing of current interest to students. 102b: Development of guitar skills including sightreading, accompanying, tone production and other classical techniques. 102a and 102b are offered both semesters.

103. Class Voice for General College Students (1) [Rpt.] Practical training in singing, with emphasis on basic skills of breathing, tone and diction; repertory to include folk, current, and classic songs in English.

107. Survey of Music I (3) I II Introductory course which concentrates on developing perceptual skills through a study of many types of music, with emphasis on Western art music of the 18th, 19th and 20th centuries, as well as popular and ethnic musics.

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) CDT Introductory development of basic keyboard musicianship and technique through activities including playing by ear, improvising, harmonizing, transposing. Open to mus. majors and minors only. P, CR 120a-120b.

111. Voice Class (1) [Rpt.] Beginning instruction; introduction and development of basic skills, breathing, diction, tone, rhythm, sight-singing, repertory songs in English; practical training in singing without specialization. Open to mus. majors and minors only.


130a-130b. Introduction to Music Literature (2-2) CDT Survey of music literature, with emphasis on structure, period, and style. Open to mus. majors and minors only. P, CR 120a-120b.

145. Composition for the General College Student (2) I II S CDT Designed for majors and nonmajors; explores similarities among the creative arts. P, ability to read music notation.

153. Percussion Instruments Class (1) I II Class instruction in all percussion instruments, including materials and procedures for teaching these instruments in the schools.

200. Conducted Ensemble (1) [Rpt.] I II P, audition or instructor's permission.
   a. Summer Band
   b. Marching Band
   c. Concert Band
   d. Symphonic Band
   e. Wind Ensemble
   h. Summer Chorus
   i. Symphonic Choir
   j. University Singers
   k. University-Community Chorus
   I. Chamber Choir
   m. Choraliers
   o. Symphony Orchestra
   p. Chamber Orchestra
   q. Collegium Musicum
   r. Jazz Ensemble

201. Ensembles (1) [Rpt.] I II Opportunity is offered for various combinations of ensemble performance.
   a. Accompanying
   b. Brass Ensemble
   c. Honor Choir
   d. Brass Choir
   e. Percussion Ensemble
   f. Contemporary Ensemble
   g. Guitar Ensemble
   h. Clarinet Choir
   j. Jazz Combo
   o. Musical Theatre
   p. Piano Ensemble
   q. Saxophone Ensemble
   s. String Ensemble
   w. Woodwind Ensemble
   x. Pep Band

205. Beginning Opera Theatre (1 to 3) [Rpt.] I II Beginning training in all aspects of operatic production, including major singing roles (when appropriate), minor roles, opera chorus, opera scenes and chamber operas; technical training in set construction, makeup, costumes and lighting.

209. Percussion for Dance Students (2) I Rhythmic principles of music for dance majors through study and performance of percussion instruments. Open to dance majors only. (Identical with Ph.Ed. 209)

210a-210b. Piano Class II (1-1) CDT Continuation of 110b, with additional sight-reading, score-reading, and accompanying. Open to mus. majors and minors only. P, II0b.

211a-211b. Diction for Singers (1-1) Training in diction for singers in English, French, German, Italian, and Spanish.

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.

240a-240b. Introduction to Composition (3-3) Introduction to the basics of music composition, stressing fundamental forms, techniques and procedures. Open to majors only. P, 120b.

250a-250b. Music Education Observation (1-1) 250a: Observation of music education programs and instruction in the public schools. 250b: Practical field experience in public schools; supervised experience in individual and small group instruction. 3L. Field trips. Open to majors only.

302. Recording Studio Production (2) I II Recording studio procedures including the recording chain and pre-post and actual recording production techniques. 1R, 3L. Open to music and radio/t.v. majors only. P, Mus. 220b for music majors, R.T.V. 213 for radio/t.v. majors. (Identical with R.T.V. 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 postonal music, beginning with serial works of Schoenberg through very recent compositions by major composers. Open to mus. majors and minors only. P, 220b.

321a-321b. Jazz Improvisation (2-2) CDT 321a: Background for the art of improvising jazz. Audition required. P, 201j. 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.

331. Jazz History (3) I CDT Development of jazz in the United States.

338m. The Teaching of Secondary School Music (3) I Carries credit in ed. only. (Identical with S.Ed. 338m)

340a-340b. Composition (3-3) Pursuing 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; small group instruction. Open to majors only. P, 240b.

350. Wind Instrument Techniques and Materials I (3) I Class instruction of flute, clarinet, oboe, and bassoon, including materials and procedures for teaching these instruments in the public schools. Open to majors only.

351. Wind Instrument Techniques and Materials II (3) II Class instruction on trumpet, trombone, horn and saxophone, including materials and procedures for teaching these instruments in the public schools. Open to majors only.

352. String Instrument Techniques and Materials (3) I Class instruction on violin, viola, cello and bass, including materials and procedures for teaching these instruments in the public schools. Open to majors only.

360. Music for the Elementary Classroom Teacher (3) I II CDT Basic musical skills, experiences, concepts, and information needed by a classroom teacher prior to studying teaching techniques, curriculum and materials for elementary school music; includes experience with classroom instruments. Not open for credit to mus. majors.

361. Music Materials and Activities for the Elementary Classroom Teacher (2) II Presentation of basic materials and activities for teaching music to children from kindergarten through sixth grade. Not open for credit to mus. majors. P, 360.

370. Introduction to Conducting (2) I Conducting choral as well as instrumental ensembles; includes basic beat patterns, transpositions and clefs, and introduction to score study. P, 220b.

371. Intermediate Instrumental Conducting (2) II Conducting techniques for instrumental ensembles of varying sizes; instrumental rehearsal techniques, score reading, and score study. P, 370.

372. Intermediate Choral Conducting (2) II Conducting techniques for choral ensembles; training the chorus, choral musicianship, continuing work in score reading, basic choral literature and program planning. P, 370.

405. Intermediate Opera Theatre (1 to 3) [Rpt.] I II Intermediate training in all aspects of operatic production, including major singing roles (when appropriate), minor roles, opera chorus, opera scenes and chamber operas; technical training in set construction, makeup, costumes and lighting. P, two units of 205.

410a-410b. Pedagogy (2-2) GC Study of methods and repertory suitable for studio teaching. Open to mus. majors in their major performance area only.

420a-420b. Counterpoint (3-3) Practical study of the counterpoint of the 16th (in 420a) and 18th (in 420b) centuries. P, 220b.

421. Orchestration (3) I CDT Instruments of the orchestra together with practical study of the art of symphonic scoring; original work and transcriptions. P, 220b.

422. Jazz Arranging (2) GC II Class instruction and practice in writing arrangements for small jazz combos, rock groups, stage bands, and pop-vocal combinations; detailed study of jazz instrumental practices and problems. Open to majors only or by permission of instructor. P, 200r, 201j, 220b.


430a-430b. Art Song Repertory (2-2) GC 1984-85 Class performance 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.

431a-431b. History of the Opera (3-3) GC 1983-84 Detailed study of the course of opera from its inception by the Florentine Camerata through Berg, Menotti, Stravinsky, Ginastera, Penderecki, Britten and others. Open to majors only.

432. Music in World Cultures (3) GC II CDT Overview of nonwestern musics in selected world cultures. 2R, 3L.

433a-433b. Piano Literature (3-3) GC Historical and stylistic study of keyboard literature, instruments and performance practices. 433a: Baroque through the early Romantic periods. 433b: Mid-Romantic through the Contemporary periods. P, 285-P. 433a is not prerequisite to 433b.

434. History and Literature of Guitar. (3) GC II 1983-84 In-depth study of the evolution of the guitar, lute, and vihuela, including repertoire, style periods, and composers. Open to majors only.
435. **Choral Literature and Techniques** (2) GC II Choral selections with interpretation techniques; for choral conductors and music educators. P, 220b, 330b.

440. **Composition Techniques** (3) [Rpt./15 units] I II Creative work in the fields of modern harmony, counterpoint, orchestration, electronic music, and specific projects in commercial-type composition and arranging. The student may take work in any or all of these areas. P, 340b.

441a-441b. **Introduction to Electronic Music** (3-3) GC [Rpt./1] Survey of the historical, theoretical and technical aspects of electronic music as applied to the composition of music in the contemporary idiom, including actual lab. applications.

450. **Teaching Music in the Elementary School** (3) GC I CDT Role of the music specialist in the elementary school; materials, activities, and observation of demonstration teaching as they relate to a comprehensive music curriculum and qualitative musical experiences for children in grades K-6.

451. **Teaching Junior High School Music** (3) GC II CDT Objectives, curriculum, material, and activities for teaching general, choral and instrumental music in the junior high school. Observation and critiqued field experience.

500. **Graduate Study in Conducted Ensemble** (1) [Rpt.] I II Techniques and literature.
   - a. Summer Band
   - b. Marching Band
   - c. Concert Band
   - d. Symphonic Band
   - e. Wind Ensemble
   - h. Summer Chorus
   - i. Symphonic Choir
   - a. Summer Band
   - j. University Singers
   - k. University-Community Chorus
   - l. Chamber Choir
   - m. Choraleers
   - n. Symphony Orchestra
   - o. Chamber Orchestra
   - q. Collegium Musicum
   - r. Jazz Ensemble

501. **Chamber Ensemble** (1) [Rpt.] I II Study and performance in small ensembles; regular coached meetings, rehearsals and public performances. P, audition or permission of instructor.
   - a. Accompanying
   - b. Brass Ensemble
   - d. Brass Choir
   - e. Percussion Ensemble
   - f. Contemporary Ensemble
   - g. Guitar Ensemble
   - h. Clarinet Choir
   - j. Jazz Combo
   - o. Musical Theatre
   - p. Piano Ensemble
   - q. Saxophone Ensemble
   - s. String Ensemble
   - w. Woodwind Ensemble
   - x. Pep Band

520. **Aesthetics of Music** (3) I Exploration of the problems of musical meanings, including a panoramic examination of what philosophers, philosophic musicians and artists, and others of critical intelligence have contributed to comprehensive theory.

521. **Introduction to Graduate Music Theory** (3) II Introduction to graduate analysis with emphasis on the survey of analytical systems as applied to a number of stylistic periods. Both cognitive and aural procedures will be investigated, Open to majors only.

530. **Music in the Renaissance** (3) II 1983-84 Vocal and instrumental genres from Dufay through Palestrina. Open to majors only.

531. **Music in the Baroque** (3) I 1983-84 CDT The age of the basso-continuo; instrumental and vocal genres from Monteverdi through J. S. Bach. Open to majors only.

532. **Music in the Classical Period** (3) I 1984-85 CDT The Viennese classical tradition from its origins to Beethoven. Open to majors only.

533. **Music of the Twentieth Century** (3) II 1984-85 CDT Contemporary idioms in music; study of genres, styles, and techniques from post-Romanticism to the present. Open to majors only.


537. **Survey of Early Music** (3) I S Intensive survey of music history from Gregorian chant to the late Baroque. Open to majors only.

550. **Advanced Studies in General Music Teaching** (3) I S Development of musical concepts through creative experiences; survey of research into music learning in children; alternative systems: Dalcroze, Orff, Kodaly, MCCP. P, 361 or 451.

570. **Advanced Conducting** (3) [Rpt.] II Styles of choral, band, and orchestral literature, as they pertain to the problems of the conductor; references to the styles of all periods, with emphasis on the contemporary and modern.
600. **Introduction to Graduate Study in Music** (3) II 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)

605. **Advanced Opera Theatre** (1 to 4) [Rpt.] II Advanced training in all aspects of operatic production, including major singing roles (when appropriate), minor roles, opera chorus, opera scenes and chamber operas; technical training in set construction, makeup, costumes and lighting; may also include operatic staging techniques. P, four units of 405.

620a-620b. **History of Speculative Theory** (3-3) 1983-84 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) I 1984-85 Study of the philosophies, procedures, techniques, and materials used in teaching theory at the college level.


630. **The Music of Bach** (3) II 1984-85

631. **The Music of Mozart** (3) II 1983-84

640. **Advanced Composition** (2 to 6) [Rpt.] I II Individual projects in composition. Open to theory and composition majors only.

650. **Foundations and Principles of Music Education** (3) I History and philosophy of music education in the public schools, with emphasis on the basic concepts needed for effective teaching in the field of music, curriculum development and evaluation of the music program.

651. **Curriculum Development in Music** (3) II 1984-85 Principles and techniques of curriculum construction applied to the field of music.

652. **The Administration of Music Education** (3) II 1983-84 Financing, scheduling, selecting personnel and equipment, supervising instruction, maintaining desirable public relations, evaluating and administering the total school music program in a school district, city, county, or state. P, 650.

653. **The Music Cultures of Asia and Oceania** (3) I 1984-85 Study of the musical styles and practices of Oceania and selected cultures in Asia, with emphasis on materials, instruments and ideas appropriate for classroom use.

696. **Seminar**
   a. Music Education (1 to 6) I II
   b. Musicology (1 to 6) I II
   c. Music Theory (1 to 6) I II

**Performance Studies: Individual and Group Instruction**

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 181 and 185.

**PIANO**

180-P, 181-P, 182-P (1 to 2)
185-P, 285-P, 385-P, 485-P (1 to 4)
580-P (1 to 2); 685-P, 785-P (1 to 4)

**VOICE**

180-V, 181-V, 182-V (1 to 2)
185-V, 285-V, 385-V, 485-V (1 to 4)
580-V (1 to 2); 685-V, 785-V (1 to 4)

**ORGAN**

181-O, 182-O (1 to 2)
185-O, 285-O, 385-O, 485-O (1 to 4)
580-O (1 to 2); 685-O, 785-O (1 to 4)

**CONDUCTING**

685-Cg, 785-Cg (1 to 4)

**STRING INSTRUMENTS**

Violin
180-Vn, 181-Vn, 182-Vn (1 to 2)
185-Vn, 285-Vn, 385-Vn, 485-Vn (1 to 4)
580-Vn (1 to 2); 685-Vn, 785-Vn (1 to 4)

String Bass
180-Sb, 181-Sb, 182-Sb (1 to 2)
185-Sb, 285-Sb, 385-Sb, 485-Sb (1 to 4)
580-Sb (1 to 2); 685-Sb, 785-Sb (1 to 4)
360 DEPARTMENTS AND COURSES OF INSTRUCTION

Cello
180-C, 181-C, 182-C (1 to 2)
185-C, 285-C, 385-C, 485-C (1 to 4)
580-C (1 to 2); 685-C, 785-C (1 to 4)

Viola
180-Va, 181-Va, 182-Va (1 to 2)
185-Va, 285-Va, 385-Va, 485-Va (1 to 4)
580-Va (1 to 2); 685-Va, 785-Va (1 to 4)

181-H, 182-H (1 to 2)

Clarinet
180-CI, 181-CI, 182-CI (1 to 2)
185-CI, 285-CI, 385-CI, 485-CI (1 to 4)
580-CI (1 to 2); 685-CI, 785-CI (1 to 4)

Flute
180-F, 181-F, 182-F (1 to 2)
185-F, 285-F, 385-F, 485-F (1 to 4)
580-F (1 to 2); 685-F, 785-F (1 to 4)

Oboe
180-Ob, 181-Ob, 182-Ob (1 to 2)
185-Ob, 285-Ob, 385-Ob, 485-Ob (1 to 4)
580-Ob (1 to 2); 685-Ob, 785-Ob (1 to 4)

Trombone
180-Tr, 181-Tr, 182-Tr (1 to 2)
185-Tr, 285-Tr, 385-Tr, 485-Tr (1 to 4)
580-Tr (1 to 2); 685-Tr, 785-Tr (1 to 4)

Horn
180-Fh, 181-Fh, 182-Fh (1 to 2)
185-Fh, 285-Fh, 385-Fh, 485-Fh (1 to 4)
580-Fh (1 to 2); 685-Fh, 785-Fh (1 to 4)

Harp
181-Hp, 182-Hp (1 to 2)
185-Hp, 285-Hp, 385-Hp, 485-Hp (1 to 4)
580-Hp (1 to 2); 685-Hp, 785-Hp (1 to 4)

Guitar
181-G, 182-G (1 to 2)
185-G, 285-G, 385-G, 485-G (1 to 4)
580-G (1 to 2); 685-G (1 to 4)

WIND INSTRUMENTS

Bassoon
180-B, 181-B, 182-B (1 to 2)
185-B, 285-B, 385-B, 485-B (1 to 4)
580-B (1 to 2); 685-B, 785-B (1 to 4)

Saxophone
180-S, 181-S, 182-S (1 to 2)
185-S, 285-S, 385-S, 485-S (1 to 4)
580-S (1 to 2); 685-S, 785-S (1 to 4)

Trumpet
180-T, 181-T, 182-T (1 to 2)
185-T, 285-T, 385-T, 485-T (1 to 4)
580-T (1 to 2); 685-T, 785-T (1 to 4)

Baritone
180-Ba, 181-Ba, 182-Ba (1 to 2)
185-Ba, 285-Ba, 385-Ba, 485-Ba (1 to 4)
580-Ba (1 to 2); 685-Ba (1 to 4)

Tuba
180-Tu, 181-Tu, 182-Tu (1 to 2)
185-Tu, 285-Tu, 385-Tu, 485-Tu (1 to 4)
580-Tu (1 to 2); 685-Tu (1 to 4)

PERCUSSION INSTRUMENTS

Percussion
180-Pc, 181-Pc, 182-Pc (1 to 2)
185-Pc, 285-Pc, 385-Pc, 485-Pc (1 to 4)
580-Pc (1 to 2); 685-Pc, 785-Pc (1 to 4)

*See schedule of fees below.

MUSIC FEES

All students registering for private or group instruction are charged special fees according to the following schedule. Regular and scholarship students will be assigned to private or group instruction each semester only after a Music Fee Statement has been secured. Rental instruments, practice rooms and lockers are issued upon presentation of this statement.

Group lesson or one-half hour private lesson: $40.
One-hour private lesson: $60.
A music major registering for more than one weekly lesson will pay a maximum fee of $60.

Rentals

Instruments are rented as available for use in regularly scheduled music activities according to the following fee schedule. Any damage beyond normal wear and tear will be paid for by the renter of the instrument. All rental instruments must be returned by the end of the semester or on demand.
Piano rental: Pianos will be rented only to those enrolled in group, private instruction or keyboard class. $4 for one hour practice per day. $8 for two hours practice per day. $12 for three hours practice per day.

Organs, Harpsichords, and Synthesizer: $10 for one hour practice per day. $15 for two hours practice per day. $20 for three hours practice per day.

Harps: $20 for one hour practice per day. $25 for two hours practice per day. $30 for three hours practice per day.

Band and Orchestra instruments: Rented only to those enrolled in ensembles or techniques and literature classes. $8 per semester.

Refunds will be made according to the refund schedule. No refund will be made on rental charges of $4 or less.

NATURAL RESOURCE RECREATION
(See Renewable Natural Resources)

NUCLEAR AND ENERGY ENGINEERING

Professors Robert L. Seale, Head, David L. Hetrick, Norman Hilberry, Richard L. Morse, Roy G. Post, Morton E. Wacks
Associate Professors W. Morris Farr, Rocco A. Fazzolare, William Filippone, Barry D. Ganapol, George W. Nelson
Assistant Professors Leland M. Montierth, Daniel Morrison

The department offers the Bachelor of Science in Nuclear Engineering, Bachelor of Science in Energy Engineering, Master of Science, and Doctor of Philosophy degrees with a major in nuclear engineering.

For undergraduate degree requirements, please see the College of Engineering section of this catalog. For graduate degree requirements, please see the Graduate Catalog.

103. Introduction to Nuclear and Energy Engineering (1) I The world's energy resources and their past, present and projected future utilization; review of basic physical principles underlying energy engineering applications; a scan of the available energy utilization systems.

104. Introduction to Energy Engineering (1) II Energy conversion processes and applications to fossil-fueled, nuclear fueled and alternate energy utilization systems; economic considerations, resource conservation and environmental effects. P, 103.

105. Introduction to Nuclear Engineering (1) II Introduction to nuclear processes, to selected fundamentals of engineering science and to the role of nuclear technology in modern society, including its economic and environmental impacts. P, 103.


221R. Radiation Detection and Isotope Applications (2) II Introduction to the principles and practices of radiation measurement. P, 231.

221L. Radiation Detection and Isotope Applications Laboratory (1) II Lab. experiments to illustrate the principles discussed in 221R. P, CR 221R.

231. Basic Nuclear Processes (3) I Nuclear structure and stability, radioactive decay and interactions of radiation with matter, with emphasis on momentum and mass energy balance, and process rate definition. P, Chem. 103b, 104b, Math. 125b.

343. Elements of Nuclear Reactor Theory (4) I Neutron diffusion and slowing down theory, as applied to bare and reflected reactors; the effects of core inhomogeneity on neutron behavior. P, 231.

348. Introduction to Nuclear Reactor Engineering (3) II The analysis and design of nuclear power stations, with emphasis on central station systems. P, 343.
396. Proseminar  
s. Status of Nuclear Energy (1) I II

410. Energy System Design (3) GC II Modern techniques in synthesis and analysis are reviewed and applied to contemporary energy problems; economic evaluation, system modeling, optimization, and decision analysis. P, 348, A.M.E. 340a or Ch.E. 306.

415. Environmental Analysis of Energy Conversion (3) GC I Engineering analysis, assessment, and resolution of energy-environment interaction, with consideration of power plant siting, emissions, thermal effects, and waste management.

416. Radiation Health Physics and Safety (3) GC I Study of health physics practices and safety responsibilities; analysis of radiation environments and applications of basic shielding methods to provide understanding of accepted working practices.

417. Nuclear Energy and Power (3) GC I Fundamentals of nuclear energy and radiation; engineering applications; the basic concepts of nuclear reactors and power systems. Designed for nonmajors.

420. Nuclear Engineering Laboratory (3) GC I II Experimental techniques for determining various parameters in nuclear systems; experiments using the critical and subcritical reactors. P, 343.

425. Nuclear Reactor Operations (2) II Application of principles of reactor theory to the operation of a nuclear reactor; reactor instrumentation, control systems, operating procedures, and radiological safety; review of federal regulation governing reactor operation and operator licensing. P, 540 or 343 and 420.


435. Radiation Effects (3) GC II Radiation effects on solids and radiation chemistry of gases and liquids, with emphasis on effects encountered in nuclear reactor, detector, and dosimeter systems. P, 343.

437. Introduction to Radioactive Waste Management (3) GC II Influence of public policy and waste physical form on the design criteria for waste management systems.

441. Contemporary Nuclear Power Systems (3) GC I Analysis of present nuclear power plants, with emphasis on design decisions as they affect performance of individual systems; comparison of different contemporary systems. P, 348 or 417.

445. Direct Energy Conversion (3) GC 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.

450. Introductory Nuclear Physics (3) GC II (Identical with Phys. 450)

453. Air Conditioning Engineering (3) GC I (Identical with A.M.E. 453)


463. Energy from Biomass (3) GC II (Identical with S.W.E. 463)

465. Current Problems in Energy and Power (1 to 4) GC II A multidisciplinary course with guest lecturers who are practicing professionals from the energy and power industry; a number of week-long, self-contained minicourses, with topics varying from year to year. (Identical with A.M.E. 465, Ch.E. 465, and E.C.E. 465)

467. Solar Energy Engineering (3) GC I Energy analyses of solar collectors; selective surfaces; solar cells; energy storage; systems for solar heating and cooling; mechanical and electrical power; perspective. P, A.M.E. 340 or Ch.E. 306. (Identical with A.M.E. 467 and E.C.E. 467)

469. Energy Engineering Laboratory (3) GC I II Basic measurements of energy quality, quantity, flow, and conversion. Includes active and passive solar as well as other alternative energy sources. 2R, 3L. P, 467 or CR. (Identical with A.M.E. 469).

477. Environmental Impact of Energy-Related Systems (3) GC II (Identical with C.E. 477)


496. Proseminar  
s. Developments in Nuclear Power (1) I II

530. Radiochemistry and Radiation Detection (3) I Radiation detection and measurement, health physics, isotope applications, activation analysis, and instrumentation. 2R, 3L. P, Chem. 480b or Phys. 230. (Identical with Chem. 530)

541. **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, 441, 540.

554. **Nonlinear Reactor Dynamics** (3) II Nonlinear dynamics of nuclear reactors; shut-down mechanisms, inertial effects, nonlinear stability criteria, time-dependent neutron transport, neutron waves, and applications to pulsed reactors, start-up transients, reactor stability, and reactor safety. P, 454.

567. **Advanced Solar Engineering** (3) II Research and development studies related to solar applications: engineering design, analysis, and economics. Course includes invited lectures, literature research, and an original paper. P, A.M.E. 340a, 442. (Identical with A.M.E. 567, Ch.E. 567, and E.C.E. 567)

588. **Photovoltaic Cells, Arrays and Systems** (3) I (Identical with E.C.E. 588)

596. **Seminar** s. Advanced Nuclear Power Activities (1) II


630. **Fuel Cycles for Nuclear Reactors** (3) II The design and analysis of fuel cycles for nuclear reactors; the processes and requirements for fuel element design and the limitations of fuel element performance to reactor design; economic factors in fuel cycles. P, 540.

642. **Reactor Theory II** (3) II Fundamental theory of heterogeneous reactors, integral transport, blackness theory, perturbation theory, and applications; temperature coefficient, changes in reactivity due to fission product accumulation, fuel consumption, and conversion. P, 540.

644. **Advanced Reactor System Design and Analysis** (3) I Application of design and analysis techniques to advanced nuclear reactor system concepts; utilizes current calculational techniques and system technology to arrive at integrated systems. P, 642.

645. **Nuclear Safety** (3) II Possible incidents involving nuclear materials in critical reactors, chemical processing systems, fuel shipment operations or subcritical arrays, including assessments of the magnitudes and consequences of nuclear incidents; determination of criteria for evaluating nuclear system safety, including plant siting and operational procedures. P, 343.

654. **System Analysis of Nuclear Reactor Dynamics** (3) II Selected topics in nuclear system dynamics, simulation and control; content varies. P, 454.

671. **Numerical Methods in Nuclear Engineering** (3) I Methods for numerical solution of differential and integral equations, with applications to computer modeling of nuclear reactors, power plants, fuel cycles, and basic processes in nuclear fission and fusion.

681a-681b. **Analytical Methods of Transport Theory** (3-3) 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, 642, Math. 422a-422b.

685. **Inertial Confinement Controlled Fusion** (3) I Advanced topics in inertial confinement fusion, including energy absorption and transport phenomena, stability of spherical implosion systems, laser and charged particle drivers and reactor designs. P, 483b, 470b. (Identical with E.C.E. 685)

687. **Magnetic Confinement Controlled Fusion** (3) II Theory and design of magnetic fusion systems; instabilities; transport and reactor design considerations associated with linear magnetic fusion systems; Tokamaks and mirror machines. P, 483b; Phys. 415b, 470b. (Identical with E.C.E. 687)

**NURSING**

Professors Gladys E. Sorensen, Dean, Agnes M. Aamodt, Jan R. Atwood, Eleanor E. Bauwens, Pearl P. Coulter (Emerita), Ada Sue Hinshaw, Margarita A. Kay, Beverly A. McCord, Arlene M. Putt (Emerita)

Associate Professors Dyanne Affonso, Helen C. Chance, Evelyn M. DeWalt, Josephine R. Gibson, Mary E. Hazzard, Daniel Levinson, Alice J. Longman, Lillian Lynch (Emerita)
Professional nursing is a service which helps people achieve and maintain health and which requires a body of knowledge in pace with scientific advances. Nursing is based upon the natural and behavioral sciences, and students are encouraged to use these principles, and to include psychological and social as well as physical care in their applied nursing courses.

The degrees offered are the Bachelor of Science in Nursing, Master of Science, Nursing Specialist, and Doctor of Philosophy with a major in nursing. For undergraduate admission and degree requirements, please see the College of Nursing section of this catalog. For graduate admission and degree requirements, please see the Graduate Catalog.

Starting with the nursing major courses in the junior year, all nursing students are required to provide their own cars for transportation to the clinical areas where they are assigned for patient-care experience. Students wear an official College of Nursing uniform for clinical courses. During these semesters the student must be enrolled for all required courses.

Honors: The college participates in the Honors Program.

340. Nursing Skills in Assessment (3) [Rpt./2] I II Designed to develop skill in interviewing and physical assessment for development of a problem-oriented patient record; basic preparation in health assessment. 2R, 3L. Open only to employed RNs; not open to majors.

341. Women and Health (3) I II Exploration of body processes and body experiences of women throughout the life cycle, through examination of research, traditional and feminist writings; health care consumerism. Not open to majors. (Identical with W.S. 341)

353. Utilization of the Nursing Process in Meeting Basic Human Needs (6) I II Application of scientific knowledge for assessment of basic human needs in levels of wellness; utilization of nursing process in assisting individuals and groups to meet their health care needs. Open to majors only.

354. Basic Nursing Practice (2) I II Principles of biopsychosocial sciences and selected psychomotor skills practiced by nurses. 1R, 3L. Open to majors only. P, CR 353.

359. Introduction to the Nursing Profession and Research (3) I II Orientation to and socialization into professional nursing, including utilization of intellectual skills to define a problem and to evaluate existing research. Open to majors only. P, 353 or CR.

363. Nursing of Adults with Health Problems (11) I II Caring for adults experiencing a deviation from their usual levels of wellness, with emphasis on medical-surgical settings. Open to majors only. P, 353, 354, 359; Pcol. 372a; CR Pcol. 372b.

372. Health Assessment of Women (4) I II GRD Knowledge and skills essential for health assessment of women, including interviews, histories, physical examinations, pelvic assessment, and interpretation of laboratory values. 1R, 9L. Open to majors only. P, RN.


377. Nursing Care of Patients with Chronic Health Problems (3) I II Nursing care of chronically ill persons, with emphasis on assisting them to remain independent and functional within the limitations imposed by the illness. Open to majors only. P, 353, 363, Pcol. 372b.

378. Nursing Care in Death and Dying (3) I Designed to provide students the opportunity to explore feelings regarding death, to consider needs and perceptions of the patient and the patient’s family, and to improve ability to provide nursing care. Open to majors only.

379. Analysis of Nursing Problems (2) I II Development of analytical skills related to research and professional problems; introduction to research approaches; interrelationship of professionalism and research. Open to majors only. P, 373, 375 or CR.
381. **Community Health Nursing** (6) I II Principles of public health science and synthesis of nursing practice and community health practice in a variety of community settings. 2R, 12L. Open to majors only. P, 373, 375, 379; CR 382, 388, 389.


387. **The Professional Nurse in the Health Care System** (16) I II A clinical course to enable students to become familiar with the functioning of a health care system and the related nurse leadership and management responsibilities. Open to majors only. P, 381, 382, 388, 389.

388. **Issues in Nursing and Health Care Delivery** (2) I II Nursing, health care and societal issues which impinge upon the practice of professional nursing; nursing role and responsibility in determining directions for change. Open to majors only.

389. **Research Methods in Nursing** (2) I II Implementation of the research process, evidenced through design of a research proposal. Open to majors only. P, 379.

391. **Preceptorship**

394. Practicum
   c. Care of Mother and Infant in Childbirth (6) I II S 2R, 12L. Open to majors only. P, 394b.
   d. Health Care of Women II (3) I I S 1R, 10L. P, 394c.

395. **Colloquium**
   b. Professional Aspects of Nurse-Midwifery (1 to 4) I II S Open to majors only.

482. **Legal Implications in Nursing** (3) GC I II Overview of the nurse's relationship with law, as a practicing nurse, and as an individual; exploration of roles from student to expanded practice, in the community, in the legislative process. Advanced degree credit available for non-Ph.D. majors only.

484. **The Health Professions and the Social Sciences** (3) GC I Implications of concepts and theories from anthropology, psychology and sociology for health care. Advanced degree credit available for non-Ph.D. majors only.

487. **Poverty and Health** (3) GC II Study of the relationship between poverty and health. Concepts and theories from anthropology, psychology and sociology will be used to analyze problems associated with poverty. Advanced degree credit available for non-Ph.D. majors only. P, six units of soc. sci. (Identical with Anth. 487 and F.C.M. 487)

488. **School Nurse Practice** (3) GC S Analysis and application of nursing in school systems. Communication skills, teaching-learning principles for family, physical, psychological assessment. P, R.N.

495. **Colloquium**
   a. Bilingual Health Communication (3) GC II (Identical with Anth. 495a, which is home.)

588. **Health of the Older Adult** (3) I Current research of the aging process including physical and mental alterations; emphasis on physiological changes. Consult college before enrolling.

600a-600b-600c. **Nursing Theory and Practice** (3-3-3) I II S Maintenance, therapeutic and preventive nursing care of persons in various settings. Student elects practice in one area of nursing: (1) child; (2) community health; (3) gerontology; (4) maternal-newborn; (5) medical-surgical; (6) psychiatric-mental health. Laboratory is required.

602. **Evaluation Process in Nursing** (3) II Development and use of models and tools for assessing nursing processes, programs and performances. Approaches to and psychological reactants of evaluation are explored.

620. **Clinical Teaching in Collegiate Schools of Nursing** (6) II Curriculum planning and implementation; principles of teaching and learning, formulation of objectives, the selection and organization of learning experiences in the clinical area. Directed practice teaching is included in the area of clinical interest. P, 600a or 600c, CR 600b.

624. **The Administrative Process** (6) II Theoretical and practical applications of administration as a decision-making process in formulating a course of action essential to solving patient care and personnel issues in nursing. P, 600a or 600c, CR 600b.

625. **Physiological Concepts: Nursing** (3) I Physiological, endocrinological, and/or biochemical concepts and principles relevant to understanding oral contraception, menopause, depression, and water and electrolyte balance.

630. **Methods in Nursing Research** (3) I Critical examination of selected problems and methods in the nursing research process. P, 600a or CR.
Clinical Phenomena: Theories and Research (3) I Theory and research surrounding common clinical phenomena (e.g., pain, stress), with emphases on description of clinical phenomena and identification of strengths and weaknesses in available knowledge and research. Laboratory is required. P or CR, 630, 600a or 600b or 600c.

Nursing in a Clinical Subspecialty (4-12) 680a: Clinical physiology, pathophysiology, and nursing skills, as related to a selected subspecialty area; major subspecialty health problems and impact on the individual, the family and society. Laboratory is required. 680b: Integration and application of previous content, including exploration of expanded role at subspecialty level. Laboratory is required. P, master's degree or 600a, 600b, 600c, 602, 620, 624, 630, or 631. Both 680a and 680b are offered fall and spring semesters.

Dynamics of Behavior in Patients with Chronic Disease (2) I Behavioral problems of individuals with chronic diseases and ways of intervening. Open to majors only.

Testing Nursing Theory (3) I Examination of selected theories currently utilized in nursing; testing of theories in practice; provision for an exercise in theory construction. Laboratory is required. P, 600a-600b-600c, 602, 630, six units of adv. human psio., six units of an adv. social sci.

Clinical Nursing Research (3) II Investigation of selected strategies appropriate to researching problems in clinical nursing. P, 600a-600b-600c, 602, 705, 630.

Methods in Clinical Nursing Research (3) I Application of research methods from the physical and social sciences to clinical nursing; experimental and nonexperimental designs; collection, analysis and interpretation of data; computer use. P, 705, 710, 630.

Study of Social Influences (3) S 1984 In-depth examination of social forces affecting the health care system.

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, 600a-600b-600c, 602, 630, 705, 710.

NUTRITION AND FOOD SCIENCE


Associate Professors Don P. Bourque, Charles P. Gerba, Gail G. Harrison, K. Y. Lei, Ralph L. Price, Edward T. Sheehan, Alice B. Stanfield (Emerita)

Assistant Professors Ronald E. Allen, Patsy M. Brannon, James F. Deatherage, Roger A. Sunde, Ann M. Tinsley, Donald L. Zink

Lecturers Stewart Christensen, Betty Jordan, Barbara J. Zeches

Extension Specialist June C. Gibbs

The Department of Nutrition and Food Science is administered by the College of Agriculture and provides instructional programs in all areas of nutrition and food science. These programs prepare students for careers in various phases of the food industry, governmental regulatory agencies, health care delivery systems, and graduate study.

The department offers the degree of Bachelor of Science in Agriculture with majors in nutritional sciences and food science under the agricultural sciences or agricultural business curriculum and the degree of Bachelor of Science in Home Economics with majors in human nutrition and dietetics, consumer service in food, and food service management.

The human nutrition and dietetics major leads to application for internship and credentials from the American Dietetic Association. The department maintains cooperative arrangements with the University Hospital and other health care and educational facilities.

The Master of Science is offered with majors in food science, dietetics, and home economics; and the department participates with the Committee on Nutritional Sciences, the Committee on Animal Physiology, the Department of Biochemistry, the Committee on Genetics, and the Department of Microbiology in offering the Master of Science and Doctor of Philosophy degrees. For admission and degree requirements, please see the Graduate Catalog.

The majors within the department are currently under review. For information contact the departmental office.
Honors: The department participates in the Honors Program.

101. Nutrition, Food, and You (2) I II Current concepts and controversies in nutrition and food safety; practical applications. Designed for nonmajors and for majors with no previous work in nutrition. 
Price

180. Science of Meat and Meat Products (3) I II (Identical with An.S. 180)


251. Food Study (3) I II Application of scientific principles in handling food for enhancement or preservation of quality. 2R, 3L. P, Chem. 101b or CR; Chem. 241a (required of majors, recommended for nonmajors). Zeches

258. Institution Food Management (3) I II Quantity food preparation and service, menu planning for institutions, management of time and labor and use of institution equipment. 2R, 3L. P, 101. Tinsley


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, 201; Chem. 103b, 104b; G.Bio. 159b.

350. Consumer Decisions in Food (3) I II Economic, nutritional, aesthetic and management considerations affecting decision-making in food selection, preparation and service; individual and group projects related to current consumer problems in food. P, 101, 251. Zeches


408. Human Nutrition (3) GC I Concepts of the physiology and biochemistry of nutrients and nutrient homeostasis in humans. P, 406a-406b or Bioc. 460, G.Bio. 159a-159b, CR 464a. Lei

430. Principles of Nutrition (3) GC I II (Identical with An.S. 430)

441. Therapeutic Nutrition (4) GC 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, rehabilitation and education. P, 408.

442. Clinical Biochemical Evaluations (2) I Review, analysis and critique of the literature covering current research methodology and information related to clinical biochemical evaluations as applied to nutritional status assessment; oral reports, group projects, and discussion. P, 408. Sheehan

443. Community Nutrition (2) II Nutritional status assessment in the community setting; review of ongoing community programs in government and private agencies; analysis of requirements and role of community nutritionist; nutrition projects and grant writing. Field trips. Sheehan

447. Perspectives in Geriatrics Laboratory (1) GC I (Identical with Ph.Pr. 447)

448. Perspectives in Geriatrics (2) GC II (Identical with Ph.Pr. 448)

449. Nutritional Care Management (2) II Management methods applied to the administration of nutritional care within health care delivery systems for individuals in various life situations. 1R, 3L. Field trips. P, 408.

451. Purchase of Foods and Food Service Equipment for Institutions (3) II Factors affecting food purchasing, storage, inventory, and cost control; equipment selection, maintenance, design of food-preparation areas for food service organization. 2R, 3L. P, 251. Tinsley

455. Experimental Food Study (3) GC I II Flavor, color, texture, temperature and appearance, as related to acceptability of food products; analysis of change during storage, preservation and preparation, as related to food composition and quality. 1R, 6L. P, 251, 360. Tinsley

458. Institution Organization and Administration (3) GC 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, 258. Tinsley
459. Sensory Evaluation of Food (3) GC II 1983-84 Fundamentals of taste, odor, color, and rheology perception as related to food; design and methodology of small-panel and consumer-panel testing. 2R, 3L. Stull/Angus


466. Postharvest Physiology (3) GC II 1983-84 (Identical with P.L.S. 466)

468. Food Processing (3) GC I Refrigeration, freezing, dehydration, heating, fermentation and pickling, irradiation and addition of chemicals, as they apply to food preservation and processing, retention of nutritive value, flavor, appearance and safety. P, Chem. 241b, Micr. 110. Price

470. Food Microbiology and Sanitation (3) GC II Microbiology in processing and handling of foods; relation of microorganisms, insects, and rodents to design and function of processing and handling equipment. P, Micr. 120 or 217. (Identical with Micr. 470) Gerba

471. Food Microbiology and Sanitation Laboratory (2) GC II 1984-85 Lab. procedures for assessment of sanitary quality of foods. P, 470 or CR. (Identical with Micr. 471) Gerba

480. Composition and Structure of Meat (3) GC I 1983-84 Refrigeration, freezing, dehydration, heating, fermentation and pickling, irradiation and addition of chemicals, as they apply to food preservation and processing, retention of nutritive value, flavor, appearance and safety. P, Chem. 241b, Micr. 110. Price

485. Dairy Products Processing (3) GC I 1983-84 Principles of processing butter, cheese, condensed milk, dehydrated milks, frozen desserts, and special products; selection and preparation of materials. Stull

493. Internship d. Consumer Service in Food (1 to 6) I II

538. Problems in the Biochemistry of Aging (2) I 1984-85 Current topics in the biochemistry of mammalian aging; examination of the metabolic, hormonal, immunologic and neural aspects of aging in lower mammals and humans. P, 406a-406b or Chem. 460 or 462b. McCaughey

560. Advanced Food Chemistry (3) I 1983-84 Chemical and physical structure and functions of food constituents, additives, and food properties. P, 360, CR 406a. Berry

568a-568b. Nucleic Acids (3-3) 1983-84 (Identical with Bioc. 568a-568b)

596. Seminar cc. Community and International Nutrition (1 to 3) II (Identical with Med. 596cc, which is home)


602. Metabolic Integration (2) II Food intake, transport, protein and amino acid utilization in higher animals. P, 408.

609. Nutritional Biochemistry Techniques (3) I Biochemical methods for evaluating metabolic functions of nutrients. 1R, 6L. P, 408, Chem. 324 or 325, and 323 or 326. (Identical with An.S. 609) Reid

615. Chemistry and Metabolism of Lipids (3) I 1983-84 Chemistry and structure of lipids and their digestion, adsorption, transport and utilization; current research in lipid metabolism and the role of lipids in certain disease states. P, 406a-406b. Marchello

617. Steroid Chemistry and Biochemistry (3) I 1984-85 Occurrence, biosynthesis and function of steroids in animals, plants and microorganisms; chemical reactions and metabolism; chromatographic analysis. P, 406a-406b or Chem. 460 and 241a-241b. (Identical with Bioc. 617 and Chem. 617) Kircher


630. Developmental Nutrition (3) II Role of nutrients in development and growth; changes in maternal and child nutritional requirements due to development and growth; current research in developmental nutrition. P, 408. Brannon

638. Theories of Aging (2) I 1983-84 Theories of aging with regard to biochemical changes in the aging organism and their effects on behavior in the aged human. P, 3 units of bio., chem., phys., or micr. Open to majors in the social or health sciences only. McCaughey

640a-640b. Field Methods in Human Nutrition (3-3) Case-oriented approach to nutritional assessment, diagnosis, prescription, plan and prognosis; application of dietary, clinical and biochemical methods. 1R, 6L. P, 693 or other ADA-approved clinical internship. Kight

645. Nutritional Pathology (3) I Identification of nutrient-based lesions; diagnosis of causative factors, using clinical, biochemical and dietary data; prognosis for the outcome; recommendation for nutritional prescription. 1R, 6L. Field trips. Sheehan

663. Chemistry of Food Carbohydrates (2) II 1982-83 Chemical and physical properties of carbohydrates important to their presence in food. P, Bioc. 462a, 460 or N.F.S. 406a-406b. Berry
665. **Chemistry of Food Proteins** (3) II 1983-84 The chemical and physical properties of proteins important to their use as food; analysis and purification of proteins; biochemical properties of proteins in muscle, milk, eggs, cereals, and other foods. P, Bioc. 462a preferred, Bioc. 460 or N.F.S. 406a-406b acceptable. Goll

672. **Food Safety** (2) I 1983-84 Significance and control of foodborne hazards associated with pathogenic microorganisms, microbial toxins, industrial chemicals, and other environmental contaminants. P, 471, Chem. 241b. (Identical with Micr. 672) Gerba

693. **Internship**
a. Dietetic Internship, ADA Accredited (12) I II Field trips. Consult dept. before enrolling. Open to majors only. P, Course work equivalent to American Dietetic Association Plan IV.

696. **Seminar**
a. Molecular Biology (1 to 2) I II
b. Nutrition (1) I II (Identical with Nu.Sc. 696b)
c. Food Science (1) I II

**NUTRITIONAL SCIENCES**

*Committee on Nutritional Sciences (Graduate)*


The interdepartmental Committee on Nutritional Sciences offers research direction in all areas of nutrition, including nutritional biochemistry, human nutrition, clinical and community nutrition, and animal nutrition.

The committee offers graduate work leading to the Master of Science and the Doctor of Philosophy degrees with a major in nutritional sciences. Options in nutritional biochemistry, human nutrition (clinical or community), or animal nutrition may be selected within this major. For admission and degree requirements, please see the *Graduate Catalog*.

696. **Seminar**

b. Nutrition (1) I II (Identical with N.F.S. 696b, which is home)

**OCCUPATIONAL SAFETY AND HEALTH**

*(See Health-Related Professions)*

**OFFICE EDUCATION**

*(See Business and Career Education)*

**OPERATIONS MANAGEMENT**

*(See Management)*
Committee on Optical Sciences (Graduate)


Assistant Professor Eustace L. Dereniak, Ursula J. Gibson, William M. Hetherington Ill (Chemistry), Chris L. Koliopoulos

Qualified applicants holding undergraduate degrees in engineering, mathematics or physics are admitted to undertake graduate programs in optical sciences. Current active research areas include coherent optics, holography, infrared techniques, instrumentation, image processing, laser physics, medical optics, nonlinear optics, optical design, optical fabrication and testing, optical properties of materials, quantum optics, remote sensing, solar energy conversion, and thin films.

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.

434. Electrical, Magnetic and Optical Properties of Materials (3) GC I 1984-85 (Identical with Met. 434)

440a-440b. Atomic and Molecular Spectroscopy for Experimentalists (3-3) GC (Identical with Phys. 440a-440b)

501. Electromagnetic Foundations of Optics (3) I Gauss’ law; Coulomb’s law; dipole moment; polarizability; Faraday’s law; Maxwell’s equations; the wave equations; plane waves; spherical waves; Fresnel’s formulas; dipole radiation; magneto-optic effects; electro-optic effects. P, Phys. 116, Math. 422b.

502. Introduction to Fourier Optics (3) I Harmonic analysis; linear systems; impulse response; convolution; Fourier transform; transfer function; diffraction; image formation; holography; optical data processing. P, Math. 223.

503. First-Order Optical Design (3) I Rays and wavefronts; Fermat’s principle; Snell’s law; dispersion; systems of plane mirrors; Gaussian imagery; paraxial design methods; Delano diagram; introduction to aberrations.

503L. First-Order Optical Design Laboratory (1) I Lab. in support of 503. P, CR 503.

504. Introduction to Quantum Optics (3) II Quantum background; interaction of radiation with matter; dipole moments; line broadening; quantization of radiation fields; spontaneous emission; stimulated emission; lasers. P, 501, Phys. 230. (Identical with Phys. 504)

505. Interference and Interferometry (3) II Wave equations; energy flow; polarization; interference; coherence; interferometers; optical testing; heterodyne interferometry; holography; speckle interferometry. P, 501, 502.

505L. Interference and Interferometry Laboratory (1) II Lab. in support of 505. P, CR 505.

506. Principles of Optical Systems Design (3) II Sources of aberrations; aberration control; aberrations in simple systems; vision; color; mechanical design principles. P, 503, 503L.

507. Introduction to Solid-State Optics (3) I Solid-state background; lattice vibrations; energy bands; energy gaps; optical properties of metals, insulators and semiconductors; measurement techniques; modulators; light-emitting diodes. P, 504.

508. Probability and Statistics in Optics (3) II Probability; random variables; stochastic processes; autocorrelation; Wiener spectrum; noise; applications in photography; atmospheric turbulence; analysis of random data. P, 502.
509. **Radiometry, Sources, Materials and Detectors** (3) II Radiometry; sources; materials and components for optical systems; imaging and non-imaging detectors. P, 502, 503, 503L.

513. **Optical Testing** (3) I 1983-84 Metrology of components; aspheric surface testing; assembly and alignment of systems; system evaluation. P, 505.


514. **Aberration Theory** (3) II 1984-85 Aberration theory; geometrical image formation; diffraction; pupil, spread, and transfer functions; random wavefront perturbations; system effects; image evaluation; image processing. P, 503.

517. **Lens Design** (4) I Fundamentals of optical system layout and design; exact and paraxial ray tracing; aberration theory; chromatic and monochromatic aberrations. 2R, 6L. P, 506.

521. **Polarized Light: Theory and Practice** (3) I 1983-84 Polarized light; mathematical description; interaction with dielectrics and metals; crystal optics; double refraction; polarization devices; matrix treatment; applications. P, 505.

522. **Theory of Partial Coherence and Polarization** (3) I 1984-85 Statistical properties of light; mutual coherence function; the Michelson stellar interferometer; image formation with partially coherent light; cascaded optical systems; resolution; photoelectron statistics; Hanbury-Brown and Twiss intensity interferometry. P, 505.

524. **Optical Data Processing** (3) II 1983-84 Inverse filtering; matched filtering; frequency-domain synthesis; the Vander Lugt filter; shadow-casting correlators; OTF synthesis; coded-aperture imaging. P, 505.

527. **Holography** (3) II 1984-85 Historical background; the Gabor hologram; the hologram as a zone plate; Fresnel, image, Fourier-transform, and reflection holograms; practical holography; limitations. P, 505.

531. **Image Processing Laboratory** (3) I (Identical with E.C.E. 531)

533. **Image Processing: Devices, Systems and Applications** (3) II 1983-84 Image formation; resolution; noise; linear processing; display; discrete images; sampling; coding; maximum efficiency codes; nonlinear computer processing; coherent processing. P, 502 or background in theory of linear systems. (Identical with E.C.E. 533)


541. **Introduction to Lasers** (3) I Laser theory; properties of lasers; stimulated emission; dispersion theory; gain saturation and rate equation; optical resonators; survey of laser types and mechanisms. P, Phys. 103b.

541L. **Introduction to Lasers Laboratory** (1) I Lab. in support of 541. P, CR 541.

542. **Laser Principles and Applications** (3) II Laser design; hazards; frequency-stabilized lasers; line width; parametric conversion; frequency doubling and tripling; modulation of laser beams; coherent detection; applications. P, 541.

542L. **Laser Principles and Applications Laboratory** (1) II Lab. in support of 542. P, CR 542.

543. **Laser Physics** (3) I 1984-85 Density matrix formulation of interaction of radiation with matter; semiclassical laser theory; single and multimode scalar fields; moving atoms; ring and Zeeman lasers; pressure effects. P, 504. (Identical with Phys. 543)

545. **Nonlinear Optics** (3) II 1983-84 Scattering of light; parametric amplification; Brillouin, Raman, Rayleigh scattering; stimulated and spontaneous interactions; frequency multiplication; intense field effects; materials damage theory. P, 501.

550. **Fundamentals of Remote Sensing** (3) I Physics and methodology of remote sensing; radiometry; data collection systems; photointerpretation; photogrammetry; image enhancement and classification; applications in the earth sciences.

552. **Optical Properties of the Atmosphere and Ocean** (3) I 1984-85 Fluctuations in modulus, phase, and coherence caused by turbulence and scattering; polarization; absorption; dispersion; visibility; transfer function; resolution; experimental data. P, CR 508.

558. **Radiometry** (3) I 1983-84 Units and nomenclature; Planck's law; black bodies; gray bodies; spectral emitters; Kirchoff's law; flux concepts; axial and off-axis irradiance; radiative transfer; normalization; coherent illumination; radiometric instruments. P, 501.

559. **Infrared Techniques** (3) I 1984-85 The radiant environment; atmospheric properties; optical materials and systems; detector description and use; data processing; displays, systems design and analysis. P, 558.
DEPARTMENTS AND COURSES OF INSTRUCTION

563. Photoelectronic Imaging Devices (3) II 1983-84 Intensifiers; camera tubes; electronography; storage tubes; specifications; evaluation; applications. P, Phys. 116.

565. Radiation Detector Laboratory (2) I 1983-84 Operational amplifiers, noise, signal processing, photovoltaic and photoconductive detectors, photomultipliers, thermal detectors. 6L. P, 509, CR 566.

566. Optical Detectors (3) II 1984-85 Photoconductors; semiconductors; signal and noise mechanisms; figures of merit; limitations on the sensitivity of detectors; photoemitters; detectors of ionizing radiation. P, 507.


569. Optics of Thin Films (3) II 1984-85 Dielectric interference films; semiconductor and metallic films; planar wave guide films; design methods for multilayer interference filter coatings; thin film components for integrated optical circuits. P, 505.

567. Colloquium a. Current Subjects in Optical Sciences (1) II


568. Advanced Radiological Imaging (3) II 1984-85 Applications of linear system theory and the theory of stochastic processes to imaging systems using x-rays and gamma rays. P, 538.

569. Laser Spectroscopy (3) I 1983-84 Interaction of light with atoms and molecules; the Lamb dip; two-photon spectroscopy; polarization spectroscopy; double resonance; photon echoes; coherent transient effects; density matrix; molecular spectroscopy; laser sources. P, 543 or Phys. 570b.

570. Quantum Optics (3) II 1984-85 Quantum theory of electromagnetic radiation; spontaneous emission; Dicke superradiance; optical coherence and noise; quantum theory of the laser; superconductivity and Josephson radiation. P, 543. (Identical with Phys. 643)

656a-656b. Atmospheric Optics and Radiation (3-3) 1984-85 (Identical with Atmo. 656a-656b)

660. Microcomputer Interfacing in the Optics Laboratory (3) I Design and construction of interfaces between microcomputer systems and a variety of devices in the optics laboratory, including switches, motors, optical sensors, displays and terminals. Hardware and assembly language software drivers. 1R, 6L. P, C.Sc. 122 or E.C.E. 171.

566. Seminar a. Advanced Optical Design (1 to 3) II P, 517.

ORIENTAL STUDIES

Professors Robert M. Gimello, Head, Ludwig W. Adamec, Don C. Bailey, Anoop C. Chandola, William G. Dever, Adel S. Gamal, Onnie M. Hartsell (Music), James M. Mahar, Earl H. Pritchard (Emeritus), Hamdi A. Qafisheh, Robert M. Quinn (Art), William R. Schultz, Jing-shen Tao, Allen S. Whiting (Political Science), David J. Woloshin (German)

Associate Professors Gail L. Bernstein, Michael E. Bonine, Constance Cronin (Anthropology), Richard M. Eaton, Leslie A. Flemming, Charles H. Hedtke, Chisato Kitagawa, Ronald C. Miao, Michael Schaller (History), Stephen H. West, William J. Wilson, Norman Yoffee (Anthropology)

Assistant Professors Marie Chan, John Y. Hou, Peter Machinist, William R. Royce, Naomi B. Sokoloff, Daniel Swetschinski

Lecturer Edward D. Putzar

The Department of Oriental Studies offers instruction in the languages, cultures and civilizations of Asia and North Africa. Programs of study may emphasize the language and literature, history, thought, or society, ancient or modern, of one or more cultural areas.
The department offers the Bachelor of Arts, Master of Arts and Doctor of Philosophy degrees with a major in Oriental studies. The Master of Education with a teaching major in Oriental studies is also available. Undergraduate majors may specialize in China, Japan, India-Pakistan, the Middle East, Judaic studies, or general Oriental studies. For courses concerning Ancient Near East Studies, see sections on Judaic Studies and the Middle East below.

The major: A minimum of 35 units from one of the following areas of specialization (listed with their additional specific requirements): (1) China: 100a-100b, 375a-375b, 400a-400b. (2) Japan: 102a-102b, 402a-402b. (3) India-Pakistan: 101a-101b and 408a-408b, or 105a-105b and 405a-405b. (4) Middle East: 477a-477b, 478, and two yrs. or equivalent of Arabic, Persian, Hebrew, Akkadian, or other language approved by the adviser. (5) Judaic Studies: 103a-103b, 403a-403b or 409a-409b, two courses selected from 370a-370b and 372a-372b. (6) General Oriental Studies: program of study to be planned with and approved by general Oriental studies adviser.

The supporting minor may be chosen, with the consent of the adviser, from outside the department or from another area of specialization within the department (except for the student with a specialization in general Oriental studies, who must seek a minor outside the department).

The teaching minor: 171, 172 and/or 170a-170b, and twelve additional units selected in consultation with departmental advisers (see the social studies teaching major in the College of Education section of this catalog).

For information regarding the East Asia Study Center and the Near Eastern Center, see the College of Arts and Sciences section of this catalog.

Honors: The department participates in the Honors Program.

Western Regional Collegiate Program (WRCP): The University of Arizona cooperates in the Western Regional Collegiate Program (WRCP) of the Western Interstate Commission for Higher Education by extending special consideration to qualified undergraduate and graduate students who are residents of the 13 Western states and who desire to enroll in Oriental studies. Such students may be given preference in admission to the University of Arizona and exemption from payment of out-of-state tuition. Prospective students are invited to write to the Registrar, University of Arizona, Tucson, for further details.

The courses listed below are grouped by areas of specialization within the Oriental studies major.

### General Oriental Studies

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>130.</td>
<td>Asian Religions</td>
<td>(3) I II Religions of India and the Far East. (Identical with Reli. 130)</td>
</tr>
<tr>
<td>140a-140b.</td>
<td>Oriental Humanities</td>
<td>(3-3) Major trends and traditions in the arts, literatures and languages, religions and philosophies of Asia. 140a: The Middle East, India and Pakistan. 140b: China and Japan. (Identical with Reli. 140a-140b)</td>
</tr>
<tr>
<td>170a-170b.</td>
<td>Introduction to Asian Civilizations</td>
<td>(3-3) Survey of the traditional and contemporary social, political, and thought patterns of China, Japan, and India. 170a: The Traditional Period. 170b: The Modern Period. (Identical with Anth. 170a-170b and Hist. 170a-170b)</td>
</tr>
<tr>
<td>333.</td>
<td>Buddhist Meditation Traditions</td>
<td>(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)</td>
</tr>
<tr>
<td>421a-421b.</td>
<td>East Asian Buddhism</td>
<td>(3-3) GC Buddhism in China, Korea and Japan with emphasis on the relationship between East Asian Buddhist thought and practice and the various historical contexts in which they emerged. P, 330a or consult dept. before enrolling. (Identical with Reli. 421a-421b)</td>
</tr>
<tr>
<td>432.</td>
<td>Islamic Mysticism</td>
<td>(3) GC II Origin and development of Sufism and its impact on the Muslim and non-Muslim worlds. (Identical with Reli. 432)</td>
</tr>
<tr>
<td>451.</td>
<td>The United States and East Asia: 1840 to the Present</td>
<td>(3) GC II 1984-85 (Identical with Hist. 451a-451b)</td>
</tr>
<tr>
<td>463.</td>
<td>Marxism in East Asia</td>
<td>(3) GC I Evolution of Marxist thought in China and Japan. (Identical with Hist. 463)</td>
</tr>
</tbody>
</table>
374 DEPARTMENTS AND COURSES OF INSTRUCTION

464. International Relations of East Asia (3) GC II (Identical with Pol. 464)

468. Asia and the West (3) GC I 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 Hist. 468)

489. Women in East Asia (3) GC I Women in traditional China and Japan; analysis of changes occurring in the modern period. (Identical with Hist. 489 and W.S. 489)

596. Seminar c. East Asian Societies (3) [Rpt.] I II

China

100a-100b. Elementary Chinese (5-5) CDT Introduction to modern spoken and written Chinese (Mandarin).


331. Taoist Traditions of China (3) I 1983-84 Intellectual foundations of Taoism in its two scriptural sources, the Lao Tzu and the Chuang Tzu, and a sampling of some of the varieties of religious practice which developed upon these foundations. (Identical with Reli. 331)


375a-375b. History of China (3-3) Historical development of China. 375a: To 750 A.D. 375b: 750 to 1900 A.D. (Identical with Hist. 375a-375b)

400a-400b. Intermediate Modern Chinese (5-5) GC CDT Grammar, reading, and conversation in the modern (Mandarin) language. P, 100b.


418. Classical Confucianism (3) GC I Formative, classical period in the history of the Confucian tradition, up to 200 A.D.; emphasis on the thought of Confucius, Mencius, and Hsun Tsu. P, 330a or consult dept. before enrolling. (Identical with Reli. 418)

419. Neo-Confucianism (3) GC II Major figures and themes in the Revival Confucianism from the 11th century through recent times; emphasis on the thought of Chu Hsi and Wang Yang-ming. P, 330b or consult dept. before enrolling. (Identical with Reli. 419)

420a-420b. Linguistic Structure of Modern Chinese (3-3) GC Linguistic study of the phonological, morphological, and syntactic systems of modern Chinese, with particular attention to linguistic analysis. (Identical with Ling. 420a-420b)

440. Chinese Calligraphy (2) GC [Rpt.] I 1983-84 Theory, practice, and aesthetics of Chinese brush writing, with emphasis on individual training and development.

443. Chinese Aesthetics (2) GC II Survey of traditional Chinese aesthetic concepts in language, literature, painting, calligraphy, and design.

460. Modern Chinese Foreign Relations (3) GC II Survey of the developments and trends in Chinese foreign relations in the modern period, focusing mainly on the relationship between the theoretical and actual objectives of China’s foreign policies from 1949 to the present. (Identical with Pol. 460)

461a-461b. Chinese Politics, 1911-Present (3-3) GC Analysis of the political, economic, and social structure in China, with particular emphasis on the role the Communist party plays in society. 461a: 1911-1949. 461b: 1949-present. (Identical with Pol. 461a-461b)

465. Traditional Chinese Political Institutions (3) GC I Survey of traditional political institutions and culture of China, with emphasis on the Ch’ing period.

475a-475b-475c-475d-475e. Periods in Chinese History (3-3-3-3-3) GC In-depth treatment of major pre-modern 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. May be taken in any order and CR. (Identical with Hist. 475a-475b-475c-475d-475e)

476. Modern Chinese History (3) GC Historical survey of the period since 1911 which examines the revolutionary developments shaping contemporary China. (Identical with Hist. 476)

482. Social History of China (3) GC Formation of ancient Chinese society; organization of families and clans; social stratification, mobility, conflict, and control in traditional China; and transformation from traditional to modern society. (Identical with Hist. 482)
495. Colloquium
   a. Revolution in Chinese History (3) GC II (Identical with Hist. 495a)


510a-510b. Chinese Historical Linguistics (3-3) II 1984-85 Historical survey of the development of the Chinese language, with particular attention to linguistic changes in phonology, morphology, and syntax. P, 400b and a course in general ling.

520. Resources and Methods in Sinology (3) II 1983-84 Introduction to and exercises in the use of standard Sinological reference and research resources. P, 500b.


553. Readings in Classical Chinese Prose (3) [Rpt. /2] I 1983-84 Readings in selected texts from literary, philosophical, and historical traditions; includes selections from the Five Classics and the great prose masters of the Han-Quing. Variable content. P, 500b.


595. Colloquium
   a. China (3) [Rpt. ] I II

596. Seminar
   f. Classical Chinese Literature (3) [Rpt. ] II
   g. Modern Chinese Literature (3) [Rpt. ] II
   h. Premodern Chinese History and Politics (3) [Rpt. ] II
   i. Modern Chinese History and Politics (3) [Rpt. ] II

India-Pakistan

101a-101b. Elementary Hindi-Urdu (5-5) CDT Conversation, reading, and composition in the major national language of northern India and Pakistan.

408a-408b. Intermediate Hindi-Urdu (4-4) GC CDT Advanced grammar, reading, and conversation in the major national language of northern India and Pakistan, with separate sections for written Urdu and written Hindi. P, 101b.

417a-417b. Sanskrit Grammar and Texts (3-3) GC 1984-85 CDT Study of the classical language of India, with emphasis on reading and translation, including selections from the Gita, Vedas, Mahabharata, Hitopadesha, Kathasaritsagara, and Laws of Manu. (Identical with Cias. 417a-417b and Ling. 417a-417b)

431. Indian Religion and Thought (3) GC I II Traditional religious and philosophical thought of India. (Identical with Reli. 431)

444a-444b. Literature of India (3-3) GC 444a: Ancient and classical literature; philosophical, epic, dramatic, and poetic literature until 1200 A.D. 444b: Modern literature; lyric poetry, short stories and novels by contemporary writers. In Engl. 444a is not prerequisite to 444b.

445. Hindu Mysticism (3) GC II 1984-85 Introduction to the major concepts and practices of Hindu mysticism, including yoga techniques, rites, symbols, and myths. (Identical with Reli. 445)

471. Introduction to Indic Civilization (3) GC I Social and political institutions, arts and philosophy of traditional society from prehistoric times to c. 1000 A.D., with emphasis on Hindu religion and its interrelations with the social order. (Identical with Anth. 471 and Hist. 471)

472. History of Medieval India (3) GC I Survey of Indian history from the 7th century to 1750. (Identical with Hist. 472)

473. History of Modern India and Pakistan: 1750-Present (3) GC II Survey of political, social and economic developments in South Asia from the mid-18th century to the present. (Identical with Hist. 473)

485. Social Organization of India and Pakistan (3) GC I Survey of family, kin, and caste in the peasant societies of India and Pakistan. (Identical with Anth. 485)
376 DEPARTMENTS AND COURSES OF INSTRUCTION

486. Political Systems of India and Pakistan (3) GC II Survey of postindependence political developments in Pakistan and India. (Identical with Pol. 486)

501. Advanced Hindi-Urdu (3) [Rpt.] Advanced conversation, writing and reading of modern prose, with separate sections for written Hindi and written Urdu.

595. Colloquium
   c. South Asia (3) [Rpt.] I II

596. Seminar
   u. Case and Paninian Grammar (3) [Rpt.] I II (Identical with Ling. 596u)

Japan

Prior to registering in any Japanese language course other than 102a, the student must demonstrate the minimum knowledge of Japanese recommended by the instructor.

102a-102b. Elementary Japanese (3 to 5-5) CDT Conversation and readings in modern Japanese. 102a: [Rpt. /6 units].

402a-402b. Intermediate Japanese (5-5) GC CDT Grammar, reading, and conversation in the modern language.

411a-411b. Modern Japanese Grammar (3-3) GC Introduction to Japanese linguistics: morphology, syntax, semantics, and pragmatics. (Identical with Ling. 411a-411b)

412a-412b. Advanced Japanese (5-5) GC CDT Reading from modern scholarship, fiction, and essays, with attention to grammatical analysis.

437. Japanese Religion (3) GC I Japanese Buddhism, Shinto, new religions, with emphasis on the period since 1600. Reading is in English; basic knowledge of Japanese history required. (Identical with Reli. 437)


474a-474b-474c. History of Japan (3-3-3) GC Social, cultural and political history of Japan. 474a: From earliest times to 1500. 474b: 1500-1800. 474c: 1800-present. (Identical with Hist. 474a-474b-474c)

495. Colloquium
   b. Japan (3) GC [Rpt. /2] I II

502. Literary Japanese (3) Introduction to the varieties of writing styles used from the 8th century to modern times, including Sino-Japanese, documentary, epistolary and purely literary styles.

595. Colloquium
   b. Japan (3) [Rpt.] I II

596. Seminar
   r. Japanese History (3) [Rpt.] I II
   s. Japanese Literature (3) [Rpt.] I II

Judaic Studies

103a-103b. Elementary Modern Hebrew (5-5) CDT Intensive introduction to basic oral skills, reading and writing in class and language lab.; leads to an understanding of Biblical and modern Hebrew.

332a-332b. Judaic Thought and Culture (3-3) Survey of intellectual currents in post-Talmudic Jewish history. 332a: Medieval Jewish philosophy, mysticism, and popular culture. 332b: Modern Jewish thought. (Identical with Reli. 332a-332b)

345. Yiddish Literature in Translation (3) I (Identical with Ger. 345)


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 and Reli. 372a-372b)

374. The Holocaust (3) II 1984-85 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 Hist. 374 and Reli. 374)
Archaeology and the Bible (3) II Discussion of areas of common interest to Biblical studies and archaeology, with a survey of the major discoveries which illuminate the Old and New Testaments. (Identical with Reli. 382)

Ancient Mesopotamia (3) GC I 1984-85 (Identical with Anth. 401)

Intermediate Modern Hebrew (5-5) GC CDT Intermediate grammar, reading, conversation, and extensive presentation of the syntax and vocabulary of modern Hebrew, leading to a firm foundation in the language. P, 103b.

Biblical Hebrew (3 to 4-3 to 4) GC 1983-84 CDT Study of Biblical Hebrew grammar and literature. 409a: Prose texts. 409b: Poetry.

Religion and Mythology of Mesopotamia (3) GC II 1984-85 (Identical with Anth. 427)

Anthropology of Law (3) GC II 1984-85 (Identical with Anth. 428)

Prophecy in Ancient Israel (3) GC II Nature and origins of Biblical prophecy and its ancient Near-Eastern analogues, including intensive study of several major Biblical prophets. (Identical with Reli. 430)

Judaic Philosophy (3) GC II 1983-84 Outline of the thinking of Philo, Saadia, Gevirol, Halevi, and Maimonides. (Identical with Reli. 435)

Modern Jewish Political Thought (3) GC I 1983-84 Analysis of the various forms of modern Jewish nationalism (e.g., Zionism, Bundism, Diaspora nationalism), their intellectual roots and socioeconomic settings.

Advanced Hebrew (3) GC [Rpt.] Advanced topics in Biblical, Rabbinic, and/or modern Hebrew language and literature. P, 403b or 409b.


Elementary Arabic (5-5) CDT Conversation and readings in modern standard Arabic.

Elementary Persian (5-5) CDT Conversation, and composition in modern Persian.

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)

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)


Intermediate Persian (4-4) GC CDT Conversation in the dialect of contemporary Iran; extensive readings in classical and modern literature. P, 105b.

Advanced Arabic (3-3) GC Continuation of 404b, with emphasis on oral and written comprehension and expression. P, 404b. 414a is not prerequisite to 414b.

Advanced Persian (4-4) GC CDT Readings in Persian, with the objective of preparing the student for independent research. 415a: Contemporary prose. 415b: Poetry and prose. P, two yrs. of Persian. 415a is not prerequisite to 415b.

Readings in Arabic Prose (3-3) [Rpt./1] GC 416a: Modern Arabic prose. 416b: Classical Arabic prose. P, two years of Arabic.

Conversational Levantine Arabic (3-3) GC 1983-84 Extensive oral drill, with emphasis on the acquisition of facility in normal conversation and comprehension. P, 104a.

Conversational Gulf Arabic (3-3) GC 1984-85 Extensive oral drill, with emphasis on the acquisition of facility in normal conversation and comprehension. P, 104a.

Introduction to Arabic Linguistics (3) GC II History and structure of the Arabic language in its various forms. P, 104b, Ling. 101. (Identical with Ling. 426)

Islamic Thought (3) GC II Traditional ideological systems of Islamic countries and their evolutionary transformations. (Identical with Reli. 434)

Arabic Literature in English (3) GC II 1983-84 Historical survey of Arabic literature of the Middle East and Mediterranean world, with readings in English translations.

Persian Literature in English (3) GC II 1984-85 Historical survey of Persian literary traditions, with readings in English translations.
457. Prehistoric Mesopotamia (3) GC I 1983-84 (Identical with Anth. 457)

458. Government and Politics of the Middle East (3) GC II (Identical with Pol. 458)

459. Topics in Economic Geography of the Middle East (3) GC II (Identical with Geog. 459)

469. Geography of the Middle East (3) GC I Physical environments and cultural areas of Southwest Asia, with emphasis on man-environment interrelationships, settlement systems and impact of Islam. (Identical with Geog. 469)

477a-477b. History of the Middle East (3-3) GC 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)

478. Modern History of the Middle East (3) GC I Near and Middle Eastern history since the late 18th century, with special emphasis on Egypt and areas to the east. (Identical with Hist. 478)

479. The Ottoman Empire to 1800 (3) GC II 1984-85 Great age of the Ottoman state, its origins and decline. (Identical with Hist. 479)

480a-480b. History of Iran and Central Asia (3-3) GC 480a: History of Iran from 226 A.D. to 1722. 480b: 18th, 19th and 20th century Iran. (Identical with Hist. 480a-480b)

481a-481b. Archaeology of Syria-Palestine in the Bronze and Iron Ages (3-3) GC Survey of the Bronze and Iron Age cultures of Syria-Palestine, ca. 3500-500 B.C., with emphasis on the use of archaeological materials in historical reconstruction. (Identical with Anth. 481a-481b)

484a-484b. Akkadian Linguistics (3-3) GC 1983-84 (Identical with Anth. 484a-484b)

584a-584b. Readings in Akkadian (3-3) 1983-84 (Identical with Anth. 584a-584b)

595. Colloquium
d. Middle East (3) [Rpt.] I II

596. Seminar
m. Middle East Historiography (3) [Rpt.] I II
p. Middle Eastern Urbanism (3) [Rpt.] I II
q. Near Eastern Archaeology (3) [Rpt.] I II (Identical with Anth. 596q)

PERSIAN
(See Oriental Studies)

PERSONNEL MANAGEMENT
(See Management)

PHARMACEUTICAL SCIENCES

Associate Professors James Blanchard, Michael B. Mayersohn
Assistant Professors Joseph J. Hoffmann (Arid Lands Resource Sciences), Karl H. Schram

The Department of Pharmaceutical Sciences includes the academic disciplines of pharmaceutical chemistry, pharmaceutics, and pharmacognosy. Courses pertinent to the Bachelor of Science in Pharmacy are offered. Please consult the College of Pharmacy section of this catalog for undergraduate admission and degree requirements.

The Master of Science and Doctor of Philosophy degrees with a major in pharmacy, and the Doctor of Philosophy degree with a major in pharmaceutical chemistry, are available. For admission and degree requirements, please see the Graduate Catalog.

A student must be enrolled in the College of Pharmacy before taking any pharmaceutical science course required in the professional curriculum, except as approved by the department. A breakage deposit of $10 is required for each lab. course.

Honors: The department participates in the Honors Program.
302a-302b. Pharmaceutics (4-4) Application of physical-chemical principles to pharmaceutical dosage forms, including a discussion of the biopharmaceutical considerations which influence the efficacy of pharmaceutical formulations. 3R, 3L. 302a: P, Phys. 102b, 180b, Chem. 103b, 104b. 302b: P, Ph.Pr. 300.


424. Antibiotics (2) GC I II Principles of antibiotic chemotherapy and the properties of the natural antibiotics employed in therapeutics and growth control. P, Micr. 110.

427. Antineoplastic Drugs (2) GC II Discovery and development of natural and synthetic antineoplastic drugs; preclinical screening and toxicity evaluation; phase I, II, and III clinical studies in humans. P, 437b or CR.

430a-430b. Medical Radiopharmaceuticals (3-3) GC Medical applications, safe handling, measurement and preparation of radiopharmaceuticals. 2R, 3L. P, Math. 123, 263, Phys. 102b, 180b, Chem. 103b, 104b.

437a-437b. Medicinal Chemistry and Pharmacognosy (4-4) GC 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, 302b, Chem. 241b, 243b.

438. Pharmaceutical Analysis (2) GC I Modern methods and instrumentation used for qualitative and quantitative determination of drugs and metabolites. P, Chem. 323.

439. Pharmaceutical Analysis Laboratory (1) GC I Instrumental methods for identification and quantitation of drugs and their metabolites from biological samples using GC, HPLC and other modern instruments. 3L. P, 438 or CR.

475. Pharmacotherapeutics (11) GC I (Identical with Ph.Pr. 475)


575. Advanced Pharmacotherapeutics (6) II (Identical with Ph.Pr. 575)

596. Seminar
   a. Pharmaceutical Sciences (1) [Rpt./5] I II
   b. Pharmaceutical Chemistry Research (1) [Rpt./5] I II
   c. Pharmaceutics Research (1 to 2) [Rpt./5] I II Open to majors only.

602. Physical-Chemical Properties Influencing Drug Action (4) II Study of physical-chemical properties that influence the design of drug molecules, the formulation of these molecules into suitable delivery systems, and their release into the biological system. P, 302b.


630a-630b. Advanced Organic Medicinals (3-3) 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) Origin and isolation of steroidal and alkaloidal drugs and other natural products of interest. P, 437b, Pcol. 471b.

634. Biomedical Applications of Mass Spectrometry (3) II 1983-84 Principles of mass spectrometry including instrumental design, interpretation of spectra, and applications to biomedical and related problems. P, Chem. 241b

875. Advanced Pharmacotherapeutics (Pharmacy) (6) (Identical with Ph.Pr. 875)

PHARMACOLOGY

Committee on Pharmacology and Toxicology (Graduate)

Professors I. Glenn Sipes Chairperson, Klaus Brendel, Thomas F. Burks, Lincoln Chin, Diane H. Russell

Associate Professors Dean E. Carter, Hugh E. Laird, II

Assistant Professor Sue Piper Duckles
The Department of Pharmacology in the College of Medicine and the Department of Pharmacology and Toxicology in the College of Pharmacy cooperate, through the Committee on Pharmacology and Toxicology, in offering programs leading to the Master of Science degree with a major in pharmacology and the Doctor of Philosophy degree with a major in pharmacology and toxicology.

For course descriptions, please see entries in this catalog for Pharmacology (Department, College of Medicine) and Pharmacology and Toxicology (College of Pharmacy). For information on graduate programs and admission requirements, please see the Graduate Catalog.

**PHARMACOLOGY**

*(Department, College of Medicine)*

Professors Thomas F. Burks, Head, David S. Alberts (Internal Medicine), H. Vasken Aposhian (Cellular and Developmental Biology), Klaus Brendel, Rubin Bressler (Internal Medicine), Bernard B. Brodie *(Adjunct)*, Burnell R. Brown (Anesthesiology), Ryan J. Huxtable, David G. Johnson (Internal Medicine), Eugene Morkin (Internal Medicine), Diane H. Russell, I. Glenn Sipes (Pharmacology and Toxicology), Henry I. Yamamura

Associate Professors Dean E. Carter (Pharmacology and Toxicology), Andre Dray, Thomas J. Lindell, John D. Palmer, William R. Roeske (Internal Medicine), Stuart R. Snider (Neurology)

Assistant Professors Kenneth A. Conrad (Internal Medicine), Thomas P. Davis, Sue Piper Duckles, John J. Duffy *(Adjunct)*, Raymond C. Duhamel *(Adjunct)*, Timothy C. Fagan (Internal Medicine), David L. Kreulen, Ronald J. Lukas *(Adjunct)*, Paul R. Marques *(Adjunct)*, Thomas L. Smith *(Adjunct)*

Instructors Alan D. Barreuther (Pharmacy), William L. Fritz (Pharmacy)

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. In the health professions, pharmacologic knowledge is applied to the diagnosis, prevention, cure or relief of symptoms of disease, and to the promotion of optimal health.

In conjunction with the Department of Pharmacology and Toxicology in the College of Pharmacy, the department offers a joint program of instruction leading to the Master of Science degree with a major in pharmacology and the Doctor of Philosophy degree with a major in pharmacology and toxicology. Students work under the administration of the Committee on Pharmacology and Toxicology (Graduate).

501. The Pharmacological Basis of Therapeutics (6) II Actions of chemical agents upon living material at all levels of organization, with emphasis on mechanisms of action of prototype drugs; foundation for a rational approach to human therapeutics and toxicology. P, Psio. 601, Bioc. 501. (Identical with Tox. 501)

520. Clinical Pharmacology (2) I Effects of drugs on natural history of disease; drug-drug interactions; drug testing designs; drug abuse; drug literature evaluation; aspects of clinical toxicology. P, 501.


561a-561b. Introduction to Pharmacological and Toxicological Literature (1-1) Designed to broaden the background of students in pharmacology and toxicology, and to improve scientific communication skills. P, 501. (Identical with Pcol. 561a-561b)

576. Environmental Toxicology (3) I (Identical with Tox. 576)

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. P, CR 501, Bio. 565, Psio. 601.

596. Seminar
a. Advanced Graduate Research (1 to 3) [Rpt./3] I II P, 561b. (Identical with Pcol. 596a)

601. Analytical Toxicology (2 to 3) I (Identical with Tox. 601)

602. Biotoxicology (2 to 3) II (Identical with Tox. 602)

653. Neuropharmacology (2) II 1984-85 (Identical with Pcol. 653)

654. Psychopharmacology (3) 1983-84 (Identical with Pcol. 654)

695. Colloquium
a. Cellular/Molecular Pharmacology (1 to 3) [Rpt./4 units] I II P, Bio. 462a-462b; Cell. 568a-568b and/or Phcl. 551.

800. Research (1 to 6) Yr.

801. The Pharmacological Basis of Therapeutics (6) II

815. Subspecialty

PHARMACOLOGY AND TOXICOLOGY

Professors I. Glenn Sipes, Head, Lincoln Chin, J. Wesley Clayton, Paul F. Consroe, Quintus Fernando (Adjunct), Albert L. Picchioni, Findlay E. Russell
Associate Professors Dean E. Carter, Hugh E. Laird, II
Assistant Professors A. Jay Gandolfi (Adjunct), David L. Nelson

Pharmacology is the science concerned with all aspects of the action of drugs on living systems. Its primary aim is the development and evaluation of drugs for the treatment of human disease. 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. In conjunction with the Department of Pharmacology in the College of Medicine, the department offers a joint program of instruction leading to the Master of Science degree with a major in toxicology and the Doctor of Philosophy degree with a major in pharmacology and toxicology. For admission and degree requirements, please see the Graduate Catalog.

Toxicology is the science concerned with the harmful effects of chemicals (including drugs) on living systems. The toxicology program offers a curriculum leading to the Master of Science degree with a major in toxicology. The program prepares students for careers in hospital laboratories, police crime laboratories, medical examiners' offices, industrial hygiene laboratories, and toxicology laboratories in industry, government, and universities. For admission and degree requirements, please see the Graduate Catalog.

Honors: The department participates in the Honors Program.

Pharmacology

372a-372b. Applied Pharmacology (2-2) Pharmacology, toxicology and dosage forms of commonly used drugs, with emphasis on clinical applications. Not available for elective credit in the College of Pharmacy. P, G.Bio. 159b. Both 372a and 372b are offered each semester.

401. Human Gross Anatomy (3) II (Identical with Anat. 401)
471a-471b. Fundamentals of Pharmacology (5-5) GC Comprehensive study of the biochemical, physiological, and therapeutic effects of drugs, including mechanisms of drug action and drug toxicity, and drug literature evaluation. 4R, 3L. P, Psio. 480, 481; Anat. 401; CR Ph.Sc. 437a-437b. (Identical with Tox. 471a-471b)

474. Clinical Toxicology (2) GC II Prevention, characteristics, diagnosis and rational management of diseases caused by drug overdose, toxic household products, poisonous plants, venomous animals, environmental and industrial toxins. P, 372b or 471b, Ph.Pr. 475, Ph.Sc. 407. (Identical with Tox. 474)

475. Pharmacotherapeutics (11) GC I (Identical with Ph.Pr. 475)

561a-561b. Introduction to Pharmacological and Toxicological Literature (1-1) (Identical with Phcl. 561a-561b)

575. Advanced Pharmacotherapeutics (6) II (Identical with Ph.Pr. 575)

596. Seminar
   a. Advanced Graduate Research (1 to 3) [Rpt.] I II (Identical with Phcl. 596a, which is home)

653. Neuropharmacology (2) II 1984-85 Role of various neurochemicals in the autonomic and central nervous systems and the effect of drugs on the nervous system, including their influence on synthesis, storage, and release of neurochemicals. P, Phcl. 501 or Pcol. 471b, 561a, 596. (Identical with Phcl. 653 and Tox. 653)


695. Colloquium
   a. Research Conference (1 to 4) [Rpt.] I I

875. Advanced Pharmacotherapeutics (Pharmacy) (6) (Identical with Ph.Pr. 875)

Toxicology

423R. General Pathology (3) GC II (Identical with V.Sc. 423R)

423L. General Pathology Laboratory (1) GC II (Identical with V.Sc. 423L)


454. Industrial Toxicology (2) GC II Principles of toxicology related to industry; dose response, mechanisms of toxicity; Toxic Substances Control Act, federal and state regulations; combustion toxicology. P, six units each of bio. sci. and organic chem. (Identical with O.S.H. 454)

462a-462b. Biochemistry (3-3) GC (Identical with Bioc. 462a-462b)

464aR-464bR. Human Physiology (3-3) GC (Identical with G.Bio. 464aR-464bR)

464aL-464bL. Human Physiology Laboratory (1-1) GC (Identical with G.Bio. 464aL-464bL)

465. Statistics for the Medical Sciences (4) GC I (Identical with Stat. 465)

471a-471b. Fundamentals of Pharmacology (5-5) GC (Identical with Pcol. 471a-471b)

474. Clinical Toxicology (2) GC II (Identical with Pcol. 474)

480. Human Physiology (4) GC I (Identical with PSIO/480)

481. Physiology Laboratory (1) GC I (Identical with Psio. 481)

501. The Pharmacological Basis of Therapeutics (6) II (Identical with Phcl. 501)

508. Insect Toxicology (3) II 1983-84 (Identical with Ento. 508)

550. Drug Disposition and Metabolism (3) I (Identical with Phcl. 550)

551. Molecular Biology of Pharmacological Agents (3) I 1983-84 (Identical with Phcl. 551)

576. Environmental Toxicology (3) I Toxicity of natural toxins and of agricultural and industrial chemicals, with emphasis on air and water pollutants; decision-making in environmental issues. P, 6 units of bio and of organic chem.; Chem. 325, 326. (Identical with Ento. 576 and Phcl. 576)

596. Seminar
   a. Advanced Toxicology (1 to 2) [Rpt.] I
   b. Courtroom Evidence (1 to 2) [Rpt.] II
601. **Analytical Toxicology** (2 to 3) I Lecture and lab. in the qualitative and quantitative determination of toxic substances in body fluids. Modern instrumental techniques will be employed whenever appropriate. Lecture may be taken separately by non-majors. 2R, 4L. P. Chem. 400a. (Identical with Phcl. 601)

602. **Biotoxicology** (2 to 3) II Lecture and lab. emphasizes the mechanisms of organ directed toxicities in animals. Included are chemical carcinogenesis, teratogenesis and mutagenesis. Lecture may be taken separately by non-majors. 2R, 4L. P, two semesters of gen. bio. (Identical with Phcl. 602)

610. **Topics in Advanced Toxicology** (3) I II Current developments in toxicology including: chemical carcinogenesis, mutagenesis and teratogenesis; behavioral toxicology; inhalation toxicology; toxicokinetics; metabolism and environmental toxicology. P, 471b, 474.

653. **Neuropharmacology** (2) II 1984-85 (Identical with Pcol. 653)

**PHARMACY PRACTICE**

Professor Theodore G. Tong
Associate Professors James L. Guidry (Adjunct), G. Richard Hall (Adjunct), William F. McGhan, Thomas M. Samuels (Adjunct), Gary H. Smith, Carl E. Trinca (Adjunct)
Lecturers Jack R. Arndt, James R. Morse
Instructors Victor A. Elsberry, Maxine I. Hammel (Adjunct), James R. Martin (Adjunct), J. C. Poe (Adjunct), Morton D. Reich (Adjunct), Richard P. Stitt (Adjunct)

The Department of Pharmacy Practice offers courses leading to the degrees of Bachelor of Science in Pharmacy and Master of Science with a major in pharmacy with concentrations available in the areas of hospital pharmacy and pharmacy administration. Graduate study in pharmacy administration leading to a Doctor of Philosophy degree with a major in pharmacy is also available. For information regarding undergraduate admission and degree requirements, please consult the *College of Pharmacy* section of this catalog; for graduate admission and degree requirements, please see the *Graduate Catalog*.

A student must be enrolled in the College of Pharmacy before taking any pharmacy practice course at the 300 level or above, except as approved by the department. A breakage deposit of $10 is required for Ph.Pr. 410.

*Honors*: The department participates in the honors program.

300. **Pharmaceutical Calculations** (2) I Pharmaceutical calculations pertinent to the selection, formulation, preparation, dosage and administration of drugs and their dosage forms.

303. **Clinical Clerkship** Must be completed in sequence.
   a. Principles of Patient Care (1) I Field trips.
   b. Long-Term Care (1) II Field trips.
   c. Ambulatory Care (1) I Field trips.
   d. Non-Prescription Drugs (1) II Field trips.
   e. Introductory Practice (1) I Field trips.

315. **History of Pharmacy** (2) I Background and comparative study of the history of the profession of pharmacy from the dawn of history to the present.

343. **Pharmacy Laws** (2) II Legal concepts covering professionalism, negligence, liability, legal processes and semantics; pertinent federal, state and local statutes and regulations.

353. **Introduction to Pharmacy Practice** (1) I Pharmacy history, internship, laws, ethics, professionalism, organizations, clinical pharmacy and career opportunities. Year-long course.

355. **Controversies in Therapeutics** (1) I Controversial issues in health care, medicine, pharmacy and drug therapy with regard to economic, political, cultural, psychosocial, and ethical considerations. P, 354, CR 475.

396. **Proseminar**
a. Clinical (1) II P, CR 494a, 494b.

403. **Clinical Clerkship**
a. Institutional Clerkship (4) II S P, 475.
b. Ambulatory Clerkship (4) II S P, 475.
c. Externship (4) II S P, 410, 475.

*Note: 403a-c are six week courses.*

410. **Pharmacy Practice** (2) I Application of pharmaceutical principles, pharmacy systems and information skills to problems in the dispensing of medicines and devices. P, 412, Ph.Sc. 407, and Phcol. 471b.

412. **Nonprescription Drugs** (2) II Presentation on nonprescription drugs, remedies sold over-the-counter (O.T.C.), designed to guide the pharmacist in providing better professional advice to the self-medicating public. P, 303c, Ph.Sc. 302b.

419. **Parenteral Preparations** (2) GC Principles and procedures in the preparation, stability, and administration of parenteral products. 1R, 3L. P, Ph.Sc. 302b or CR.

440. **Pharmacy in the Health Care System** (3) GC II Consumers, providers, financiers, and regulators of health care in the U.S. and exploration of pharmacy's roles in relation to these components.

442. **Professional Practice Management** (3) I Management of professional situations and the interaction among patients, colleagues, and other health-care providers, with application to institutional, community, and clinical pharmacy practice. P, 445.

445. **Nonpharmacological Issues of Medicines** (3) GC I An overview of the drug-use process, including an examination of social, behavioral, and economic factors associated with the prescribing, dispensing, and use of drugs. P, 440.

447. **Perspectives in Geriatrics Laboratory** (1) GC II Open to nonmajors. P, CR 448. (Identical with N.F.S. 447)

448. **Perspectives in Geriatrics** (2) GC II Multidisciplinary approach to the health-care needs of the elderly, including medication use and nutrition, through didactic training, a team project, and clerkship experiences. Open to nonmajors. P, CR 447 for nonmajors. (Identical with N.F.S. 448)

451. **Hospital Pharmacy** (2) II Basic considerations of hospital pharmacy practice, extended care facilities and interrelationships involving overall patient care services rendered by hospitals.

455. **Introduction to Clinical Pharmacy** (4) GC I Clinical evaluation of drug utilization related to specific diagnosis and desired therapeutic response; consultation with physicians, nurses and patients; solving specialized drug problems. P, 394, Ph.Sc. 409, Pcol. 470b, 471b, CR 475.


494. **Practicum**
a. Clerkship (1 to 15) II P, 455.
b. Externship (1 to 15) II P, 455.

c. Adult Pharmacy Practice (4) II S P, grad. students consult dept. before enrolling.
d. Ambulatory Pharmacy Practice (4) I II S P, grad. students consult dept. before enrolling.
e. Drug/Poison Information (4) II II S P, grad. students consult dept. before enrolling.

*Note: 503a-d are six week courses.*

511. **Hospital Pharmacy Administration** (3) I History, organization and administration of pharmaceutical services within the institutional environment.

512. **Applied Hospital Pharmacy Management** (3) II Application of management principles to problem-solving and decision-making techniques in the provision of pharmaceutical services within the institutional environment. Field trips. Open to majors only. P, 511.

557. **Physical Parameters for Monitoring Drug Therapy** (1) II Introduction to physical assessment skills required of pharmacists for monitoring, assessing, and consulting on drug therapy. 3L. P, CR 575.

581. **Research Methodology and Drug Literature Evaluation** (3) II Skills and principles of clinical research design and biostatistics needed for evaluation of the medical literature and writing of research proposals. P, CR 575.
575. **Advanced Pharmacotherapeutics** (6) II Advanced concepts for the rational use of drugs in the management of diseases based on pathophysiological, pharmacokinetic, or pharmacologic and toxicologic considerations. 4R, 6L. P, 303e, 410, 475, CR 557. (Identical with Ph.Sc. 575 and Pcol. 575)

596. **Seminar**
   a. Pharmacy Practice (1) [Rpt./5] I II
   b. Pharmacy Practice (Hospital) (1) [Rpt./5] I II

611a-611b. **Pharmacy and Its Environment** (3-3) 1983-84 Cultural, social, behavioral, and organizational foundations of pharmacy, including the development of the present state of practice.

612a-612b. **Issues in Pharmacy Practice Research** (3-3) 1984-85 Survey of research methodology for studying social and behavioral aspects of health care and pharmacy practice; strategy for selecting and modifying existing research tools for particular purposes.

621. **Pharmaceutical Marketing** (3) I II Socioeconomic factors in the development, production, and distribution of drugs.

694. ** Practicum**
   a. Clinical Clerkship (1 to 15) [Rpt.] I II
   b. Administrative Clerkship (1 to 15) [Rpt.] I II

800. **Pharmacy Practice Research** (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**

*Note: 803a-d are six week courses.*

810. **Pharmacy Clerkship**
   a. Internal Medicine (4) I II S P, 803a, 803b, 803c, 803d.
   b. Surgery (4) I II S P, 803a, 803b, 803c, 803d.
   c. Pediatrics (4) I II S P, 803a, 803b, 803c, 803d.
   d. Geriatrics/Gerontology (4) I II S P, 803a, 803b, 803c, 803d.
   e. Family Practice (4) I II S P, 803a, 803b, 803c, 803d.
   f. Emergency Services (4) I II S P, 803a, 803b, 803c, 803d.
   g. Acute Care (4) I II S P, 803a, 803b, 803c, 803d.
   h. Clinical Pharmacokinetics (4) I II P, 803a, 803b, 803c, 803d.
   i. Psychopharmacy/Neurology (4) I II S P, 803a, 803b, 803c, 803d.

*Note: 810a-i are six week courses.*

815. **Pharmacy Subspeciality**
   a. Hematology/Oncology (2 to 4) I II S P, eight units of 810 or CR.
   b. Cardiology (2 to 4) I II S P, eight units of 810 or CR.
   c. Pulmonary (2 to 4) I II S P, eight units of 810 or CR.
   d. Endocrine (2 to 4) I II S P, eight units of 810 or CR.
   e. GI/Renal (2 to 4) I II S P, eight units of 810 or CR.
   f. OB/GYN/Neonatal (2 to 4) I II S P, eight units of 810 or CR.
   g. Infectious Disease (2 to 4) I II S P, eight units of 810 or CR.
   h. Rheumatology/Immunology (2 to 4) I II S P, eight units of 810 or CR.
   i. Dermatology (2 to 4) I II S P, eight units of 810 or CR.

*Note: 815a-i are six week courses.*


875. **Advanced Pharmacotherapeutics (Pharmacy)** (6) P, 303e, 410, 475, CR 857. (Identical with Ph.Sc. 875 and Pcol. 875)

896. **Seminar**
   a. Pharmacy Practice (1) I
   b. Pharmacy Practice Research (1) II
Philosophy


Associate Professors Henry C. Byerly, Frank A. Lewis

Philosophy is concerned with the critical examination of basic human beliefs in such areas as science, morality, politics, art, law, and religion.

The Bachelor of Arts, Master of Arts and Doctor of Philosophy degrees are available with a major in philosophy.

The major: thirty units, including 111, 112, 260 or 460, and 262 or 461 or 462. At least fifteen units must be in upper-division work. Students who contemplate using an undergraduate major in philosophy as a background for graduate or professional work may want to plan a more specialized program in consultation with the department's undergraduate adviser.

The supporting minor should be chosen after consultation with the undergraduate adviser.

Honors: The department participates in the Honors Program.

110. Critical Thinking (3) I II Designed to improve ability to reason and think critically; emphasis on evaluating and presenting arguments.

111. Introduction to Philosophy (3) I II Selected basic philosophical areas and problems: knowledge, belief and truth; the world and God; nature of persons; action and free will; the good life; the ideal community.

112. Introduction to Logic (3) I II Principles of correct argument; fallacies and effective argumentation; inductive inference; elements of symbolic logic.

113. Introduction to Moral and Social Philosophy (3) I II Practical and frequently encountered moral problems; readings from representative moral and social philosophers.

145. Science, Technology and Human Values (3) I Nature of science, technology, pseudoscience, and their relation to philosophy and culture; impact of science and technology on society and its values and religion.

202. Symbolic Logic (3) I II Truth-functional logic and quantification theory; emphasis on deductive techniques and translation into symbolic notation. (Identical with Math. 202)

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. Problems in Existentialism (3) I 1983-84 Exploration of central problems of the human condition, such as meaning of life; death; self-deception; authenticity, integrity and responsibility; guilt and shame; love and sexuality.

260. Ancient Philosophy (3) I Survey of Greek philosophy, with emphasis on the pre-Socratic philosophers, Plato, and Aristotle.


262. Modern Philosophy (3) I Principal European systems of thought from Bacon to Kant.

263. Recent Philosophy (3) I Examination of some of the main post-Kantian philosophical movements of the 19th and 20th centuries, such as idealism, materialism, existentialism, pragmatism, and positivism.

305. Introduction to the Philosophy of Science (3) I Basic issues in the logic of science: scientific concepts and their meaning, testing of hypotheses, explanation, measurement, role of mathematics, truth versus convention, limits of science.


310. History of Ethical Theory (3) I 1983-84 Reading and critical analysis of main ethical theories from the Greeks to the present.
321. **Medical Ethics** (3) GC I Ethical issues that arise within the context of the practice of medicine: abortion, euthanasia, the allocation of scarce medical resources, socialized medicine, doctor-patient confidentiality, paternalism, etc.

328. **Aesthetics** (3) II Classical and contemporary theories of art; the esthetic experience, form and content, meaning, problems in interpretation and criticism of works of art.

344. **Contemporary Analytic Philosophy** (3) II 1984-85 Study of the writings of some of the following: Russell, Moore, Wittgenstein, Ryle, Austin, Carnap, Quine, and those exhibiting a similar approach.

376. **Introduction to the Philosophy of Language** (3) I 1984-85 A survey of basic issues in the philosophy of language. (Identical with Ling. 376)

402. **Mathematical Logic** (3) GC II 1983-84 (Identical with Math. 402)

403. **Foundations of Mathematics** (3) GC II 1984-85 (Identical with Math. 403)


410. **Philosophy of the Physical Sciences** (3) GC II Philosophical problems regarding space, time, motion, relativity, causality, measurement, theoretical entities.

411. **Philosophy of the Biological Sciences** (3) GC I 1983-84 Laws and models in biology, structure of evolutionary theory, teleological explanations, reductionism, sociobiology. (Identical with Ecol. 411)

415. **Philosophy of Action** (3) GC II Topics include the explanation of human action; the nature of intentional action; practical reason and deliberation; and the mental antecedents to action, especially desire and belief.

420. **Ethical Theory** (3) GC II Nature and justification of ethical judgments and principles.

422. **Linguistic Semantics and Lexicology** (3) GC II 1984-85 (Identical with Ling. 422)

424. **Philosophy of Psychology** (3) GC II 1983-84 Investigation of philosophical issues arising from current work in psychology including perception, reasoning, memory, motivation and action.

425. **Advanced Symbolic Logic** (3) GC II 1984-85 Investigation of some major results in logic, such as Lowenheim-Skolem, Godel, Church and Tarski's theorems, and their philosophical import.

426. **Introduction to Nonstandard Logic** (3) GC II 1983-84 Introduction to modal logic; problems of interpretation and application; extensions to such areas as tense logic, epistemic logic, deontic logic.

431. **Metaphysics** (3) GC I Topics include free will and determinism; causation; personal identity; and universals.

432. **Theory of Knowledge** (3) GC I Critical examination of some of the major problems concerning evidence, justification, knowledge, memory, perception and induction.

434. **Social and Political Philosophy** (3) GC I Fundamental concepts of politics; leading social and political theories, such as anarchism, social contract, Marxism.

439. **Analytical Philosophy of Religion** (3) GC II 1984-85 Effect of analytical and linguistic philosophy on basic questions of religious truth, the meaning of religious and theological statements, and the way in which religious discourse may be understood. (Identical with Reli. 439)

460. **Greek Philosophy** (3) GC [Rpt.] II Topics in Greek philosophy, to be selected from Plato (Earlier or Later Dialogues) and Aristotle.

461. **Rationalism and Empiricism** (3) GC II 1983-84 Survey of main controversies among rationalists and empiricists of the 17th and 18th centuries.

462. **Problems in 17th- and 18th-Century Philosophy** (3) GC [Rpt.] II 1984-85 Intensive study of selected issues in the philosophy of one or two of the following: Hobbes, Locke, Berkeley, Hume, Descartes, Spinoza, Leibniz, Kant.

472a-472b. **Philosophy of Law** (3-3) GC Nature and limits of law; law and morality; legal obligation; problems about liberty, justice, responsibility, and criminal punishment. (Identical with Pol. 472a-472b)

473. **Speech Production and Comprehension** (3) GC II 1984-85 (Identical with Ling. 473)

474. **Philosophy of Mind** (3) GC II Topics include the nature of mental states; the relation between mind and brain; and analysis of perception, emotion, memory and action.

475. **Semantics** (3) GC II 1983-84 Investigation of main philosophical and linguistic trends in semantic analysis, with reference to relevant current semantic issues in linguistic theory. (Identical with Ling. 475)

476a-476b. **Philosophy of Language** (3-3) GC An intensive study of selected topics in the philosophy of language.

477. **Pragmatics** (3) GC I 1983-84 (Identical with Ling. 477)

478. **Minds and Machines** (3) GC I 1983-84 Philosophical problems arising from current work in artificial intelligence and cognitive psychology.
388 DEPARTMENTS AND COURSES OF INSTRUCTION

596. Seminar

a. Ethics (3) I II
b. Metaphysics (3) I II
c. Epistemology (3) I II
d. Logical Theory (3) I II
e. Esthetics (3) I II
f. Social and Political Philosophy (3) I II
g. Philosophy of Law (3) I II
h. Philosophy of the Physical Sciences (3) I II
i. Philosophy of the Behavioral Sciences (3) I II
j. Philosophy of the Biological Sciences (3) I II
k. Philosophy of Mind (3) I II
l. Philosophy of Language (3) I II
m. Theory of Value (3) I II
n. Philosophy of Religion (3) I II
o. Philosophy of History (3) I II
p. History of Philosophy: Classical (3) I II
q. History of Philosophy: Recent (3) I II
r. Philosophical Psychology (3) I II
s. Philosophy of Mathematics (3) I II
t. Special Problems (3) I II

PHYSICAL EDUCATION

Professors Anne E. Atwater Acting Head, Donna Mae Miller, Frederick B. Roby, Mary P. Roby, David H. Strack, Jack H. Wilmore, John M. Wilson


Assistant Professors Anne L. Binkley, Victor A. Convertino, Roger M. Enoka, M. Agnes Garner, James H. Gramann, Nina Janik, Roy A. Tatum, Mary K. Wolff, Ruth E. Wynn

Lecturers Ethel J. Hibbs, Royal A. Price, Judy A. Sorensen, Ronald A. Sutherland, George Zoritch

Instructors Gwen A. Hyatt, Marvin Schierbeek

The Department of Physical Education participates with the College of Education in programs leading to the Bachelor of Science in Education degree with a teaching major in physical education for the secondary-school level or for K-12 certification; with the College of Arts and Sciences in a program leading to a Bachelor of Fine Arts with a major in dance; with the College of Business and Public Administration in a program leading to a Bachelor of Science in Public Administration with a major in public recreation administration; and with the Department of Drama and the School of Music (in the College of Arts and Sciences) in providing course work for the musical theatre option within the Bachelor of Fine Arts major in general fine arts studies. The musical theatre option is described in the College of Arts and Sciences section of this catalog. Undergraduate minors are available in athletic coaching and physical education. Physical education may be taken as a major for the Master of Science degree and the Master of Arts degree. For admission and degree requirements for the graduate programs, please see the Graduate Catalog.

The physical education teaching major (secondary emphasis): 276, 279, 285, 286, 288, 354 (two units); an additional two units from 260, 354, 357 or professional activities; 370, 371, 373, 374, 377, 380, 381, 386, 394b; G.Bio. 159a-159b. Departmental skills requirement must be satisfied through proficiency examination or completion of a minimum of ten courses and fifteen units from the following professional activity courses: 210, 211, 213, 214, 217, 218, 219, 221, 223, 224, 225, 226, 227, 229, 230, 231, 232, 233.

The physical education teaching major (K-12 emphasis): 261, 276, 279, 285, 286, 288, 294a, 352, 354 (two units); an additional two units from 260, 354, 357 or professional activities; 358, 370, 371, 373, 374, 377, 380, 381, 388, 394b, 486; Elem. 493a; G.Bio. 159a-159b. Departmental skills requirement must be satisfied through proficiency examination or completion of the following professional activity courses: 213, 217, 221, 223, 225, 227, 231, 232; and two additional courses from 210, 211, 214, 218, 219, 224, 226, 229, 230, 233.

The dance major: Dance majors must audition for placement in dance technique courses. For information regarding entrance requirements, please contact the department. In addition to the group units required, as described under the B.F.A. in the College of Arts and Sciences section of this catalog (Group III not required; Group IV fulfilled by G.Bio. 159a-159b), the following courses must be taken: 121 or 175, 143a, 240a-240b, 241a-241b, 245a-245b, 259a-259b, 340a-340b, 341a-341b, 440a-440b or 441a-441b, any three of 343a or 343b or 343c or 343d, 209, 246, 247a-247b, 346, 348 or 357 or 496a, 370 (section for dance majors),
394c, 394f, 445, Mus. 107, 108. Twenty units of combined electives from dram., mus., and r-tv. are also required. Thirty units in dance classes, including four units in ballet technique, four units in modern technique, and 394c, 394f, must be taken in residence. Minimum units required for the degree with this major—125.

**The major in public recreation administration.** For information regarding this program, please see the College of Business and Public Administration section of this catalog.

**The major in natural resource recreation.** For information regarding this program, please see the Renewable Natural Resources section of this catalog.

**The athletic coaching minor** (not available to physical education majors); 276, 370, 373, 374, 377, 394a; four units from 385, 386, 408, 485; six units from 286 and 354, to include a minimum of four units in 354.

**The physical education teaching minor.** 261 or 377; 285, 288, 370, 371, 373, 374, 380, 381; G.Bio. 159a-159b. Departmental skills requirement must be satisfied through proficiency examination or completion of a minimum of eight courses and twelve units from the following professional activity courses: 210, 211, 213, 214, 217, 218, 219, 221, 223, 224, 225, 226, 227, 229, 230, 231, 232, 233.

### ACTIVITY COURSES

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.

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<td>Aquatic Sports</td>
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<td>107</td>
<td>Archery</td>
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<td>109</td>
<td>Backpacking</td>
<td>(1) I II S Two-day field trip.</td>
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<td>110</td>
<td>Badminton</td>
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<td>a. Beginning Badminton, c. Intermediate Badminton</td>
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<td>134</td>
<td>Field Hockey</td>
<td>(1) I II</td>
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390 DEPARTMENTS AND COURSES OF INSTRUCTION

135. Folk Dance (1) I II
   a. Beginning Folk Dance
   c. Intermediate Folk Dance

137. Golf (1) I II S
   a. Beginning Golf
   c. Intermediate Golf
   d. Advanced Golf

138. Gymnastics (1) I II
   a. Beginning Gymnastics
   c. Intermediate Gymnastics

140. Handball (1) I II

141. Hiking (1) I II S Field trips.

143. Improvisation (1) I II
   a. Beginning Improvisation
   c. Intermediate Improvisation

145. Jogging-Aerobics (1) I II S

146. Judo (1) I II S

150. Lifesaving (1) I II S P, 169d.

152. Modern Dance (1) I II S
   a. Beginning Modern Dance
   c. Intermediate Modern Dance

157. Personal Defense (1) I II S

159. Racketball (1) I II S
   a. Beginning Racketball
   c. Intermediate Racketball

160. Recreational Games (1) I II

164. Soccer-Speedball-Speed-A-Way (1) I II
   a. Beginning Soccer-Speedball-Speed-A-Way

165. Social Dance (1) I II

166. Softball (1) I II
   a. Beginning Softball
   c. Intermediate Softball

169. Swimming (1) I II S
   a. Beginning Swimming
   b. Swimming for Beginners with Limited Experience
   c. Intermediate Swimming
   d. Advanced Swimming


171. Synchronized Swimming (1) I II P, 169b.

173. Tennis (1) I II S
   a. Beginning Tennis
   b. Tennis for Beginners with Limited Experience
   c. Intermediate Tennis
   d. Advanced Tennis

175. Theatre Dance (1) I II S

176. Touch Football (1) I II

178. Track and Field (1) I II

179. Tumbling and Trampoline (1) I II
   a. Beginning Tumbling and Trampoline
   c. Intermediate Tumbling and Trampoline

181. Volleyball (1) I II S
   a. Beginning Volleyball
   c. Intermediate Volleyball
   d. Advanced Volleyball

183. Weight Control (1) I II P, for students who are a minimum of 20% overweight.

184. Weight Training (1) I II S

185. Wrestling (1) I II

189. Foundations of Physical Fitness (2) I II
## PROFESSIONAL ACTIVITY/DANCE TECHNIQUE COURSES

Open to physical education majors and minors and dance majors only.

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<td>Soccer-Speedball-Speed-A-Way (2) I II #</td>
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<td>Volleyball (2) I II # *</td>
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<td>Wrestling (2) I II 1983-84 #</td>
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<td>240a-240b</td>
<td>Ballet Technique I (2-2) **</td>
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<tr>
<td>241a-241b</td>
<td>Modern Dance Technique I (2-2) **</td>
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<tr>
<td>244a-244b-244c-244d</td>
<td>Jazz Dance Technique (1-1-1) ** Janik</td>
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<tr>
<td>340a-340b</td>
<td>Ballet Technique II (2-2) P, 240b. **</td>
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<tr>
<td>341a-341b</td>
<td>Modern Dance Technique II (2-2) P, 241b. **</td>
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<tr>
<td>440a-440b</td>
<td>Ballet Technique III (2-2) P, 340b. **</td>
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<tr>
<td>441a-441b</td>
<td>Modern Dance Technique III (2-2) P, 341b. **</td>
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</tbody>
</table>

# Development of knowledge and skill competencies necessary for teaching each activity, with emphasis on skill progressions, practice opportunities, and error diagnosis and correction.

*Enrollment by proficiency demonstrated by passing beginning course or by meeting equivalent skill and knowledge requirements.

**Students must audition for placement in dance technique courses.

## PROFESSIONAL PREPARATION COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Notes</th>
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</thead>
<tbody>
<tr>
<td>209</td>
<td>Percussion for Dance Students (2) I (Identical with Mus. 209)</td>
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<tr>
<td>245a-245b</td>
<td>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, 143c. Bergsohn/Wolff</td>
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<tr>
<td>247a-247b</td>
<td>Production in Dance (3-3) Theory and practical training in dance production; lighting, sound, costing, and promotion. IR, 4S. Wolff</td>
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<tr>
<td>258a-259b</td>
<td>History of Dance (3-3) 258a: Origins of dance as human expression in ritual, social, and theatrical context. 259b: History of dance as theater art within the western world from 1581 to the present. 259a is not prerequisite to 259b. Wolff/Bergsohn</td>
<td></td>
</tr>
<tr>
<td>260</td>
<td>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.</td>
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<tr>
<td>261</td>
<td>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.</td>
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</tr>
</tbody>
</table>
DEPARTMENTS AND COURSES OF INSTRUCTION

276. **Designed Exercise Programs** (1) I II Instruction and practice in various types of formal exercise programs. Munroe/Simko

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. Morris

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.

286. **Sports Officials** (1) I II Guiding principles and standards; rules, mechanics and procedures for officiating sports common to secondary school interscholastic and community club programs. Consult department before enrolling.
   a. Basketball (Men and Women's Rules) II
   b. Baseball-Softball I
   c. Women's Gymnastics I 1983-84
   d. Football II
   e. Soccer I
   f. Volleyball II

288. **History of Sport and Physical Education** (2) I II Development of physical education from ancient societies through the 20th century; its influence on current practices.

294. **Practicum**
   a. Sports Development Program (2) [Rpt./1] I II S P, 279, 285. Morris

321. **Outdoor Education** (3) I Theories and techniques of educational programs conducted in organized camps and related environments, with emphasis on management and curricular aspects of such programs.

322. **Dynamics of Recreation Group Management** (3) I Knowledge, skills and techniques necessary to provide creative and effective leadership in a variety of recreation service delivery systems.

323. **Camp Management** (3) II Administrative and counseling techniques required for the successful operation of day and resident camps.

325. **Recreation and Special Populations** (3) II Disabilities and needs of the handicapped and their implications for the development and management of recreation services and resources.

328. **Recreation Delivery Systems** (3) I Historical and philosophical perspectives of the recreation profession in the United States; an overview of the settings and agencies in which recreation and park professionals are employed.

339. **Ballet Pointe Preparation** (1) [Rpt./1] I II Strength, stretch and placement techniques in preparation for ballet pointe; analysis of foot and shoe-fitting; barre and centre basics. 2S. P, 112c or audition.

343d. **Dance Repertory** (2-2-2-2) a and b sections 1984-85; c and d sections 1983-84. Study of performance skills from classical, modern, contemporary and folk repertory. 6L. Enrollment by audition only.

346. **Theory and Philosophy of Dance** (2) I 1984-85 Theories of dance as an art form and as an educational discipline. P, 259a-259b. Wilson

348. **Selected Dance Forms** (2) II 1983-84 Ethnological methods in analysis and reconstruction of social-cultural dance forms. 1R, 3L. P, 112c or 152c, CR 259a.

351. **Elementary School Physical Education** (3) I II Purposes and practices of physical education at the elementary school level; instruction in recommended activities; teaching and evaluation techniques; class organization.
   a. Grades K-3
   b. Grades 4-6
   c. Grades K-6

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.
   a. Aquatics (2) II 1984-85 P, 169d, 229 or 285 (not required for athletic coaching minor).
   b. Baseball (2) II P, 285 (not required for athletic coaching minor).
   e. Women's Gymnastics (2) II 1984-85 P, 221, 285 (not required for athletic coaching minor).
   g. Tennis (2) II 1983-84 P, 230, 285 (not required for athletic coaching minor).
   h. Track and Field/Cross Country (2) II P, 231, 285 (not required for athletic coaching minor).
   i. Volleyball (2) II P, 232, 285 (not required for athletic coaching minor).

357. **Methods of Teaching Dance** (2) II 1983-84 Instruction and practice in the various methods of teaching dance at the high school level. P, 135a or 217, 224, 285. *Bergsohn*

358. **Dance for Children** (2) I 1984-85 Basic methods, materials and activities for teaching dance to children. *Bergsohn*


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, G.Bio. 159a-159b.

373. **Physiology of Exercise** (2) I II Effect of exercise on structure and function; circulorespiratory adjustments during exercise; metabolic and environmental aspects of exercise; fatigue and training. P, G.Bio. 159a-159b. F. *Roby/Munroe*

374. **Physiology of Exercise Laboratory** (1) I II P, CR 373. *Roby/Munroe*

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, G.Bio. 159a-159b. *Delforge*

380. **Scientific Foundations of Motor Learning** (3) I II Introductory investigation of the nature of motor skill learning, including topics such as learning theory, neural basis, models of motor skill acquisition and factors which affect motor performance and learning. P, 370, Psyc. 100a. *Russell*

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. *Munroe*

385. **Principles and Problems of Athletic Coaching** (2) II Examination of the duties, ethics and responsibilities of a coach; application of principles from psychology, sociology and other related fields; discussion of typical problems that confront the coach. *Baker*

386. **Administration of Interscholastic Athletics** (2) I Role of athletics in secondary education, with emphasis on administrative philosophy, staff relations, business procedures, facilities, and the conduct of athletic events. *Baker*

388. **Administration of Physical Education Programs** (3) I II Principles and practices characteristic of programs of physical education; organizational models and theories, curriculum development, contemporary economics, innovations and issues. *Baker/Miller*

393. **Internship**
   a. Junior Field Work in Recreation (1) [Rpt./1] II S

394. **Practicum**
   a. Athletic Coaching (3) I II
   b. Physical Education Teaching Techniques on the College Level (1) I II
   c. Dance Project (1) I II 3L.
   d. Exercise Leader (2) [Rpt./2] I II S 1R, 8L P, 276, G.Bio. 159a.
   e. Exercise Technician (2) [Rpt./2] I II S 1R, 8L P, 373, 374, 394d.
   f. Production Project (1) I II 3L. P, 247a-247b, 445.

408. **Mechanics of Sports** (3) II (Identical with Phys. 408)

422. **Aging and Leisure** (3) GC I Investigation of psychological, sociological and physiological characteristics of aging populations; exploration of services for the aging; and analysis of problems and opportunities related to leisure and recreation. Advanced degree credit available for nonmajors only.

425. **Administration of Recreation** (3) II Basic administrative functions and practices as they relate to various recreation delivery systems. (Identical with N.R.R. 425)

426. **Recreation Programming** (3) II S Principles, policies and procedures utilized in the planning and conducting of recreation programs and services in a variety of recreation delivery systems.

427. **Principles of Therapeutic Recreation** (3) I S Basic principles and concepts of therapeutic recreation relating to both institutional and community-based leisure delivery systems. P, 325.
445. **Advanced Choreography** (2) I Movement qualities, motif development, and geometric principles applied to group composition. 4S. P, 245b. Wilson

448. **Sport in Contemporary Society** (3) GC I Study of contemporary sport from the perspectives of its personal, social, cultural, economic and educational dimensions. Miller


492. **Internship**

493. **Practicum**
   a. Children’s Developmental Movement (2) I II P, 279

494. **Proseminar**
   a. Dance-Related Art Forms (1 to 3) GC II 1984-85 Bergsohn/Wilson
   b. Analysis of Data in Human Motion Studies (1) GC I II Atwater

495. **Workshop**
   a. Sports Injuries (1 to 3) I II
   b. Folk Dance (1 to 3) I II


503. **Therapeutic Recreation Processes** (3) II Relationships of all components of a therapeutic recreation service such as resources, facilities, and personnel. P, 325 or 427.

505. **Commercial Recreation** (3) II Introduction to profit-oriented recreation agencies and factors which contribute to their financial success, including design, planning, development, management, and marketing.

515. **Philosophy of Physical Education and Sport** (3) I Designed to help the student examine philosophic foundations, to explore the philosophic process, and to analyze, formulate, and apply principles as guides to action. P, twelve upper-division units of ph.ed. Miller

520. **Biomechanics of Human Movement** (3) I Analysis of human motion focusing on the mechanical interaction between the human body and the external environment. 2R, 3L. P, 370, G.Bio. 159a-159b, twelve upper-division units of ph.ed. Atwater

525. **Motor Learning and Human Performance** (3) I Neuropsychological approach to the study of motor skill acquisition and learning variables affecting human potential for physical performance. Fairchild

526. **Neural and Perceptual Foundations of Motor Learning and Performance** (3) I Examines the neural basis of motor behavior and the role and influence of perceptual modalities in motor learning and sports performance; topics include sensory coding, perceptual processing and motor control. Russell

527. **Psychological and Social Parameters Affecting Sports Performance** (3) I Examines the effects of motivation, personality, aggression, anxiety and anxiety management techniques, attitudes, competition and social influence processes on sport performance and the influence of physical activity/fitness on psychological well-being. Williams

530. **Advanced Physiology of Exercise** (3) I Study of metabolic, cardiorespiratory, thermoregulatory, fluid-electrolyte, neuroendocrine, neuromuscular and various environmental factors which influence the performance of muscular activity during acute exercise and the physiological adaptations to chronic exercise. P, 373. Convertino/F. Roby/Wilmore

535. **Issues and Trends in Physical Education and Sport** (3) II Designed to aid the student in identifying, analyzing, and evaluating recent developments and basic issues in physical education and sport. P, twelve upper-division units of ph.ed. Miller

536. **Administration of Sports Programs** (3) II 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. Miller

540. **Motor Development and Skill Acquisition in Children and Young Adults** (3) II Motor development and the progressive changes in motor behavior and motor skill acquisition from infancy through young adulthood. P, 279.

545. **Evaluation and Regulation of Body Build and Composition** (3) I Laboratory and field assessment of body fat, lean body mass and somatotype; anthropometry; body build and composition of the athlete; morphology of fat and lean tissue; exercise and dietary regulation of obesity and chronic underweight. P, 373, 374, Math. 117. Wilmore

550. **Laboratory Techniques for Exercise Physiology** (3) II Instrumentation and techniques used in measuring the physiological responses of human subjects during exercise stress. F. Roby/Wilmore
PHYSICAL EDUCATION 395

555. **Cinematographic Techniques for Analyzing Human Movement** (3) II High-speed motion picture photography applied to the study of human motion; techniques of data collection, reduction, analysis and interpretation. P, 520. Atwater

556. **Physical Activity and Coronary Heart Disease** (3) II The etiology and pathophysiology of coronary heart disease (CHD); primary and secondary risk factors; diagnosis of CHD; role of exercise in primary and secondary prevention. Field trips. P, 530.

570. **Research Design in Physical Education** (2) I II Special emphasis on research orientation; study of areas of research and methodology pertinent to physical education; selection of research problems and preparation of thesis. Fairchild

580. **Recognition of Athletic Injuries** (3) I Advanced study of the etiology, pathology and manifestations of common athletic injuries, with emphasis on specific techniques of injury recognition by the athletic trainer. P, 377; 800 hrs. of clinical experience in athletic training. Delforge

581. **Reconditioning of Athletic Injuries** (2) II Advanced study of the use of hydrotherapy, electrotherapy and massage in the rehabilitation of athletic injuries. P, 580. Delforge

582. **Anatomical Basis of Sport Injuries** (2) 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. 1R, 3L. P, CR 580. Hillman

584. **Therapeutic Exercise** (3) II Role of exercise in the rehabilitation of common athletic injuries; principles in the development and application of therapeutic exercise programs for injured athletes. P, 580. Delforge

585. **Current Problems in Athletic Training** (3) S Current problems in athletic training and sports medicine; organization and administration of athletic training programs; historical aspects of athletic training. P, 580. Delforge

586. **Physical Education and the Law** (3) S 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

587. **Management of Athletic Injuries** (3) S Principles of injury recognition and initial management of sports injuries for the coach, physical education teacher, and other athlete health care personnel. Credit is allowed for this course or 580, but not for both. P, 377.

595. **Colloquium**

596. **Seminar**
   a. Contemporary Problems in Athletics (3) S Simko

694. **Practicum**
   a. Concert Production and Choreography (2 to 3) [Rpt./1] II P, 247a-247b, 445.

795. **Colloquium**
   a. Physiological Adaptations to Training (2) [Rpt./1] I II P, 530.
   b. Environmental Stress and Performance (2) [Rpt./1] I II P, 530.
   c. Cardiovascular Dynamics (2) [Rpt./1] I II P, 530.
   d. Exercise Metabolism (2) [Rpt./1] I II P, 530.
PHYSICS


Associate Professors Ke-Chiang Hsieh, Adrian N. Patrasciou, Jay E. Treat, Richard A. Young

The department offers the degrees of Bachelor of Science, Master of Science and Doctor of Philosophy with a major in physics. A Bachelor of Science in Education and Master of Education are available with a teaching major in physics. The Bachelor of Science in Engineering Physics is offered through the College of Engineering. Students should consult the department concerning areas in which research is being conducted.

The major: Thirty-six units, including 110, 116, 121, 230, 410, 415a, 420, 425, 435, and 480a-480b. Under special circumstances 102a-102b and 180a-180b, or 103a-103b and 180a-180b may be substituted for 110, 116, and 121. The following courses are strongly recommended: 415b, 470a-470b, 481a-481b; Chem. 103a-103b, 104a-104b, or 105aH-105bH. Math. 253 is recommended as a prerequisite for upper-division physics.

For the major in engineering physics, please see the College of Engineering section of this catalog. An engineering physics major who intends to do graduate work in physics should discuss his or her plans with the adviser.

The teaching major: 30 units, including 103a-103b and 180a-180b (or 110, 116, and 121), 230, 433, 480a-480b. Courses in related fields, such as astronomy, may be chosen in consultation with the departmental adviser.

The teaching minor: Eighteen units, including 102a-102b and 180a-180b (or 103a-103b and 180a-180b, or 110, 116, and 121), 433, 480a, and other courses chosen in consultation with the departmental adviser.

Honors: The department participates in the Honors Program.

102a-102b.* Introductory Physics (3-3) CDT Designed for liberal arts and life science majors with no calculus background. Survey of the basic fields of physics, with emphasis on applications to other fields and historical development. P, h.s. algebra, geometry, and trigonometry. Both 102a and 102b are offered each semester. Those wishing to take this course as a lecture-lab. course should register concurrently for 180a or 180b.

103a-103b.* Introductory Physics with Calculus (3-3) CDT Fundamental principles of mechanical, thermal, acoustical, electrical, optical, atomic and nuclear phenomena. P, CR Math. 125b. Both 103a and 103b are offered each semester. Those wishing to take this course as a lecture-lab. course should register concurrently for 180a or 180b.

105. Elements of Physics (3) I II CDT Designed for nurs. majors. Physical measurement, kinematics, laws of motion, gravitation, work and energy, heat and thermometry, electromagnetism, light, sound, molecules, atoms, X-rays and nuclear radiations. 3R, 2L. Not to be used for Group VI requirements in the College of Arts and Sciences, P, Math. 117e.

106. Physics for Architects (3) II CDT Introduction to physics, with special emphasis on topics and concepts of interest to architects.

107. The Physics of Music (4) I CDT Sound production, musical instruments, frequency analysis, physics of hearing, psychological and physiological effects, harmony and scales, hall acoustics, electronic production and recording. 3R, 3L.

108. Physics of Sound (4) II CDT Introduction to physics principles important to acoustics; statics, dynamics, conservation laws, electricity, harmonic motion, waves, complex wave analysis, and sound transmission. 3R, 3L.
110. **Introductory Mechanics** (4) I II CDT Vector concepts; kinematics, statics, and dynamics for point masses, particle systems, and rigid bodies; conservation laws of energy, momentum, and angular momentum. 4R, 2L, P, Math. 125a, CR 125b.

112. **Foundations of Science: Physics** (3) I II CDT Basic concepts of physics, with emphasis on modern physics; major topics: mechanics, wave motion, properties of light, nuclear and atomic physics, and astronomy. No previous physics or math. background assumed. 2R, 3L.

**Periodically, a section of this course will be taught in Spanish.**

116. **Introductory Electricity and Magnetism** (4) I II CDT Field concepts, electrostatics, magnetostatics, currents, electromagnetic phenomena and electromagnetic waves. 4R, 2L, P, 110, CR Math. 223.

121. **Introductory Optics, Acoustics and Heat** (3) I II CDT Introduction to heat and thermodynamics; treatment of optics and acoustics from viewpoint of scalar wave theory. 3R, 2L, P, 110, CR Math. 223.

*Credit will be allowed for only one of the following sequences of courses: 102a-102b and 180a-180b; 103a-103b and 180a-180b; 110, 116 and 121.*

180a-180b. **Introductory Laboratory** (1-1) Quantitative experiments in physics, both illustrative and exploratory. Designed to accompany 102a-102b and 103a-103b; sections are established corresponding to each course. 3L, P, CR 102a-102b or 103a-103b. Both 180a and 180b are offered each semester.

230. **Structure of Matter** (3) I II CDT Introduction to modern physics; quantum theory, relativity, atomic structure, nuclear physics. P, 110, 116, 121; Math. 223.

402. **Medical Physics** (3) GC I CDT Basic physics of the human body: the principles of mechanics, electricity, sound, light, and radiation as they apply to physiology, with emphasis on instrumentation for diagnosis and treatment. P, 102b.

408. **Mechanics of Sports** (3) GC II CDT Study of sports from a mechanical viewpoint. Necessary concepts of basic mechanics will be developed. Open to nonmajors only. (Identical with Ph.Ed. 408)


415a-415b. **Electricity and Magnetism** (3-3) GC CDT Electromagnetic phenomena; Maxwell's equations. P, 410 or Math. 422a.

420. **Optics** (3) GC I II CDT Electromagnetic waves; rays, interference, diffraction, scattering; applications to imaging systems, Fourier methods, holography, and crystal optics. P, 116, 121, Math. 223.

425. **Thermodynamics** (3) GC I II CDT Basic laws of thermal equilibrium; heat engines; ideal and nonideal gases; phase transitions; introduction to irreversible processes, kinetic theory, and statistical mechanics. P, 110, 121, Math. 223.

430. **Introduction to Biophysics** (2) GC I CDT Concepts and experimental techniques of molecular biophysics; physical properties of biological macromolecules and cell organelles, optical interactions, macromolecular transitions, molecular mechanism or regulation. P, 102b, Chem. 103a-103b. (Identical with Micr. 430)

433. **Physics Demonstrations** (1 to 3) GC II Introduction to teaching materials and lab. 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 phys.

435. **Introductory Quantum Theory and Atomic Spectra** (3) GC I II CDT Introductory quantum mechanics; solutions of the Schroedinger equation for hydrogen-like atoms; perturbation theory; atomic structure; spectra of one and many electron systems; Zeeman-Paschen-Bach effects; hyperfine structure. P, 230, 410, Math. 253; CR 470a or Math. 413 recommended.

436. **Applications of Introductory Quantum Theory** (3) GC II CDT Applications of quantum theory to molecules, atomic nuclei, elementary particles and simple solids. P, 435.

440a-440b. **Atomic and Molecular Spectroscopy for Experimentalists** (3-3) GC CDT Experimental techniques to generate, analyze and detect photons from X-ray to IR; interpretation of spectra from gases, liquids, solids and biological macromolecules; light scattering, polarization. P, 230. (Identical with Opti. 440a-440b)


460. **Introductory Solid-State Physics** (3) GC II CDT Properties of solids from molecular, atomic, and electronic theory; electric, magnetic, and thermal properties of metals, insulators, and semiconductors; free electron and band theories. P, 230.
470a-470b. Methods of Mathematical Physics (3-3) GC CDT Vector and tensor analysis; differential and integral equations; Green's functions; variational techniques; linear operator theory, with emphasis on physical applications. P, 410, Math. 253, CR 415a-415b.

480a-480b. Methods of Experimental Physics I (1 to 2 - 1 to 2) Designed to develop experimental skills and to demonstrate important concepts in classical and modern physics. 3 or 6L. P, two upper-division courses in phys. or CR. Both 480a and 480b are offered each semester.

481a-481b. Methods of Experimental Physics II (1 to 2 - 1 to 2) Continuation of 480a-480b, with emphasis on individual work. 3 or 6L. P, 480b; ten units of upper-division phys. Both 481a and 481b are offered each semester.

504. Introduction to Quantum Optics (3) (Identical with Opti. 504)

511. Analytical Mechanics (3) I Laws of motion as developed by Newton, d'Alembert, Lagrange and Hamilton; dynamics of particles and rigid bodies. P, 410.


525. Advanced Thermodynamics and Kinetic Theory (3) II 1983-84 First and second laws of thermodynamics and their applications; Boltzmann transport equation; H-theorem; mean free path methods applied to viscosity, thermal conductivity, and diffusion. P, 425.

528. Statistical Mechanics (3) I Physical statistics; the connection between the thermodynamic properties of a macroscopic system and the statistics of the fundamental components; Maxwell-Boltzmann, Fermi-Dirac, Einstein-Bose statistics. P, 470b.

530. 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 Micr. 530)

535. Advanced Atomic Physics (3) (3) II 1984-85 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.

543. Laser Physics (3) I 1984-85 (Identical with Opti. 543)


551. Satellite and Planetary Perturbation Theory (3) II (Identical with Pty.S. 551)


556a-556b. Electrodynamics of Conducting Fluids and Plasmas (3-3) 1984-85 (Identical with Pty.S. 556a-556b)


570a-570b. Quantum Mechanics (3-3) Principles of quantum mechanics; wave mechanics and matrix mechanics; applications to atomic structure and spectroscopy. P, 470a-470b suggested but not required.

575. Advanced Mathematical Methods in Physics (3) I 1984-85 Selections from topics such as functions of complex variables, dispersion relations, group theory, distributions, integral transforms, numerical analysis, approximation theory. P, 470b.

577a-577b. Theory of Relativity (3-3) 1983-84 Special theory of relativity and its application to mechanics and electrodynamics; tensor calculus and general relativity; relativistic astrophysics and cosmology. P, 470b.

579a-579b. Advanced Relativistic Quantum Mechanics (3-3) 1984-85 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) II 1983-84 Production, interaction, and decay of mesons, baryons and leptons; high energy scattering of elementary particles; particle classification and symmetries; theoretical interpretation. P, 436.

583a-583b. Thermonuclear Theory (3-3) 583a: II. 583b: I. (Identical with Nu.E. 583a-583b)

585. Stellar Pulsation (1 to 3) [Rpt./5] I II Stellar pulsation, the solar atmosphere, solar seismology and long-term solar variability related to climate.
PHYSIOLOGY

(Office of Medicine)

Professors Paul C. Johnson, Head, William H. Dantzler, Robert W. Gore, Raphael P. Gruener, Otakar Koldovsky (Pediatrics), Daniel A. Pollen (Adjunct), Douglas G. Stuart
Associate Professors Eldon J. Braun, Andrew M. Goldner
Assistant Professors Ziaul Hasan, Daniel R. Kenshalo, Jr. (Adjunct), Richard J. Lemen (Pediatrics), Richard L. Stouffer, Stephen H. Wright

The Department of Physiology offers a program of instruction leading to the degree of Doctor of Philosophy with a major in physiology. For admission and degree requirements, please see the Graduate Catalog. A Master of Science degree is offered only in rare instances when individuals qualified to study for the Ph.D. are forced to terminate their graduate education.

In addition to the courses listed below, the Department of Physiology offers temporary courses in the following areas, subject to faculty availability and student interest: neurophysiology, renal physiology, physiology of muscle, endocrinology, peripheral vascular physiology, respiratory physiology, gastrointestinal and developmental physiology, and membrane transport processes in physiology.

418. Physiology for Engineers (4) GC I Designed to bring to engineering students an awareness of the structure and function of whole organisms, their component organs, and organ systems. Open to nonmajors only. (Identical with A.M.E. 418, Ch.E. 418 and E.C.E. 418)

419. Physiology Laboratory (2) GC I Lab. 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 A.M.E. 419, Ch.E. 419 and E.C.E. 419)

480. Human Physiology (4) GC I Principles of physiology with emphasis on the human; designed primarily for students in pharmacy and health related sciences. Open to pharmacy majors; others consult dept. before enrolling. P, Chem. 243b, Math. 123, Phys. 102b. (Identical with Tox. 480)

481. Physiology Laboratory (1) GC I Experiments intended to reinforce principles of physiological phenomena; designed primarily for students in pharmacy and health related sciences. Open to pharmacy majors; others consult dept. before enrolling. P, Chem. 243b, Math. 123, Phys. 102b. (Identical with Tox. 481)

495. Colloquium
a. Introduction to the Neurosciences I (2) GC (Identical with Med. 495a, which is home)
b. Introduction to the Neurosciences II (2) GC (Identical with Med. 495b, which is home)

600. Mathematical Techniques in Physiology (3) I Application of quantitative and analytical mathematical techniques to selected areas of physiology; introduction to mathematical approaches commonly used in physiology. Open to majors and minors only. P, Math. 125a-125b, 160.

601. Human Physiology (8) II Principles of physiology, with emphasis on that of the human. P, Chem. 103b, 104b, 241b, 243b; Phys. 102b.

602. Readings in Physiology (2) II Designed to provide students with more detailed consideration of various organ systems than can be provided in 601. Open to majors and minors only. P, Chem. 103b, 104b, 241b, 243b, Phys. 102b, CR Psio. 601.

605. Neurosciences (6) Phase II (Identical with Anat. 605)

606. Readings in Neuroscience (2) II Essentials of mammalian neural structure and function. Open to majors and minors only.
610. Research Methods in Physiology (1 to 3) [Rpt.] I II Lab. course stressing the principles of physiological research.

696. Seminar
   a. Advanced Mammalian Physiology (1 to 4) [Rpt./1] I II Open to majors and minors only. P, 600, 601, 602; 606 or Anat. 605.
   b. Literature (1) [Rpt./1] I II Open to majors only. P, 600, 601, 602; 606 or Anat. 605.

801. Human Physiology (8) II

805. Neurosciences (6) II (Identical with Anat. 805)

PLANETARY SCIENCES

Professors Victor R. Baker, William B. Hubbard, Donald M. Hunten, J. Randolph Jokipii, John S. Lewis, George H. Rieke, Bradford A. Smith, Charles P. Sonett, Robert G. Strom
Associate Professors Laurel L. Wilkening, Head, William V. Boynton, Michael J. Drake, Uwe Fink, Eugene H. Levy, H. Jay Melosh
Participating Faculty from the Lunar and Planetary Laboratory:
   Professors Tom Gehrels, Elizabeth Roemer
Research Associate Professors Harold P. Larson, Martin G. Tomasko, Benjamin H. Zellner
Research Fellows Larry A. Lebofsky, Ewen A. Whitaker

The Department of Planetary Sciences offers a multidisciplinary program leading to the degrees of Master of Science and Doctor of Philosophy with a major in planetary sciences. For admission and degree requirements, please see the Graduate Catalog.

105. The Universe and Humanity: Origin and Destiny (3) I II Formation and evolution of the Universe, the solar system, and life; events which led to our existence; the future for life in the solar system; life elsewhere. Designed for nonscientists. (Identical with Astr. 105)

106. Survey of the Solar System (4) I II Interdisciplinary synthesis of planetary and space science; the sun, planets, satellites, interplanetary gas, comets, small bodies, space missions. Designed for nonscientists. 3R, 3L. (Identical with Astr. 106 and Geos. 106)


403. Introduction to the Solar System (3) GC I Survey of planetology; origin of planets; asteroids; meteorites; interplanetary dust and gas; planetary interiors; geophysics; planetary atmospheres; origin of life. Advanced degree credit available only with departmental permission. P, Phys. 103a-103b. (Identical with Astr. 403 and Geos. 403)

404. Exploration of the Solar System (3) GC I S Primitive astronomy to modern space exploration; planetary science fundamentals, solar system physical properties; planetarium demonstrations, classroom projects. Field trip. Advanced degree credit available only with departmental permission. (Identical with Astr. 404)

419. Physics of the Earth (3) GC I (Identical with Geos. 419)


510. Principles of Cosmochemistry (3) I 1984-85 Chemical compositions of solar system objects; equilibrium and nonequilibrium chemical processes applied to planets; cosmochronology. P, 403, Chem. 480a-480b.


518. Experimental Methods of Planetary Science (3) I 1983-84 Nature and detection of radiant energy; remote optical methods and direct sampling techniques; error analysis and ultimate limits to system performance; numerical procedures; laboratory experiments in cosmochemistry, absorption spectroscopy and IR detector technology. 2R, 3L. P, introductory physics and calculus. (Identical with Atmo. 518 and Astr. 518)
520. **Meteorites** (3) II 1984-85 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)

527. **Advanced Geochemistry** (3) I (Identical with Geos. 527)

528. **Nuclear Geology** (3) II 1984-85 (Identical with Geos. 528)

544. **Physics of the High Atmosphere** (3) II 1983-84 Physical properties of the upper atmosphere, including gaseous composition, temperature and density, ozonosphere, and ionosphere, with emphasis on chemical transformations and eddy transport. (Identical with Atmo. 544)


554. **Evolution of Planetary Surfaces** (3) II 1984-85 The geologic processes and evolution of terrestrial planet and satellite surfaces including the Galilean and Saturnian satellites; possible origins of impacting objects; implications for the early history of the Earth. P, 311, 403. (Identical with Geos. 554)


565. **Jovian Planets and Satellites** (3) I 1984-85 Observational data; atmospheric structure and composition; thermal balance; mass, radius, flattening; physics of light elements at high pressures; structure of rotating planets; origin of magnetic fields. P, 403.

567. **Inverse Problems in Geophysics** (3) I 1984-85 (Identical with Geos. 567)

571. **Constitution and Evolution of the Terrestrial Planets** (3) I 1983-84 Composition and evolution of terrestrial planets; includes the Moon, asteroids, meteorites, other evolved rocky satellites; geophysical/geochemical techniques used to deduce histories. (Identical with Geos. 571)

596. **Seminar**

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**PLANT PATHOLOGY**


Associate Professor H. Earl Bloss

Assistant Professor Iraj J. Misaghi

The curriculum for students majoring in plant pathology is planned to develop understanding and recognition of plant pathogens, host reaction to infection, and means to control or prevent diseases of plants.

- The department offers the degrees of Bachelor of Science in Agriculture, Master of Science and Doctor of Philosophy with a major in plant pathology.

  *The major*: In addition to meeting the requirements of the agricultural science curriculum, as outlined in the *College of Agriculture* section of this catalog, students must take 205, 206, 402, 407, 451, Micr. 110. The suggested program includes Pl.S. 100; V.Sc. 250; G.Bio. 321 or Pl.S. 228; Cell. 460; Chem. 241a-241b, 243a-243b; Math. 117e, 118 and 263 or Pl.S. 421; Phys. 102a or 102b. Calculus and computer science are also recommended.

120. **Recognition and Control of Plant Diseases** (2) I Diagnosis and control of plant diseases. Designed primarily for home gardeners and nurserymen. Not open to plant pathology or plant protection majors. Credit allowed for this course or 205, but not for both.

205. **General Plant Pathology** (3) I Detailed study of representative plant diseases, with emphasis on basic concepts of diagnosis, cause, epidemiology, and control. Credit allowed for this course or 120, but not for both. P, Pl.S. 100.

208. **General Plant Pathology Laboratory** (1) I Lab. exercises in plant pathology, P, 205 or CR.

250. **Forest Pathology** (3) II Basic principles of plant pathology, with emphasis on diseases of forest trees and associated vegetation. Designed for majors in natural resources. 2R, 3L. P, Pl.S. 100.
402. Introduction to Pesticides and Their Use (2) GC II Overview of pesticide use, with emphasis on interaction of technical, societal, individual, and regulatory aspects of the choices; specific control recommendations not stressed. (Identical with Ento. 402, Pl.S. 402, and S.W.E. 402)


451. Diagnosis and Control of Plant Diseases (3) GC I Field and lab. course designed to give students familiarity with diagnosis of plant diseases and plant disease control concepts. 2R, 3L. All-day field trips. P, 206.

475a-475b. General Mycology (3-3) GC 1984-85 Introduction to the fungi, including their structure, function, classification, and ecological importance. 475a: Basidiomycetes and Fungi Imperfecti. 475b: Myxomycetes, Phycomycetes, and Ascomycetes. 2R, 3L. P, Pl.S. 100. 475a is not prerequisite to 475b.

516. Plant Nematology (3) II 1984-85 Introductory course in plant nematology, including the nature, ecology and classification of plant parasitic nematodes. Diagnosis and control of nematode diseases of plants. 2R, 3L. P, 205.

520. Analytical Techniques for Phytopathological Research (4) II Techniques, including chromatography, electrophoresis, spectroscopy and immunology. 2R, 6L. P, 206.

596. Seminar
   a. Current Research (1 to 3) I II


694. Practicum

PLANT SCIENCES


Associate Professors Paul M. Bessey, Koaru Matsuda, Hiroshi Muramoto
Assistant Professors Wallace C. Hofmann, Albert K. Huff, Chi Won Lee, Victoria Marcarian (Adjunct), Eugene A. Mielke, David A. Palzkill (Adjunct), Dennis T. Ray (Adjunct), M. Dale Williams (Adjunct)

The Department of Plant Sciences offers a broad spectrum of principles and practices related to agronomy, horticulture, production physiology, plant breeding, and genetics. The academic training prepares a student for a wide range of opportunities in plant-related sciences and agriculture.

The Bachelor of Science in Agriculture degree is available to undergraduate students with majors in agronomy and in horticulture. A third major designated as plant sciences is available to undergraduates preparing for entrance to a graduate school. The Master of Science and Doctor of Philosophy degrees are available with majors in either agronomy and plant genetics or horticulture.
Undergraduate students majoring in agronomy or horticulture will follow the agriculture curriculum as specified below. Majors in plant sciences will follow the agricultural science curriculum. The agricultural business curriculum may be elected with majors in agronomy or horticulture. Consult adviser.

The agriculture curriculum: Students following this curriculum must fulfill the requirements specified in the College of Agriculture section of this catalog, including in their programs 100, 110, 228 or G.Bio. 320 or 321; Pl.S. 405; Ento. 151 or 201R; Pl.P. 205; Chem. 103a-103b, 104a-104b; G.Bio. 260 or Cell. 460; S.W.E. 200, 201.

The major in agronomy: For the concentration in general agronomy, it is suggested that students take 212, 235, 296a, plus nine additional units in pl.s. and six units from s.w.e. For the concentration in seed industry management, 212, 235, Acct. 204 or 200a-200b, Econ. 201a, Mgmt. 320, 330, and Mktg. 361 are required.

The major in horticulture: Students in this major selecting the concentration in general horticulture are required to complete 230, 239, 255, 332 or 334a, 342 or 343, and one from the following: 357, 358, 359, or 362. For the concentration in environmental and landscape horticulture, the following are required: 230, 239, 251 or 354, 332 or 334a, 342 or 343, and 353. For the concentration in fruit and vegetable production, the following are required: 212, 230, 255, plus at least two of the following: 357, 358, 359, 362.

The agricultural science curriculum: Students following this curriculum must meet the requirements specified in the college section, including in their programs 100, 101, 110, 228 or G.Bio. 320 or 321; Chem. 103a-103b, 104a-104b, 241a-241b, 243a-243b; G.Bio. 260 or Cell. 460.

The major in plant sciences: For the concentration in botany, the student must complete Ecol. 102 or G.Bio. 436, Ecol. 450, 470, 472, Cell. 460. For the concentration in plant breeding and genetics, the following courses are suggested: 235, 405, 421, 516; Ento. 151 or 201R; Pl.P. 205; S.W.E. 200, 201; Ecol. 470. For the concentration in production physiology, the following courses are suggested: 212, 405, 408; three additional units in pl.s.; S.W.E. 200, 201; 314 or 316; 404 or 497c; Ento. 151 or 201R; Pl.P. 205.

The agricultural business curriculum: In addition to the requirements specified in the college section, students following this curriculum must complete the agriculture curriculum, excepting any two of the following: Ento. 151, Pl.P. 205, or Pl.S. 405. In addition, ten additional units of pl.s. within one of the areas of concentration within the agronomy or horticulture major must be chosen in consultation with a major adviser.
255. **Vegetable Production** (3) I Vegetable production in the Southwest, including climatic requirements, varieties, and cultural practices related to the vegetable industry. P, 110. Oebker

258. **Forage Production** (3) II Adaptation, culture, and growth of legumes, grasses, and other forage plants, with emphasis on a critical examination of literature pertaining to forage crop improvement. All-day field trip. P, 100 or 110. Schonhorst

259. **Cotton and Other Fiber Crops** (3) I Principles and practices of growing and harvesting cotton and other fiber crops, with emphasis on cotton production, fiber technology, and utilization. All-day field trip. P, 110. Muramoto

272. **Grain Crop Production** (2) II Economic importance, production, utilization, and improvement of grain crops. Voigt

276. **Production Skills** (1) I II Field and greenhouse experience in horticulture and agronomic crop production, tractor and power equipment operation, irrigation practice, crop culture. Field trips. 3L. Open only to majors with no farming experience. Bessey

296. **Proseminar**
   a. Crops and Soils (1) I II (Identical with S.W.E. 296a)

322. **Arid Landscape Plants** (3) II Plants adapted to arid environments for landscape and revegetation of disturbed land areas. 1R, 6L. Field trips. P, 110.

334a-334b. **Plant Materials** (3-3) I I (Identical with L.Ar. 334a-334b)

342. **Principles and Practices in Floriculture** (3) II Physiological principles and environmental factors in the production of potted plants and cut flower crops. 2R, 3L. P, 110, 230. Lee

343. **Indoor Foliage Plants** (3) I Environmental and nutritional requirements of foliage plants used for interior decoration; uses, identification, nomenclature. 2R, 3L. Field trip. P, 239 or CR.


354. **Landscape Management** (3) I Installing, establishing and maintaining plants in the landscape; synthesis of cultural practices and environmental management techniques. 2R, 3L. Field trip. P, 100 or 110. Sacamano

357. **Principles of Fruit Production I** (3) I Principles of the commercial production of nut and vine crops. 2R, 3L. Field trips. P, 110. Mielke

358. **Principles of Fruit Production II** (3) II Principles of the commercial production of stone and pome fruits. 2R, 3L. Field trips. P, 110. Mielke

359. **Citriculture** (3) I Citrus growth in desert regions, including climatic requirements, cultivars, varieties, rootstocks, physiology, fruit development, and orchard management. P, 110. Huff

362. **Tropical and Subtropical Horticulture** (3) I Horticultural plants of the world, with emphasis on crops outside the continental U.S., their botany, climatic adaptation, and culture. P, six units of pl.s.

402. **Introduction to Pesticides and Their Use** (2) GC II (Identical with P.I.P. 402)

405. **Weed Control** (3) GC I Principles and effects of controlling agronomic, horticultural, and range weeds, with emphasis on chemical control methods; weed identification. 2R, 3L. P, 6 units of pl.s. Hamilton

408. **Crop Ecology** (3) GC 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, eleven units of pl.s. Briggs

421. **Field Plot Research** (3) GC I Principles of field plot research, with emphasis on procedures in small plot experimentation, such as the laying out of experiments, size and shape of plots, border effects, collection of data, and the summarization and publication of results. 2R, 3L P, Math. 117e.


466. **Postharvest Physiology** (3) GC II 1983-84 Postharvest physiology, grading, packing, storage, transportation and handling of fruits, vegetables and other horticultural products. P, G.Bio. 260 or Cell. 460; Chem. 241a. (Identical with N.F.S. 466) Huff

482. **Plant Cell and Tissue Culture** (3) GC II Principles and theory of callus induction, embryoid and plantlet regeneration, nutrient transport, protoplast culture and fusion and cell suspension. 2R, 3L P, G.Bio. 260. Katterman

506. **Plant Resistance to Insects** (2) II 1984-85 (Identical with Ento. 506)

516. **Genetic Principles of Hybrid Seed Production** (3) II Genetic and cyto genetic principles applied to the development and maintenance of inbreds and to the production of hybrid seed. P, 228, G.Bio. 320 or 321. Bemis
528. **Plant Microtechnique (4)** II Theory and practice of plant histological technique, including the use of light and electron microscopes and accessory equipment. P, twelve units of plant sciences or biology. Bartels


562. **Plant Intermediary Metabolism (3)** II 1984-85 (Identical with Cell. 562)

564. **Plant Growth and Development (3)** II 1983-84 (Identical with Cell. 564)


631. **Crop Physiology (3)** I Plant processes and environmental interactions in relation to growth and production of crop communities, with emphasis on recent advances and research techniques. P, G.Bio. 260 or Cell. 460.


634. **Quantitative Genetics and Selection (3)** II 1983-84 Biological approach to the principles of quantitative inheritance as applied to the selection of quantitative characters in breeding experiments, with emphasis on the methods of measuring, analyzing, and interpreting quantitative data. P, three units of gene.; Agri. 539.

635. **Advanced Cytogenetics (4)** II Fundamental principles that illustrate the correlation of genetic and cytological features involving intra- and interchromosomal structural changes, heterploidy and species hybrids. 3R, 3L. P, 6 units of gene. Endrizzi

696. **Seminar**
- a. Agronomy (1) [Rpt./2] I II
- b. Horticulture (1) [Rpt./2] I II

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**POLITICAL SCIENCE**

Professors John C. Wahlke, **Head**, James A. Clarke, Richard C. Cortner, Vine Deloria, Jr., Rosendo A. Gomez (Emeritus), Neal Houghton (Emeritus), Helen M. Ingram, Conrad F. Joyner, Paul Kelso (Emeritus), Clifford M. Lytle, Edward N. Muller, Jerrold G. Rusk, Currin V. Shields (Emeritus), Peter A. Toma, Allen S. Whiting, Edward J. Williams, Clifton E. Wilson


Assistant Professors Thomas M. Holm, Lyn Ragsdale

The Department of Political Science 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 are available with a teaching major in political science.

**The major:** Thirty units, including 102 and at least one of the following: 140, 150, 220. At least 21 units must be selected from the fields listed below, including at least three units in each of any five fields. Individual study may not be applied to the 21-unit requirement.

**The teaching minor:** Twenty units, including 102, and either 103 or 214a (110 is not applicable to the teaching minor), and three units in each of any three fields of study listed below. Teacher certification: The U.S. and Arizona Constitutions requirement for a teacher’s certificate may be satisfied by three course options: 102, 103; 102, 214a; or 110. An additional option is the Constitutions examination, which carries no University credit.

406 DEPARTMENTS AND COURSES OF INSTRUCTION


Special programs: Majors interested in law, civil service or foreign service should consult the department's career advisers regarding an appropriate course of study. Internships are offered in connection with the State Legislature, the Public Defender, the Juvenile Court, administrative agencies of the City of Tucson and Pima County, and the U.S. Congress. Prelaw students interested in legal problems of American Indians may combine prelaw and American Indian policy courses in the Department of Political Science with the minor in American Indian studies.

Honors: The department participates in the Honors Program.

101. Introduction to Politics (3) I II Issues in contemporary political analysis; human values and political goals; how governments differ and why they change; how nations influence one another. Not open to students with previous credit in 220, 140 or 150.

102. American National Government (3) I II General survey of the constitutional bases, organization, and functioning of the American national government; recent and current trends. Credit allowed for this course or 110, but not for both.

103. American State and Local Government (3) I II General survey of state and local government; recent and current trends.

110.* National and State Constitutions (3) I II Meets the state requirement for a teacher's certificate. Designed for seniors intending to teach. Credit allowed for this course or 102, but not for both.

*The state requirement for a teacher's certificate may be taken through correspondence or by special examination.

140. Introduction to Comparative Politics (3) I II Survey of the major political systems and analysis of comparative political concepts, with a view to preparation for more advanced study.

150. 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.

205. The American Presidency (3) I II Political dynamics of the executive office and its relationship to the competitive branches of government within the American political system.

206. Public Administration and Policy (3) I Theory and practice of executive agencies, including policy making and other functions, processes, personnel and fiscal management, and administrative law.

214a-214b. Arizona Government (3-1) 214a: History, structure, powers and processes of state and local government. May be used for state teacher certification. 214b: Arizona constitution. Offered through correspondence only. 214a is not prerequisite to 214b.

220. Introduction to Political Ideas (3) I Basic issues in political thought, with emphasis on contemporary problems of democracy, liberty, authority, obligation, and ideology.

231. Political Parties (3) I II Organization, goals, functions, and leadership of parties in Western democracies, especially in America, with special attention to electoral law and conduct of elections, from delegate selection and conventions to Electoral College and proposals for reform.

240. Canadian Government and Foreign Policy (3) I Analysis of politics, parties and parliament problems, with emphasis on Quebec, resources, and the United States.

242a-242b. Western European Political Systems (3-3) Examination of the ideological framework, political culture, functions and processes of the Western European political systems. 242a: Britain, Ireland, Scandinavia and the Low Countries. 242b: France, Italy, West Germany and Spain. 242a is not prerequisite to 242b.

247. Introduction to Latin-American Politics (3) I Survey of the political forces and social groups important in shaping contemporary Latin America; examination of Indians, slaves, peasants, landlords, labor, the middle sectors, and the military; discussion of theories of instability.

250. Contemporary International Politics (3) I II Analysis of conflicts of national interests; decision making in the present international system; role-playing and simulation experience.

251. The United Nations (3) I The United Nations and its agencies, with emphasis on major issues confronting the organization.

297. Workshop a. U.N. (1 to 3) I II Open to participants in Model U.N. programs only. d. Election Law (3) I All-day field trips.

309. The Judicial Process (3) I II Structure, function, and processes of the "third branch" of the American government.

315. Political Sociology (3) I (Identical with Soc. 315)
328. **Problems in Contemporary Political Theory** (3) II Intensive examination of selected problems and concepts in political theory.

330. **Minority Groups and American Politics** (3) I 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 B.I.S. 330 and M.A.S. 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 M.A.S. 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 A.I.N.S. 334)

342. **Comparative Public Administration** (3) II Administrative systems as agents of public policy; problems of recruitment, accountability, corruption in U.S., Europe and developing nations; review of health, welfare, taxation, environment and other policies.

393. **Internship**
   - b. Public Defender (1 to 6) I II
   - c. County Attorney (1 to 6) I II
   - d. Senatorial Internship (1 to 12) I II Open to majors only.
   - e. Congressional Internship (1 to 12) I II Open to majors only.

396. **Proseminar**
   - a. Honors (3) [Rpt./2] I II

406. **Bureaucracy** (3) GC I Analyses of legal, political, cultural and behavioral aspects of public organizations, bureaucratic typologies and methods of public control.

407. **The Legislative Process** (3) GC I II Analysis of relations between Congress and other consequential forces, including the White House, lobbyists and public opinion; internal life and roles of Congress in national decision making; comparisons with state and foreign systems.

408. **Parliamentary Procedure** (3) II (Identical with Sp.C. 408)

412. **Local Government and Administration** (3) GC I II Examination and analysis of local decision-making structures and their policy outputs. P, 103.

421. **Ancient and Medieval Political Theory** (3) GC I Development of Western political theory from the Greeks to Machiavelli.

422. **Early Modern Political Theory** (3) GC II Western political theory from Machiavelli to Marx.

423. **Recent Political Thought** (3) GC I II Political theory from Marx to the present.

426. **American Political Thought** (3) GC II American political ideas from colonial times to the present.

431. **Political Culture and the Dynamics of Change in American Society** (3) GC I 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.

432. **Pressure Groups** (3) GC I II 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.

433. **Political Research and Methodology** (3) GC I Introduction to research design and methods, with attention to philosophical foundations of modern political science.

434. **Quantitative Analysis of Political Problems** (3) GC I Introduction to the use of statistics on political data, with emphasis on statistical manipulation; evaluation and interpretation of statistical explanations of political phenomena.

435. **Public Opinion and Voting Behavior** (3) GC 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. (Identical with Soc. 435)

436. **Personality and Politics** (3) GC II Examination of the theories and concepts associated with the psychological basis of various types of political behavior.

437. **Political Participation and Democracy** (3) GC I Cross-national survey of political attitudes and behavior of ordinary citizens relevant to the stability of democratic political systems.

440. **Politics and Mythology** (3) GC I Comparative examination of the role of mythology in building nations, political legitimation, and cultural revitalization.

443. **Soviet Politics** (3) GC I Revolution and contemporary ideology; state, party and mass organizations; economic and social planning; civil liberties; models of autocracy and pluralism.

444. **East European Politics** (3) GC II Divergent models of Communist development, from East Germany to Yugoslavia; political, economic, social and cultural reform.
445. **Comparative Political Revolution (3) GC I** Examination of the causes and consequences of 20th-century revolutions and the revolutionary process, with emphasis on contemporary events.

446. **Politics of Developing Areas (3) GC II** Survey of politics and problems in Asia, Africa, and Latin America, including political violence, elections, bargaining, elites, parties, the military and ideology.

447. **Latin-American Political Development (3) GC II** Presentation of strategies for development in Latin America; examination of case studies from Cuba, Brazil, Chile, Guatemala, and other countries.

448. **Government and Politics of Mexico (3) GC I** Description and analysis of Mexico's political economy, its political system, and its foreign policy, with emphasis on Mexican-U.S. relations. (Identical with M.A.S. 448)

449. **The Politics of Cultural Conflict (3) GC II** Comparative examination of the approaches of different types of political systems to domestic conflict of a racial, religious, lingual and/or ethnic nature.

450. **Soviet Foreign Policy (3) GC I** Ends and means of Soviet foreign policy; the decision-making process; Soviet relations with the West and developing nations.

451. **Communist Foreign Relations (3) GC II** Interrelations of fourteen Communist-party states, with emphasis on cooperation and conflict in such organizations as the Comecon and the Warsaw Pact.

452. **Theories of International Relations (3) GC I** Introduction to theories of international relations on the levels of man, the nation-state, and the international system, with a logical and empirical evaluation of approaches and theories.

453. **American Foreign Policy (3) GC I II** Analysis of the Cold War; Congressional-Executive clashes over foreign policy control; approaches to policy analysis.

454a-454b. **International Law (3-3)** GC 456a: The international state system; legal-political problems, including territory, environment, seas. 456b: The international system and the individual; the war system, including use of force, laws of war. 456a is not prerequisite to 456b.

457. **Inter-American Politics (3) GC I** Survey and analysis of the leading political and economic issues at controversy between the United States and Latin America.

458. **Government and Politics of the Middle East (3) GC II** (Identical with Or.S. 458, which is home.)

459. **Problems of World Order (3) GC II** Analysis of complex, interrelated global problems, threats to survival, quality of life and exploration of past and present policies and future worlds. Course is value-oriented and prescriptive.

460. **Modern Chinese Foreign Relations (3) GC II** (Identical with Or.S. 460)

461a-461b. **Chinese Politics, 1911-Present (3-3)** GC (Identical with Or.S. 461a-461b)

462. **International Relations of East Asia (3) GC II** National interests, issues and conflicts, relations, and influence of domestic politics in interstate relations in East Asia. (Identical with Or.S. 464)

463. **Government and Politics of Africa (3) GC II** Government and politics of African nations south of the Sahara; emphasis on processes of political and economic development. (Identical with BI.S. 468)


465. **Constitutional Law: Civil Liberties (3) GC I II** Analysis of the constitutional guarantees of civil liberties in the U.S.

466a-466b. **Philosophy of Law (3-3)** GC (Identical with Phil. 472a-472b)

467. **Administrative Law (3) GC I** Law governing the organization, powers, and procedures of the executive and administrative establishment, with emphasis on the limitations imposed by the American constitutional system.

468. **Concepts in Criminal Law (3) GC II** Focus on questions such as what constitutes a crime; when is killing murder; what makes punishment just; what distinctions exist between justifiable and excusable crimes.

469. **Women and the Law (3) GC I 1984-85** Legal status of women in America, including constitutional protections, marriage and family relationships, educational and vocational opportunities, political rights, criminal law. (Identical with W.S. 476)

470. **Formation of Public Policy (3) GC I** Needs and demands for public action on policy issues; organization and nature of political support; processes and problems of decision making in the formation of public policy at the national, state, and local levels.

471. **Environmental Policy (3) GC II** Role of government in management of energy, natural resources and environment; process and policy alternatives; special attention to the Southwest. (Identical with W.R.A. 481)

472a. **Urban Public Policy (3) GC I II** Analysis and discussion of social, economic, and political problems and proposed solutions in changing urban environments.
484a-484b. Development of Federal Indian Policy (3-3) GC 484a: European colonial precedents through the treaty-making period. 484b: End of treaty-making to the present. 484a is not prerequisite to 484b. (Identical with A.In.S. 484a-484b)

485. National Security Policy (3) GC I Decision-making structures, processes and outcomes relevant to American security policy; comparison with major foreign powers.

486. Political Systems of India and Pakistan (3) GC II (Identical with Or.S. 486)

487. Race and Public Policy (3) GC I Examination of the race issue in the context of American politics, from historical, behavioral, and comparative perspectives. (Identical with A.In.S. 487 and BI.S. 487)

579. Research Design (3) I Introduction to experimental and quasi-experimental research design; survey research; the use of aggregate statistics; historical documents and life-history materials; participant observation; unobtrusive methods.

580. Methods of Political Inquiry (3) I II Systematic examination of problems of scope and methods of inquiry in the discipline of political science; intended to acquaint students with the discipline and to prepare them for scholarly research in the field.

582. Research and Methodology (4) II Quantitative techniques and computer applications in political science.

595. Colloquium
   a. American Political Institutions (3) I II
   b. Political Behavior (3) I II
   c. Survey of Political Theory (3) I II
   d. Comparative Politics (3) I II
   e. International Relations (3) I II

596. Seminar
   a. American Political Institutions (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
   f. Public Law and the Judicial Process (3) [Rpt./2] I II
   g. Public Policy (3) [Rpt./2] I II
   h. American Indian Law and Policy (3) [Rpt./2] I II

610a-610b. Fiscal and Budgetary Administration of Public Agencies (3-3) (Identical with P.P.P.A. 610a-610b)

PORTUGUESE
(See Spanish and Portuguese)

PSYCHOLOGY


Associate Professors Harold S. Arkowitz, Philip Balch, Wayne R. Carroll, Lewis Hertz, Spencer A. McWilliams, Ronald H. Pool, William H. Thweatt

Assistant Professors Jeff L. Greenberg, David E. Kieras, George P. Knight, Karen A. Paulsen, Susan A. Warner

Lecturers Hubert R. Estes, Reed A. Mencke

The Department of Psychology offers courses designed to provide an understanding of the scientific principles of human and animal behavior.

Degrees awarded are the Bachelor of Arts, Bachelor of Science, Master of Arts and Doctor of Philosophy with a major in psychology. The master's degree is awarded during doctoral training; there is no M.A. program as such.
The major for the B.A.: 36 units of psyc., including at least eighteen upper-division units, and 100a-100b, 245, and 255. Majors must also complete at least six units in each of the following four areas (24 units total): (1) biological bases of behavior: 302, 312, 400, 401, 403, 404a-404b, 411AR, 411AL, 481; (2) cognitive-affective bases of behavior: 329, 370, 371, 411bR, 411bL, 425, 428, 472, 482; (3) social bases of behavior: 300, 410, 421, 430a-430b, 435, 450, 483; (4) individual bases of behavior: 265, 313, 414R, 414L, 416, 418, 458, 484. One three-unit course from among 405, 475, 485, 94 series, or 99 series, may be substituted for one, only, of the thirty area courses listed above. A maximum of twelve elective units in psyc. courses may be included in the major. Students planning to attend graduate school should complete 405 and 475.

The major for the B.S.: Same psyc. requirements as above, with the addition of eight units in a biological lab. science (G.Bio. 100a-100b and 101a-101b excluded); eight units in either chemistry or physics lab. courses; Math. 117e and either Math. 119 or Math. 123.

The department will present additional topics, as needed, in the variable-content courses 481 through 485, 576, and 577: creativity, myths and tales, psychology and women, humanistic psychology, computer applications, ergonomics, visual processes, group leadership, community problems, and others.

Recommended minors are biological, physical, or social sciences, and mathematics. A minimum of three upper-division units is required.

The minor and teaching minor: 15 units of psyc. (nine of which must be in upper-division courses), in addition to 100a-100b. A maximum of three units of independent study may be included in the 15 units of the minor.

100a-100b. Elementary Psychology (3-3) 100a: History and systems, physiology, neurology, sensation, perception, learning, motivation, memory, cognition, language. 100b: Development, personality, social psychology, intelligence, testing, psychopathology, behavior therapy. 100a is not prerequisite to 100b. Both 100a and 100b are offered each semester.

245. Psychological Measurement and Statistics (3) I II Measurement, quantitative description, and statistical inference as applied to psychological variables. P, Math. 116; Psyc. 100a or 100b or CR.

255. Research Methods (3) I II Students will gain experience in a range of psychological research methods. 2R, 3L. P, 100a or 100b, 245.

265. Normal Personality (3) I II Practical implications of psychology for normal personality growth, with emphasis on development in the college years; applications to students' lives discussed in student-led groups. (Students unwilling to participate in the small-group sessions of the course must consult instructor for alternative assignment.) 2R, 3L. P, 100b.

300. Social Psychology (3) I II Basic concepts and theories in social psychology; the individual as related to culture and group situations. P, 100a-100b.

302. Neurological Foundations of Behavior (3) I II Review of the anatomy and physiology of the mammalian nervous system; designed for students in the life sciences. P, 100a-100b or eight units of bio. lab. sci.

312. Primate Behavior (3) I II Survey of psychological research on nonhuman primates; includes sensory processes, learning, development, social and abnormal behaviors. P, 100a-100b.

313. Developmental Psychology (3) I II The child, from conception to adolescence, with emphasis on experimental analyses of the development of behavior. P, 100b.


370. Learning and Cognition (3) I Review of learning processes and related research methods and findings. P, 100a.

371. Environmental Psychology (3) I Basic concepts in environmental psychology; the relationship between the individual and the large-scale environment. P, 100a.

400. Neurological Psychology (3) GC I II Group discussion, demonstrations and experiments on current problems in neuropsychology. Problems selected to permit students to integrate laboratory techniques, research literature, and anatomical and physiological knowledge with behavioral theory. P, 100a-100b, 255, 302.

401. Body Chemistry and Behavior (3) GC I Biochemical compounds related to life and the role of behavior in life; chemical processes occurring within organisms and how they interact with behavior. P, 100a-100b; and 302 or 8 units of bio. lab. sci.

403. Biopsychology (3) GC I Functions of the brain and other bodily systems in reflex and learned control of movement and perceptual responses; emotional effects and experiences, sleep, and language. P, 100a-100b, 302.
404a-404b. Human Brain-Behavior Relationships (3-3) GC 404a: Brain functions in relation to intelligence, speech, memory, judgment and reasoning, and visual-spatial abilities. P, 302. 404b: Continuation of 404a; methods of examination of human brain functioning in relation to individual differences in both normal and brain-damaged persons.

405. Advanced Statistical Methods in Psychology (3) II Rationale and methods of statistical inference; sampling distributions, analysis of variance, statistical models; comparisons, correlation and regression. P, 100a-100b and 255.

410. Advanced Social Psychology (3) GC I II Social psychology, with emphasis on theory and method. P, 245, 300.

411aR-411bR. Comparative Psychology (3-3) GC Systematic study of animal behavior. 411aR: Analysis of environmental and genetic determinants of behavior, special behavioral adaptations in animals, and sociobiological concepts. 411bR: Animal learning with emphasis on interspecies comparisons. 411aR is not prerequisite to 411bR. P, 100a-100b.

411aL-411bL. Comparative Psychology Laboratory (1-1) GC 411aL: Lab. training in animal early experience and social behavior research. P, 100a-100b, 245, CR 411aR. 411bL: Lab. training in animal learning techniques. P, 100a-100b, 245, CR 411bR. 411aL is not prerequisite to 411bL.

414R. Advanced Developmental Psychology (3) GC I II Research and theory in the development of individuals from birth to death. P, 100a-100b, 313.

414L. Advanced Developmental Psychology Laboratory (1) [Rpt./1] GC I II Applications of developmental psychology in lab. and natural settings. P, 100a-100b; 414R or CR.

416. Personality (3) GC I II Advanced study of theories of personality; methods and results of personality study. P, 100a-100b, 245.

418. Abnormal Psychology (3) GC I II Nature and etiology of various forms of behavior disorder, mental deficiency, and other deviations; critical evaluation of current theories. P, 100a-100b, 245.

421. Psychology of Death and Loss (3) GC 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, 100a-100b.

425. Advanced Perception (3) GC II Experiments in perception and sensory processes. P, 100a-100b, 255, 329; or grad. standing.

426. Field Methods in Environmental Psychology (3) GC II Behavior in man-made or managed environments, with emphasis on objective methods; designed for students having a professional interest in environmental design or management. P, 371. (Identical with Arch. 428 and L.Ar. 428)

430a-430b. Psychology, Law and Social Policy (3-3) GC Critical review of theory, methods and research in the psychology, law and social policy interface. P, 100a-100b. 430a is not prerequisite to 430b.

435. Psychological Problems of the Aged (3) GC I Cognitive, intellectual, personality, and behavioral correlates of aging; relates general psychological theory to the problems of aging. P, 100a-100b or grad. standing.

450. Psychological Assessment and Testing (3) GC I II Evaluation of assessment processes and of measurements of intelligence, aptitudes, personality, and interests; test theory; social implications. P, 100a-100b, 245.

458. Psychopathology (3) GC II In-depth study of current theoretical and research formulations in behavior deviancy; various approaches to behavior change. P, 418.

472. Human Memory and Cognition (3) GC II Human learning, memory, and cognition; emphasis on information-processing approach to results and theory. P, 100a-100b, 245, 370; or grad. standing.

475. History of Psychology (3) GC I Growth of psychology as a science; major schools and theories; contributions of famous investigators and major advances; psychology as an art and a science today. P, 100a-100b, 255.

481. Topics in the Biological Bases of Behavior (3) [Rpt./1] GC I II Variable content (consult schedule); physiological, neurological, sensory, and motor systems; comparative psych., others. P, 100a-100b and six units upper-div. psyc.; or grad. standing.

482. Topics in the Cognitive and Affective Bases of Behavior (3) [Rpt./1] GC I II Variable content (consult schedule); learning, cognition, perception, psycholinguistics, emotion, others. P, 100a-100b and six units upper-div. psyc.; or grad. standing.

483. Topics in Social Bases of Behavior (3) [Rpt./1] GC I II Variable content (consult schedule); group processes, organizational theory, leadership, others. P, 100a-100b and six units upper-div. psyc.; or grad. standing.

484. Topics in Individual Bases of Behavior (3) [Rpt./1] GC I II Variable content (consult schedule); developmental psychology, personality, psychopathology, others. P, 100a-100b and six units upper-div. psyc.; or grad. standing.
485. Contemporary Issues in Psychology (3) [Rpt./1] GC I II Variable content (consult schedule); major topica l problems in psychological research, theory, and applications. P. 100a-100b and six units of upper-div. psyc.; or grad. standing.

507a-507b. Statistical Methods in Psychological Research (3-3) 507a: Research design, application of analysis of variance, multiple comparisons, and computer techniques in psychological research. 507b: Selected methodological issues and multivariate methods in psychology, with coverage of computer applications. Open to psychology majors only.

509. History of Psychological Theories and Research (3) II Development of psychology as a science; schools, systems, theories, major advances, famous investigators.

520a-520b. Theory and Research in Biopsychology (3-3) [Rpt./1] 520a: Review of current theories and research in biopsychology. 520b: Research methods for the study of biological processes and behavior; emphasis on current techniques and instrumentation for stimulus control, recording and analyzing behavioral data, and psychopharmacological studies. P. 403.

521a-521b. Theory and Research in Environmental Psychology (3-3) Advanced topics in environmental psyc. 521a: Emphasizes research and application. 521b: Emphasizes methodology.


528a-528b. Neuropsychology: Assessment and Clinical Applications (3-3) 528a: Methods of neuropsychological examination of children; interpretation of test results in brain damage, behavioral disturbances, and learning disorders. P. 404b. 528b: Continuation of 528a. Clinical applications in neurological and neurosurgical settings; aging effects; emotional versus organic problems; forensic neuropsychology; and rehabilitation.

550. Theory and Research Methods in Developmental Psychology (3) I Major theories and research methods in contemporary developmental psychology.

551. Social/Personality Development (3) II 1984-85 Theories and research in the development of social behavior patterns and personality.

552. Child Language Development (3) II 1983-84 Advanced theories and research related to children’s acquisition of their native language.

555. Cognitive Processes (3) I Intensive review of current theories and results in human cognitive processes from an information-processing perspective.

560a-560b. The Effects of Law on Psychology (3-3) 1984-85 Critical evaluation of the professional organizational standards and laws controlling the science and profession of psychology, and the clients of their services.

561a-561b. Theory and Research in Law and Psychology (3-3) [Rpt./1] 1983-84 Advanced topics in law psychology. 561a: Research and application. 561b: Methodology.

575. Personality Theory and Research (3) II Basic problems of theory construction, with application to theoretical systems in the personality area. P. 416.

576. Contemporary Issues in Experimental Psychology (3) [Rpt./1] I II Advanced study of topical problem areas in general and experimental psychology.


596. Seminar u. Interdisciplinary Environment-Behavior-Design (3) [Rpt./1] I (Identical with Idis. 596u, which is home)

600a-600b. Introduction to Graduate Training in Psychology (1-1) Basic areas of psyc., ethics and standards, teaching methods. Open to first-year psyc. grad. students only.

620. Scientific and Professional Aspects of Clinical Psychology (3) I Orientation to clinical psychology; relationship of community and socioeconomic conditions to emotional disturbance; ethical considerations in research and practice. Open to majors only.

621. Clinical Assessment Methods (3) I II Theory and practice in interview techniques and cognitive and personality assessment. Open to majors only.

622. Clinical Principles of Behavior Modification (3) I Systematic review of the major theories of behavior modification, with emphasis on application to clinical problems. Open to majors only.

623. Clinical Insight Therapies (3) I II Theory, technique and research of approaches to behavior change which are oriented toward internal awareness, self-direction and personal responsibility by means of relationship, insight, and self-awareness. Open to majors only.

624. Clinical Research Methods (3) I Contemporary research issues in clinical psychology are critically examined. Open to majors only.
Clinical Community Psychology (3) II Expanding role of psychology in innovative mental health functions, with emphasis on consultation, program development, primary prevention and social system modification. Open to majors only.

Clinical Group Psychotherapy (3-3) 626a: Theory and practice of group psychotherapy. 626b: Experience in leading groups; advanced theory. 2R, 3L.

694. Practicum
a. Clinical Interviewing and Assessment (1 to 3) [Rpt./1] II Open to clinical psyc. students only.
b. Psychotherapy (1 to 3) [Rpt./1] II Open to clinical psyc. students only.
c. Community Mental Health (1 to 3) [Rpt./1] II Open to clinical psyc. students only.

PUBLIC POLICY, PLANNING AND ADMINISTRATION

Professors Don L. Bowen, Robert D. Carpenter, Travis W. Hirschi, Lawrence D. Mann, June M. Morrison, Raymond A. Mulligan, Arthur L. Silvers, Norman Williams, Jr.
Associate Professors Michael K. Block, Robert W. Buckingham, Jon B. Christianson, Theodore H. Koff, Ronald J. Vogel
Assistant Professors Eric C. Carlson, Reid H. Ewing, Vernon L. Greene, Richard B. Polley

The Department of Public Policy, Planning and Administration is being reorganized. For information, contact the head of the Department of Management.

Study of public administration prepares graduates for managerial and professional positions in a wide variety of governmental or quasi-public organizations ranging from local to international in scope and including the provision of many different kinds of public goods and services.

The department offers the Bachelor of Science in Public Administration with majors in criminal justice administration, health services administration, human services administration, public management, and public recreation administration. The curriculum for the B.S.P.A. may be found in the College of Business and Public Administration section of this catalog. A Master of Public Administration degree is also offered. For more information on this degree, please see the Graduate Catalog. Students wishing to minor in public administration should consult the head of the department.

Honors: The department participates in the Honors Program.

Issues in Public Policy (3) I II Major issues, problems and options facing public sector policymakers and administrators.

Introduction to the Analysis of Data for Decision Making (3) I II Informal and exploratory approaches to the analysis of empirical data in a managerial context.

The Crime Problem (3) I Theory and research on the nature, causes and control of crime from an interdisciplinary perspective.

Legal Aspects of the Criminal Justice Process (3) I II Analysis of selected principles of criminal law, criminal procedure and correctional law.

Courts Management (3) I II Theory and practice in the administration of criminal and civil responsibilities of the courts. P, 130, 201.

Criminal Justice Administration (3) I II Theory and practice of criminal justice organizations; police, courts and correctional institutions.

Counseling in Public Agencies (3) I Basic concepts and principles of interviewing and counseling in public agencies, with emphasis on the role of such methods in human services administration.

Social Welfare Policy (3) I 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.

Acute Health Care Policy and Administration (3) I Delivery modes for acute care, analysis of public policies relating to such care and discussion of general issues in its administration, including inpatient care (hospitals), outpatient care (solo physicians, group practices, HMOs), and emergency care.

Administration of Human Services (3) I Principles of administrative planning and control in organizations providing human and social services.

Introduction to Administration of Services for the Aging (3) I Administration of services, planning, and public policy related to the multiple issues of growing old in modern society. Field trips.
DEPARTMENTS AND COURSES OF INSTRUCTION

400. Quantitative Methods for Administrators (3) I II S (Identical with M.I.S. 400)

401.* Environment and Strategic Management in Organizations (3) II Administration of organizations dealing with complex operating environments; emphasis on interaction of public and private sector organizations.

405.* System and Program Evaluation (3) GC I Methodology of evaluating the performance of programs and strategies in the context of policy assessment.


411.* Public Administration and the Mexican American (3) GC I Hispanic-American cultural and historical impact on public administration in the southwestern U.S. from 1775 to the present; patterns of contemporary Spanish-speaking participation in state and local governmental administration of services. (Identical with Ed.F.A. 411 and MAS -411)

413.* Administrative Leadership (3) GC I Elements of leadership, as applied to selected administrative situations in the field of public management.

414.* Project Management (3) GC I Organizational, environmental, and analytical aspects of project planning and management, including government contracting and grants, as applied to public sector projects.

415.* Public Personnel Policies (3) GC II Description and analysis of operation of public personnel systems.

417.* Public Sector Labor Relations (3) GC II Description and analysis of recent developments in public employee labor relations at federal, state, and local levels.

430.* The Criminal Justice System (3) I Background, philosophy, and modes of operation in the United States criminal justice system. Emphasis on crime in institutional contexts such as business and labor organizations.

444.* Group-Process Methods in Public Administration (3) GC II Application of behavioral science knowledge to group functioning in public agencies with emphasis on observation, analysis, feedback and intervention in small groups; the SYMLOG theory and method of group analysis, along with other perspectives from social psychology and sociology. P, 472. (Identical with Soc. 444)

445.* Human Relation Skills in Administration (3) GC II Psychological techniques applied to the improvement of leadership and other organizational skills in public management.

454.* Chronic Health Care Policy and Administration (3) I Delivery modes for chronic or long-term care, analysis of public policies relating to such care and discussion of general issues in its administration, including institutional care (nursing homes, mental health institutions), home care (community based home health services), hospice care, and other alternatives.

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.

456.* Current Issues in Health Services (3) II Current public policy issues in health services administration.

463.* Program Planning for Human Services (3) GC II Deals with the process of program planning from problem identification and need assessment through implementation and evaluation, with specific application to human services administration.

466.* Public Policy and the Elderly (3) I Consideration of public policy as it relates to the needs of elderly persons in modern industrial societies. Emphasis on vulnerable groups such as poor and minority elderly.

472.* Administration in Public Organizations (3) II Application of major theories of human behavior in organizations to decision making in public sector organizations from the perspective of upper echelon executive; case study emphasis. P, 410a, Mgmt. 305, Pol. 474.

*Open only to students who meet the requirements for advanced standing in the College of Business and Public Administration section of this catalog.

588. Operations Research in Health Care Delivery (3) II (Identical with S.I.E. 588)

595. Colloquium a. Public Management (3) [Rpt./ 12 units] I II b. Urban Affairs (3) [Rpt./ 12 units] I II c. Health Care (3) [Rpt./ 12 units] I II d. Aging and Society (3) [Rpt./ 12 units] I II e. Corrections (3) [Rpt./ 12 units] I II f. Criminal Justice (3) [Rpt./ 12 units] I II
600. **Advanced Public Administration** (3) I Fundamentals of structure and process in public administration, with respect to both its academic study and applications.

604. **Analytic Methods in Planning and Management** (3) II (Identical with U.PI. 604)

605. **Research and Evaluation in Public Administration** (3) I Research and evaluative methodologies which support public sector policies and administration, including the philosophical basis of these methods and a research design exercise. P, 600, Mgmt. 552.

610a-610b. **Fiscal and Budgetary Administration of Public Agencies** (3-3) 610a: Internal fiscal operation and the budgetary cycle of public and nonprofit agencies. P, 600, Acct. 572. 610b: Cost/benefit analysis for public agencies. 610a is not prerequisite to 610b. (Identical with Pol. 610a-610b)

621. **Administrative Patterns in the Federal System** (3) I Legal, political, and social framework of inter-jurisdictional and interagency relations; trends, emerging issues, and devices for securing coordination and responsibility.

630. **Public Policy and Police Administration** (3) II Research-based critique of contemporary police administration in relation to its success in meeting the goals of public policy on crime control and community order maintenance. P, 600, 605.

640. **Public Policy and Correctional Administration** (3) I Research-based critique of contemporary correctional administration in relation to its success in meeting the goals of public policy on the correction of criminal offenders. P, 600, 605.

650. **Advanced Health Systems** (3) I Introduces the student to the scope and nature of public and private health systems in the U.S.; examines roles of government and private enterprise in the development and operation of health institutions.

651. **Health and Public Policy** (3) II Examines public policy issues in health, including recent developments in health policy and planning at the national, state and local levels, and their impact on administrative behavior. P, 650.

653. **Comparative Management in Health Administration** (3) I Assists students in applying general management principles to particular types of health agencies. Models of organizational behavior are used to develop a paradigm for comparative analysis. P, 650.

655. **Efficiency Analysis in Health Administration** (3) II Professional-level treatment of economic and related principles as they apply to the health-care industry, and of the impacts of health policy and program alternatives; case-study method used. P, Econ. 500a.

662. **Aging and Public Policy** (3) I Policy framework for administration of programs, plans, priorities, and legislation related to the needs of the aging in modern society.

693. **Internship**
   a. Law Enforcement Administration (1 to 6) I II
   b. Correctional Administration (1 to 6) I II
   c. Public Management (1 to 6) I II
   d. Health Services Administration (1 to 6) I II
   e. Public Recreation Administration (1 to 6) I II
   f. Retirement Housing Administration (1 to 6) I II

696. **Seminar**
   a. Development Administration (1 to 3) [Rpt./6 units] I II
   b. Program Planning and Development (1 to 3) [Rpt./6 units] I II
   c. Performance Measurement and Accountability (1 to 3) [Rpt./6 units] I II
   d. Comparative Law Enforcement Systems (1 to 3) [Rpt./6 units] I II
   e. Health Services Administration (1 to 3) [Rpt./6 units] I II
   f. Environmental Administration (1 to 3) [Rpt./6 units] I II
   g. Criminal Justice Administration (1 to 3) [Rpt./6 units] I II

**PUBLIC MANAGEMENT**
*(See Public Policy, Planning and Administration)*

**PUBLIC RECREATION ADMINISTRATION**
*(See Natural Resource Recreation, Physical Education and Public Policy, Planning and Administration)*
RADIO-TELEVISION

Professors William T. Slater, Head, Frank R. Barreca
Associate Professors Harry Atwood, Donald G. Godfrey, Wesley B. Marshall, Marvin E. Smith
Assistant Professors H. Bruce Fowler, Gordon E. Hamilton, Elizabeth J. Leebron, David K. Terwische
Lecturer Michael Thomsen

For students planning a career in electronic communication or broadcast film, the Department of Radio-Television provides undergraduate studies which focus upon the development of production, management, and policy-making skills. The facilities of the Division of Media and Instructional Services, including KUAT-TV-AM/FM and film production facilities, are utilized for many laboratory classes. Students have the opportunity to obtain professional experience through the department's internship program. Basic facilities are provided; however, students are responsible for the cost of film/tape stock and other necessary supplies.

The Department of Radio-Television offers course work leading to a Bachelor of Arts in Radio-Television. Students may emphasize media production, broadcast journalism, or producing/writing, or may enroll in an interdisciplinary general studies program.

**The major:** In addition to the group requirements for the B.A., as described in the Faculty of Fine Arts section of this catalog, the student must complete Sp.C. 105 and one of the following English courses beyond the Group I requirement: Engl. 207, 209, 210, 307, or 308. Requirements in the major include the following: 34 units of radio-television courses, including the following core courses: 103, 111, 150, 213, and 220. At least twelve units must be upper-division courses exclusive of 399, 444, 493, 497, and 499, and no more than 48 units may be counted toward the degree. It is recommended that students develop the ability to type prior to enrollment in courses at the 200 level or above. From time to time the department will offer specialized course offerings to meet student demand or the general needs of the community. Persons interested in specialized course offerings should contact the department head. At least 18 units of the major must be completed in residence.

Students who wish to emphasize *media production* are urged to enroll in the following courses: 310 and 410.

Students who wish an emphasis in *broadcast journalism* are urged to enroll in 160, 230, 310, 320, 330, and 335.

Students who wish an emphasis in *producing/writing* are urged to enroll in the following sequence of courses: 230, 310, 320, 322.

Students who wish an interdisciplinary *general studies* approach are urged to enroll in the following courses: 230, 310, 360, 370.

The *teaching minor* consists of 103, 111, 213, 220, 310, 360, and electives for a minimum total of 24 units.

**Honors:** The department participates in the Honors Program.

103. **Introduction to Radio and Television** (3) I II S An introduction to the study of radio and television; examination of the media, their effects on society and culture, history, technology, and ethics.

111. **Introduction to the Aesthetics and Theory of Media Production** (3) I II A survey of the elements which make up the audio, film, and television image; laboratory experiments with individual elements and message design and structure. 2R, 3L.

141. **Beginning Photography** (3) [Rpt./2] I II (Identical with Art 141)

150. **Survey of Law and Regulation of Electronic Media and Film** (3) I II S Introduction to the legal and regulatory framework of the electronic media and film; applicable federal and state laws, copyright, libel, slander, constitutional guarantees, the FCC and FTC. P, 103.

160. **Electronic Media and Society** (3) I II S Survey of the relationships between electronic media and society; violence, stereotyping, obscenity, agenda-setting, political advertising; structure of the industry. P, 103.

170. **Development of the Electronic Media** (3) I II Examination of history and major program types, with emphasis on the relationships among genres common to radio, television, and broadcast film.
212. **Electronic Media Performance (1) [Rpt./1]** I II Analysis of and practice in the role and responsibilities of the broadcast/cable performer as communicator. Students will work with audio and video production laboratories. 2R, P, 103, 111.

213. **Fundamentals of Broadcast Production (4)** I II Introduction to the elements of broadcast production, including station personnel, professional practices, production elements, and related items. 3R, 3L. Nonmajors enroll in special lab. sections. P, 111.

215. **Introduction to Broadcast Film Production (3)** I II Basic principles of broadcast film production and examination of production techniques and practices; laboratory experience with film production equipment and production of a short 16 mm. film. 2R, 3L. P, 111.

220. **Broadcast Writing (3)** I II Theory of broadcast writing, including all types of copy formats, with emphasis on students' writing activities. P, 213, completion of Engl. composition course beyond Group I.


239. **Speaking for Radio and Television (3)** I II (Identical with Sp.C. 239)

293. **Internship**
   a. **TV Production (1)** I II Open to majors only. P, 103, 111, 150, 220.
   b. **Radio Production (1)** I II Open to majors only. P, 103, 111, 150, 213.
   c. **TV Graphics (1)** I II Open to majors only. P, 103, 111, 150, 213.
   d. **Radio-TV News (1)** I II Open to majors only. P, 103, 111, 150, 230.
   e. **Radio-Television Promotion (1)** I II Open to majors only. P, 103, 111, 150, 215.
   f. **TV Film (1)** I II Open to majors only. P, 103, 111, 150, 215.
   g. **Radio-TV Advertising (1)** I II Open to majors only. P, 103, 111, 150.
   h. **Radio-TV Public Relations (1)** I II Open to majors only. P, 103, 111, 150.

302. **Recording Studio Production (2)** I II (Identical with Mus. 302)

310. **Intermediate Broadcast Production (3)** I II Production of various types of radio and television programs, including techniques and theory of studio operation, use of equipment and personnel relationships, with emphasis on the role of the broadcast producer. 2R, 3L. Open to majors only. P, 213, 220.

315. **Intermediate Broadcast Film Production (3)** I II Production of broadcast films, with emphasis on sound, editing techniques, and visual design. Students will produce a short informational/documentary film. 2R, 3L. P, 215.


335. **Producing Public Affairs and Documentary Programs (3)** I II Advanced work in the production of documentary and public affairs programs; idea formulation, budgeting, writing, researching, with emphasis on organization of production team and practical production considerations. 2R, 3L. Open to majors only. P, 310, 320 or 330.

360. **Broadcast Communications Research (3)** I Survey research, commercial rating services, other research techniques; problems of minority audiences; applications in the behavioral sciences, marketing, and broadcasting; major emphasis on the radio-TV audience. P, 160.

361. **Broadcast Cable Time Sales Management (3)** I II Sales activities in broadcast and cable operations; strategies; client need analysis, successful sales behaviors, management structures.

364. **Creative Advertising (3)** I II (Identical with Mktg. 364)

366. **Public Relations (3)** I II (Identical with Mktg. 366)

370. **History of American Broadcasting (3)** I S Examination of the American broadcast industry; technical innovation, the rise of stations and networks, financial base, programming, regulation, and changes in audience.

375. **Cinematic Theory and Criticism (3)** I 1983-84 Major theories of the motion picture; examination of major approaches to film criticism, viewing, discussion, and writing. 2R, 3L. P, Dram. 270a-270b.

410. **Advanced Broadcast Production (3)** I II Production of various types of broadcast programs, including continued exposure to studio operations, lighting, staging, and use of color as well as black and white equipment, with emphasis on the role of the broadcast director. Student pays for film, tape and lab. charges. 2R, 3L. P, 310.
442. **Broadcast Programming** (3) GC I II Investigation of radio and television programming techniques, including both public and commercial broadcasting. P, 360.

443. **Broadcast Management** (3) GC I II Investigation of broadcast management techniques, including both public and commercial broadcasting. P, 150.

444. **Readings in Broadcasting** (1 to 3) [Rpt. /6 units] I II S Individual course of readings approved by instructor to cover subjects not available in other course offerings.

450a-450b. **Broadcast Law, Policy, and Regulation** (3-3) GC 1983-84 Examination of the legal and regulatory framework and how it affects telecommunication policy. 450a: Spectrum management and entry into the broadcast system. 450b: Content issues. P, 150 or 450a.

461. **Instructional Media Design** (3) GC I II Planning and design of instructional systems utilizing radio, television and related media in a variety of learning contexts.

493. **Internship**
   a. **Radio-TV Audience Research** (1 to 5) I II Open to majors only. P, completion of core courses, 360.
   b. **Radio-TV Instructional Services** (1 to 5) I II Open to majors only. P, completion of core courses, 461.
   c. **Radio Program Production** (1 to 5) I II Open to majors only. P, completion of core courses, 310.
   d. **Television Program Production** (1 to 5) I II Open to majors only. P, completion of core courses, 310.
   e. **Radio-Television News** (1 to 5) I II Open to majors only. P, completion of core courses, 330.
   f. **Film** (1 to 5) I II Open to radio/tv majors and gen. fine arts studies majors with cinema option only. P, 315.

494. **Practicum**
   a. **Research** (3) I II Open to majors only. P, 360.
   b. **Television Directing** (1 to 5) I II P, 410.

497. **Workshop**
   a. **Community Audio-Video Production** (3) I II P, 410.
   b. **Video for Law Enforcement** (1) GC

**RANGE MANAGEMENT**

*(See Renewable Natural Resources)*

**READING**

Professors Wilbur S. Ames, Elizabeth M. Antley, Amelia Melnik, Kenneth J. Smith
Associate Professors William J. Valmont, Head, Adela A. Allen, Patricia L. Anders, John M. Bradley, Judy N. Mitchell
Assistant Professor Stephanie L. Brown

The Department of Reading provides pre-service training in reading for prospective teachers. Curricula are available to prepare special reading teachers, reading clinicians, reading consultants, reading supervisors, classroom reading teachers, college teachers, and researchers.

The department offers programs leading to the Master of Arts, Master of Education, Educational Specialist, Doctor of Education, and Doctor of Philosophy degrees. For admission and degree requirements, please see the Graduate Catalog.

304. **Decoding Skills in the Elementary School** (2) I II Basic decoding skills needed in reading; methods and materials used in teaching reading. (Identical with Elem. 304)

406. **Foundations of Reading Instruction in Spanish** (2) GC II Introduction to the theoretical and practical aspects of the reading process, with attention to essential decoding and comprehension skills; special application for teaching Spanish-speaking children to read. Taught in Span. P, Span. fluency. (Identical with M.A.S. 406)

435. **Secondary School Reading in the Classroom** (3) GC I II Provisions and procedures for evaluating and developing reading skills needed in content areas. (Identical with S.Ed. 435)

480. **Literature for Children** (3) GC I II (Identical with Li.S. 480)
485. Literature for Adolescents (3) GC I II (Identical with Li.S. 485)

487. Microcomputers in Education (3) GC I II S (Identical with Ed.F.A. 487)

494. Practicum
   a. Elementary School Reading (1) I II P, 304. (Identical with Elem. 494a)
   b. Secondary School Reading (1 to 3) I II (Identical with S.Ed. 494b, which is home)
   c. Reading in School Settings (3) I II Credit allowed for one of the following: 494a, 494c, or 494d. (Identical with Elem. 494c)
   d. Reading Certification (1) I II P or CR, 304, 435, or 607.

508. Bilingual Reading (3) I Analysis of reading situations encountered by bilingual students; phonological, semantic and syntactic aspects of instruction; methods and materials. (Identical with Ed.F.A. 508 and M.A.S. 508)

520. Reading in the Content Areas (3) II Advanced examination of activities to integrate process and content instruction at all grade levels, with emphasis on interaction between classroom teachers and reading specialists.

561. History of Children's Literature (3) II (Identical with Li.S. 561)

571. Classroom Diagnosis and Instruction (3) I II Procedures for diagnosing and developing reading skills for pupils of below-average achievement level. Open to nonmajors only.

594. Practicum
   a. Reading for the Exceptional Child (3) I II P, 304, 406, 435, or 607.

602. Pre-Reading and Beginning Reading Development (3) I II An examination of various aspects involved in pre-reading and beginning reading development, including psychological, sociological, physiological, linguistic and educational considerations.

605. Essentials of Reading Instruction (3) I II Theories and principles underlying reading instruction, approaches to teaching reading, basic analysis of reading research.

607. Analysis of Decoding (3) I II Phoneme theory; prerequisites for learning phoneme-grapheme associations; teaching word identification skills; examination and analysis of instructional materials and related research. P, 605 or CR.

612. 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, 605 or CR.


628. Field Experience in Reading (3) I II Supervised experience in assessment and teaching of reading skills in the schools; use of developmental, corrective, and remedial techniques and practices.

633. Psycholinguistics and Reading (3) I II Basics in psycholinguistics of reading and reading instruction, with emphasis on the comprehension of written language.

637. Application of Miscue Analysis (3) II 1983-84 (Identical with Elem. 637)

671. Diagnostic Laboratory (3 to 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. Open to majors only. P, 607, 612, 620 or CR.

672. Instructional Laboratory (3 to 6) [Rpt./6 units] I II Supervised practice in teaching reading; preparing, analyzing and critiquing special instructional programs for students. Open to majors only. P, 671 or CR.

680. Investigations in Reading (3) I II Analysis and synthesis of research in reading and its implications and influences on practice.

683. Curriculum Development and Supervision in Reading (3) I II Organizational patterns of reading curricula: approaches to the improvement of reading instruction; personnel relations. Designed for the reading supervisor and the school administrator. (Identical with Ed.F.A. 683)

686. Classroom Reading: Issues, Concerns, Practices (3) I II Critical analyses of principles, procedures and research related to the analysis, assessment, and improvement of reading abilities among individuals and groups at various levels.

695. Colloquium
   b. Issues in Reading (1 to 3) I II [Rpt./15 units]

795. Colloquium
   a. Problems in Reading (1 to 3) I II

796. Seminar
   a. Research and Evaluation (1 to 3) I II
## REAL ESTATE
(See Finance and Real Estate)

## REGIONAL DEVELOPMENT
(See Geography and Regional Development)

## REHABILITATION

Professors Amos Sales, Head, Bob G. Johnson  
Associate Professors Kent B. Kloepping (Adjunct), S. Mae Smith  
Clinical Associate Professors Marlene Bence, Inez Tucker  
Clinical Assistant Professors William Downey, James Organist  
Lecturer Thomas L. Fisher

The undergraduate major in rehabilitation will prepare students for selected positions in various areas, including rehabilitation, social, and education services. Trained for case management and client advocacy, students in this program will become skilled interviewers, competent report writers, and able assessors of service eligibility. Students will also become conversant with the philosophy underlying rehabilitation services, the laws that make these services possible, and the agency structure within which services are rendered.

The center offers programs leading to the Bachelor of Science in Education, Master of Science, Doctor of Education and Doctor of Philosophy degrees with a major in rehabilitation. For admission and degree requirements for the undergraduate degree, please see the College of Education section of this catalog; for the graduate degrees, please see the Graduate Catalog.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>200a-200b</td>
<td>Introduction to Manual Communication</td>
<td>3-3</td>
<td>Principles, methods, and techniques of communicating with deaf people, with emphasis on orientation to deafness; history of manual communication and types of hearing loss. 200b: Continuation of 200a, with emphasis on conversational expressive and receptive skills; education and rehabilitation of deaf people; theories of communication with deaf individuals.</td>
</tr>
<tr>
<td>210</td>
<td>Introduction to the Health Field</td>
<td>3</td>
<td>(Identical with H.R.P. 210)</td>
</tr>
<tr>
<td>215</td>
<td>Basic Manual Communication</td>
<td>3</td>
<td>Principles, methods, techniques of communicating manually with deaf persons, with emphasis on developing manual communication skills for use by practitioners in rehabilitation settings. P, 200a-200b.</td>
</tr>
<tr>
<td>300</td>
<td>Introduction to Rehabilitation</td>
<td>3</td>
<td>Introduction to philosophies and theories underlying rehabilitation and the agencies and personnel providing these services.</td>
</tr>
<tr>
<td>320a-320b</td>
<td>Survey of Human Disabilities</td>
<td>3-3</td>
<td>Critical study of rehabilitation processes and services for handicapped individuals and groups. P, 300.</td>
</tr>
<tr>
<td>325</td>
<td>Vocational Development and Placement</td>
<td>3</td>
<td>Intensive study of vocations, vocational skill development and vocational placement. Open to majors only. P, 300, 320b.</td>
</tr>
<tr>
<td>405</td>
<td>Fundamental Sign Language</td>
<td>3</td>
<td>GC I II Fundamentals of sign language to develop communication skills for providers of social services for the deaf.</td>
</tr>
<tr>
<td>410</td>
<td>Intermediate Conversational Manual Communication</td>
<td>3</td>
<td>GC I II Comprehensive study of English idioms translated into sign language; expansion of sign vocabulary and emphasis on receptive skills development. P, 215 or demonstrated proficiency.</td>
</tr>
<tr>
<td>420</td>
<td>Advanced Conversational Sign Language</td>
<td>3</td>
<td>GC I II Comprehensive study of basic sign language idioms and colloquialisms in Ameslan, with emphasis on continued skill building, expressive and receptive ability in Ameslan, and ability to converse with deaf adults. P, 410 or demonstrated proficiency.</td>
</tr>
</tbody>
</table>
425. **Advanced Ameslan** (3) GC I II American Sign Language, with emphasis on reverse, idioms, and grammatical structure. P, 420.

430. **Interpreting for Deaf People** (3) GC I II Principles, methods, and techniques of interpreting for deaf people in rehabilitation and other settings. P, 410 or demonstrated proficiency.

435. **Advanced Techniques of Interpreting** (3) GC I II Emphasis on rapid verbatim interpreting; educational, platform, and religious interpreting and the professional ethics involved; introduction to legal and medical interpreting. P, 430.

450. **Interviewing and Client Services** (3) GC I II Intensive study of case procedures and techniques and their application to the functions of rehabilitation and related agencies, with emphasis on the case practices of interviewing. P, 300.

455. **Rehabilitation of the Aged** (3) GC II Emphasis on aging from the viewpoint of the aging person and those working with the aged.

460. **Supervised Casework in Rehabilitation** (3) GC I II Application of philosophies and theories underlying rehabilitation services and the agencies and personnel providing those services. Open to majors only. P, 300, 320b; 450 or CR.

480. **Problems of Drug Abuse** (3) GC [Rpt./1] I II Survey course for teachers, counselors, and agency workers concerned with drug abuse; examination of community, cultural, and educational approaches to drug use and abuse.

487. **Microcomputers in Education** (3) GC I II S (Identical with Ed.F.A. 487)

500. **Principles of Rehabilitation** (3) GC I II Principles underlying rehabilitation programs and interdisciplinary relationships of agencies engaged in rehabilitation services.

510. **Medical Aspects of Disability** (3) GC I II Etiology, therapy, and prognosis of the major disabilities, including drug and alcohol; assessment of physical capacities and limitations; typical restorative techniques.

520. **Psychosocial Aspects of Disability** (3) GC I II Exploration of the psychological and sociological aspects of disability; analysis of somatopsychology, psychosomatics, and social psychology.

550. **Principles and Practices of Vocational Evaluation** (3) GC I II Understanding work skills and labor market conditions; process of vocational evaluation of rehabilitation clientele; collecting and synthesizing evaluation data and writing meaningful reports.

557. **Methods in Marital Therapy** (3) GC I (Identical with C.D.F.R. 557)

560. **Role and Function of Workshop Facilities** (3) GC I II Defining the role and function of workshop facilities in rehabilitation; evaluation and production methods; wage and hour regulations; work adjustment methodologies.

600. **Counseling Practices in Rehabilitation Setting** (3) GC I II Facilitation training of rehabilitation professionals in their implementation of counseling practices with varied ethnic, age, disability, and dependency populations. 3R, 1L. Open to majors only.

620. **Client Assessment in Rehabilitation** (3) GC I II Exploration of the world of work; critical review of vocational choice theories; experiences in the use and interpretation of individual assessment techniques. P, Rhab. 500 or CR.

630. **Plan Development in Rehabilitation** (3) GC I II Problems of physical, mental, social, and emotional disability, as they relate to the formulation of a rehabilitation plan; exploration of the various sources of occupational and career choice information, job placement and development. P, 500, 620.

640. **Psychosocial Assessment of the Deaf Person** (3) GC I II Selection, administration, and interpretation of various psychosocial evaluation instruments used with deaf persons. P, Ed.P. 671, 672a.

650. **Construction and Development of Assessment Samples** (3) GC I II Use of occupational information, career exploration and job analysis techniques; development, construction, standardization, and use of work samples and related vocational assessment techniques.

660. **Counseling and Case Practices with the Deaf** (3) GC I II Principles, methods, and techniques of counseling and case practices with deaf people in rehabilitation settings. P, 600.

695. **Colloquium**
   a. Rehabilitation Psychology (3) GC I II
   b. Rehabilitation Administration (3) GC I II
   c. Vocational Evaluation (3) GC I II
   d. Rehabilitation of the Deaf (3) GC I II
   e. Group Processes (3) GC I II

730. **Investigations in Rehabilitation Psychology** (3) GC I II Identification and analysis of current problems in rehabilitation.
RELIGIOUS STUDIES

Committee on Religious Studies

Robert A. Burns (Classics), Chairperson, Norman Austin (Classics), Joseph L. Cowan (Philosophy), Robert Gimello (Oriental Studies), Andrew M. Greeley (Sociology), Peter Machinist (Oriental Studies), John C. Ulreich (English), Donald Weinstein (History)

Religious studies is an interdisciplinary program offering a wide range of approaches to the study of various religions.

The major: Thirty units requiring general survey courses in both Asian and Western religious traditions (120, 130 — six units). It also requires six units of courses involving the application of particular disciplinary approaches to the study of religion (233, 411, 439, 522). Finally, the major requires at least nine units each in further study of Western and Eastern religions.

The minor: Twenty units, including 120, 130 and fourteen additional units in religious studies.

120. Western Religions (3) II Religions of the Western World: Judaism, Christianity, Islam.
126. Mythology (3) I II (Identical with Clas. 126)
130. Asian Religions (3) I II (Identical with Or.S. 130)
140a-140b. Oriental Humanities (3-3) (Identical with Or.S. 140a-140b)
233. Philosophy of Religion (3) I (Identical with Phil. 233)
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. Protestant Thought in the 20th Century (3) I Survey of the various strands of Protestant theology since the turn of the century, with special reference to authors such as Rauschenbusch, Barth, Brunner, Tillich, Bultmann and Bonhoeffer.
303. Epistles of St. Paul (3) I Examination of the religious and cultural background in the Greco-Roman world during the lifetime of St. Paul; analysis of Paul's thought in Acts and the Epistles.
320a-320b. Literature of the Bible (3-3) (Identical with Engl. 320a-320b)
323. Religious Organizations in America (3) II (Identical with Soc. 323)
330a-330b. Chinese Thought (3-3) (Identical with Or.S. 330a-330b)
331. Taoist Traditions of China (3) I 1983-84 (Identical with Or.S. 331)
332a-332b. Judaic Thought and Culture (3-3) (Identical with Or.S. 332a-332b)
333. Buddhist Meditation Traditions (3) I (Identical with Or.S. 333)
340. Jesus in Contemporary Thought (3) I 1983-84 Survey of present thinking about the meaning of Jesus, including humanistic, Jewish, and various Christian interpretations.
370a-370b. History of the Jews (3-3) (Identical with Or.S. 370a-370b)
372a-372b. History and Religion of Israel in Ancient Times (3-3) I (Identical with Or.S. 372a-372b)
374. The Holocaust (3) II 1984-85 (Identical with Or.S. 374)
382. Archaeology and the Bible (3) II (Identical with Or.S. 382)
405a-405b. Medieval Europe (3-3) GC (Identical with Hist. 405a-405b)
407. Intellectual History of Medieval Europe (3) GC I (Identical with Hist. 407)
408. The Renaissance (3) GC I (Identical with Hist. 408)
409. The Reformation (3) GC II (Identical with Hist. 409)
411. Anthropology of Religion (3) GC I (Identical with Anth. 411)
416. Tudor-Stuart England (3) GC I (Identical with Hist. 416)
418. Classical Confucianism (3) GC I (Identical with Or.S. 418)
419. Neo-Confucianism (3) GC II (Identical with Or.S. 419)
421a-421b. East Asian Buddhism (3-3) GC (Identical with Or.S. 421a-421b)
427. Religion and Mythology of Mesopotamia (3) GC II 1983-84 (Identical with Anth. 427)
430. Prophecy in Ancient Israel (3) GC II (Identical with Or.S. 430)
431. Indian Religion and Thought (3) GC I II (Identical with Or.S. 431)
432. Islamic Mysticism (3) GC II (Identical with Or.S. 432)
434. Islamic Thought (3) GC II (Identical with Or.S. 434)
435. Judaic Philosophy (3) GC II 1983-84 (Identical with Or.S. 435)
437. Japanese Religion (3) GC I (Identical with Or.S. 437)
439. Analytical Philosophy of Religion (3) GC II 1983-84 (Identical with Phil. 439)
445. Hindu Mysticism (3) GC II 1984-85 (Identical with Or.S. 445)
480. Dialectical Theology (2) [Rpt.] I Origin and nature of dialectical theology; reading and discussion of authors such as Karl Barth, Emil Brunner and Friedrich Gogarten. P, 120, 130.

REMOTE SENSING

Committee on Remote Sensing

Professors Philip N. Slater (Optical Sciences), Chairperson, Victor R. Baker (Geosciences), Dinshaw N. Contractor (Civil Engineering), Benjamin N. Herman (Atmospheric Sciences), Ray D. Jackson (Adjunct), Donald F. Post (Soils, Water and Engineering), Richard W. Reeves (Geography and Regional Development)

Associate Professor Charles E. Glass (Mining and Geological Engineering)

Assistant Professors Charles F. Hutchinson (Arid Lands Resource Sciences), William O. Rasmussen (Renewable Natural Resources), Robert A. Schowengerdt (Electrical and Computer Engineering and Arid Lands Resource 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 Committee on Remote Sensing offers no major at the present time but minor programs are available for doctoral students with majors in disciplines within the Colleges of Agriculture, Arts and Sciences, Business and Public Administration, Earth Sciences, Engineering, and Mines; and in the Office of Arid Lands Studies and the Optical Sciences Center. For further information concerning the minor, please see the Graduate Catalog.

RENEWABLE NATURAL RESOURCES


Associate Professors Stanley K. Brickler, Paul R. Krausman, Gordon S. Lehman, Michael M. McCarthy, Jon E. Rodiek, William W. Shaw, E. Lamar Smith, Jerry C. Tash, Donovan C. Wilkin

Assistant Professors Robert L. Gillen, Susan J. Hebel, R. William Mannan, William J. Matter

Instructor Hanna J. Cortner

Lecturer Charles D. Ziebell (Adjunct)
Programs of the School of Renewable Natural Resources concern the management of resources for water, wood, forage, recreation, wildlife, fisheries, soil and aesthetic values.

The Bachelor of Science in Renewable Natural Resources degree is available with majors in natural resource recreation, range management, watershed management and wildlife and fisheries science. A major in landscape architecture for the Bachelor of Landscape Architecture and Master of Landscape Architecture degrees is also offered. In addition, a student may obtain the degree of Master of Science or Doctor of Philosophy with a major in range management, watershed management, wildlife and fisheries science, or renewable natural resources studies.

**Renewable Natural Resources**

135. **Conservation of Natural Resources** (3) I II 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. Zwolinski

202. **Forest and Range Plants** (2) 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. 1R, 3L. P, G.Bio. 104 or PLS. 100. Ogden

295. **Colloquium** (1 to 3) II

a. Natural Resource Management

321. **Natural Resource Measurements** (3) I Study of basic land, climatic, hydrologic and vegetative measurements used in management of natural resources; presentation and interpretation of resulting data. 2R, 3L. P, Math. 118; 160 or 263. Lehman

546. **Principles of Research** (3) I Philosophy of science and research, the scientific method, problem selection, problem analysis, study plans, scientific communications. Klemmedson

595. **Colloquium**

a. International Renewable Resource Issues (2) I 1984-85
b. Public Natural Resource Management (2) II
c. Human Dimensions in Renewable Natural Resources (2) I 1983-84
d. Topics in Forest and Range Ecology (2) II 1983-84

**Landscape Resources**

Stanley K. Brickler, *Chairperson of the Division*

**Landscape Architecture**

The curriculum leading to the B.L.A. is a five-year program comprising two preprofessional years and three professional years designed to prepare the student to meet the demands of the profession and to qualify for professional registration in the state. While the principles of professional practice are universal, the program, which is accredited by the American Society of Landscape Architects, encourages strong linkages in renewable natural resources and recognition of the unique qualities of the arid Southwest.

In addition to complying with University admission requirements, all applicants to the program must file an *Application for Admission to the Professional Major* with the division chairman by July 1 preceding the intended fall admission. Students are admitted to the professional major in the fall semester only, after having completed the following sixty units of courses: L.Ar. 101 (two units), 112a-112b (six units); Math. 117e and 118 (five units); Art 101a (three units); Chem. 101a-101b (six units), 102a-102b (two units); Phys. 102a (three units), 180a (one unit); PLS. 100 (three units) or Ecol. 102 (four units); S.W.E. 200 (three units); R.N.R. 135 (three units); C.E. 151 (three units); Geol. 103aR or 103bR (three units); Econ. 201a or A.Ec. 217 (three units); Engl. 101 and 102 (six units) or 102 and 103 (six units); Sp.C. 102 (three units); three units of soc. sci. electives.
Applicants will be evaluated by the Landscape Architecture Admissions Committee on
the basis of the following criteria: grade point average, course work, statement of intent, work
experience, special interests, and creative endeavors. Admission will be restricted to those ap-
plicants with the highest evaluation. It is unlikely that a student with an overall grade point
average less than 2.5000 will be admitted. Applicants seeking advanced standing will be
placed at the Year II level until they fulfill all requirements of the preprofessional phase.

101. Introduction to Landscape Architecture (2) I Introduction to the profession of landscape architec-
ture.

112a-112b. Introduction to Landscape Architectural Design (3-3) Elementary problems in landscape ar-
chitecture; programming, analysis, composition, graphic communication, problem-solving and
decision-making processes. 1R, 6L. Field trips.

104 or P.I.S. 100. (Identical with P.I.S. 334a-334b)

345. Landscape Architecture/Interior Design Relationships (3) I Study of the field of landscape archi-
tecture designed for interior design majors. Development of graphic communication techniques,
examination of design process, and exposure to the use of plants and structural materials. P, H.Ec.
115R, 155R.

350. Site Analysis (3) I Introduction to basic analytical methods resulting in the solution of site problems;
analysis procedures, data collection, data categorization, statistical techniques, computer applica-

420a-420b. Landscape Analysis, Planning and Design (5-5) GC 420a: Omnibus studio; problem solving in

422a-422b. Intermediate Land Planning and Design (5-5) GC Application of the design process to prob-
lems of increasing scope and diversity. 422a: Urban/suburban interface. 422b: Urban environment.

424a-424b-424c. Advanced Land Planning and Design (1-5-5) GC 424a: I Orientation and proposal devel-
opment for omnibus project. 424b: I Special studies studio; individual emphasis. 424c: II Complex
problems in regional and urban environments. Field trips. P, CR 422b or nine units arch. or u.pl.

428. Field Methods in Environmental Psychology (3) GC II (Identical with Psyc. 428)

435. Planting Design (3) GC II Application of plant materials to problems in landscape design. 2R, 3L.
Field trips. P, 420b, 334b.

441. History and Theory of Landscape Architecture (3) GC II Examination of the historical background
and theoretical basis of landscape architecture. P, 420a.

451. Site Engineering (3) GC II Introduction to topography, contours, grading, drainage, road layout, utili-
ties, and other site engineering considerations. 2R, 3L. Field trips. P, 420a, 350.

452. Landscape Construction (3) GC I Construction materials and methods in landscape architecture;
introduction to working drawings and specifications. 2R, 3L. P, 420b, 451.

453. Contract Documents and Professional Practice (2) GC II 1983-84 Techniques and procedures for
preparation of working drawings and specifications, and for professional office conduct. P, 420b,
452.

497. Workshop
i. Community Design for Non-Designers (3) GC I (Identical with Arch. 497i, which is home)

533. Critical/Significant Environments (3) I Assessment and management of natural and cultural critical
environmental resources, including natural, scenic and historic areas, habitats of rare and endan-
gered species, and unique resource combinations. 2R, 3L. Field trips.

595. Colloquium
a. Systems Ecology for Planners and Designers (3) I
b. Western Wildland Planning and Design (3) I

596. Seminar (3) I
u. Interdisciplinary Environment-Behavior-Design (Identical with Idis. 596u, which is home)

696. Seminar (1 to 3) I II
a. Landscape Architecture (1) [Rpt.]
Range Resources

E. Lamar Smith, Chairperson of the Division

Range Management

Training in range management provides students with the knowledge and skills necessary to manage rangelands for maximum and sustained production of forage for livestock and wildlife while maintaining the value of the lands as watersheds and recreation areas. Employment opportunities are with state and federal resource management agencies, private ranches, management and consulting firms and foreign assistance programs.

In addition to the requirements for the curriculum in natural resources, the following courses are required for range management: A.Ec. 215 or 476 or Ws.M. 440; An.S. 430; 477 or 474; Cell. 460 or G.Bio. 260; Chem. 103a-103b, 104a-104b, 241a; Ecol. 102, Econ. 201a-201b; Engl. 101 or 103; 102; 307 or 308; Geos. 151; Math. 123; 160 or 263; N.R.R. 381; Phys. 102a; G.Bio. 104; Ra.M. 305, 318, 382, 416, 446, 456, 486, 487, 495a; R.N.R. 202, 295a, 321; S.W.E. 200, 201, 431; Sp.C. 102; Ws.M. 422, 459; W.F.Sc. 444.

305. Range Management (3) II Historical, political, physiological and ecological factors affecting range use; range plants and grazing regions; range treatments and improvements; range evaluation and planning; multiple use interrelationships. Field trips. P, P.I.S. 100 or G.Bio. 104.

318. Range Field Studies (2) S Field course covering the practical application of the principles of range management and ecology; grazing problems on forest, brush and grass ranges; noxious plant control; revegetation techniques; multiple use management. Fee $100.

382. Range Plants and Communities (3) II Identification, value and habitat relationships of important range plants, and description of major range plant communities. 2R, 3L. P, R.N.R. 202.


446. Range Improvements (3) GC I Range improvements through grazing systems, noxious plant control, cultural and mechanical elements of revegetation, runoff control, and specialized range and critical area treatments. 2R, 3L. Weekend field trips. P, 305, Ecol. 102.

456. Range Evaluation (3) GC II Methods of evaluating range vegetation, productivity, carrying capacity, utilization, condition and trend; measurement techniques and interpretation of data. 2R, 3L. P, 305, 382, 416, R.N.R. 321.

480. Forest Policy and Administration (3) GC II (Identical with Ws.M. 480)

486. Range Planning and Economics (3) GC I Principles of management planning for rangelands and economic analysis of management alternatives; includes case studies, linear programming, computer simulation. P, 305; A.Ec. 215 or 476 or Ws.M. 440.

487. Ranch Planning (2) GC II Preparation of a range management plan for a ranch enterprise including field data collection, economic and environmental analysis of management alternatives. 6L. All-day field trips. P, CR 456; 486.

495. Colloquium
a. Range Management (1) II P, 305.

595. Colloquium
a. Rangeland Policy (2) I 1984-85
c. Range Herbivores (2) I 1983-84

696. Seminar
a. Range Management (1) [Rpt.] I II
**Forest-Watershed Resources**

Gordon S. Lehman, *Chairperson of the Division*

**Watershed Management**

Watershed management courses, which consider the management needs of whole watersheds and their multiple uses, qualify the student for a professional career. Students may obtain a major in watershed management with an option in watershed hydrology or forest-watershed management. The watershed management program is accredited by the Society of American Foresters.

In addition to the requirements for the curriculum in *natural resources*, the following courses are required for both options in *watershed management*: Chem. 103a-103b, 104a-104b; Ecol. 102; Econ. 201a-201b; Eng. 101 or 103; 102; 307 or 308; G.Bio. 104 or P.L.S. 100; Geos. 151; Math. 160; Phys. 102a or 103a; 180a; Ra.M. 305; R.N.R. 202, 295a, 321; S.W.E. 200, 201; Sp.C. 102; Ws.M. 410, 460, 462. The *watershed hydrology option* also requires: Atmo. 171; Cell. 460; Chem. 241a; C.E. 471; Math. 125a-125b, 223; Phys. 102b or 103b; 180b; S.W.E. 405 or 470; 406 or A.M.E. 331a; S.I.E. 170; Ws.M. 342 or Ra.M. 382; Ws.M. 440 or A.Ec. 476. The *forest-watershed management option* also requires: Chem. 241a and Cell. 460 or nine units of mgmt./p.p.p.a. electives; C.Sc. 111 or S.I.E. 272; Math. 123 or 125a; N.R.R. 381; Ws.M. 250, 342, 408, 415; 420 or 422; 430, 440, 480, 481, 489. Students in the forest-watershed management option selecting the mgmt./p.p.p.a. electives may use up to six units of mgmt./p.p.p.a. courses to fulfill their social science/humanities requirement.

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250. Forest Pathology (3) II (Identical with Pl.P. 250)

330. Introduction to Remote Sensing (3) I (Identical with Geog. 330)

342. Silvics and Dendrology (4) I Application of ecological principles to forests; silvical properties and identification of American forest trees and shrubs. 3R, 3L. P, S.W.E. 200, Ecol. 102, R.N.R. 202. Lehman

408. Forest Fire Management (3) GC I Forest fire behavior, as influenced by fuels, weather, topography; ecological effects of fire; prevention, detection and control methods; fire danger rating and use of prescribed fire in forest management. Zwolinski

410. Silviculture (3) GC II Principles and technical procedures for reproducing, planting, and tending forest crops, with reference to watershed. 3R, 3L. P, S.W.E. 200; Ecol. 102. Wagle


420. Photogrammetry (2) GC I Aerial photographic planning for natural resource management; stereoscopic principles applied to planimetric and topographic mapping. 1R, 3L. P, Math. 118. Knorr

422. Photointerpretation (2) GC II Reading and interpretation of aerial photographs; natural resource inventory from aerial photographs; remote sensing techniques. 1R, 3L. Lehman


425L. Wood Technology Laboratory (1) GC II 1984-85 Macroidentification of commercially important woods.

427. Bioclimatology (3) GC II (Identical with Atmo. 427)

430. Forest Resource Management (3) GC I Decision making in the management of forest lands. 2R, 3L. P, 410, 415, 440. Knorr

440. Forest Resource Economics (3) GC II Economics of the production of goods and services from forest lands; decision making in microforest resource management situations; supply and demand relationships for products of forest resources. P, Econ. 201a, 201b, Math. 123. (Identical with A.Ec. 440) King

459. Rangeland Water Management (3) GC II Hydrologic principles as applied to arid and semiarid ecosystems with water management applications in range management, wildlife, fisheries and recreation. Credit is allowed for this course or 462, but not for both. P, Math. 160 or 263 and S.W.E. 201.

460. Watershed Hydrology (3) GC I Application of fundamental principles to quantifying the basic hydrologic processes occurring on watersheds. P, Geos. 100a or 151; S.W.E. 200, 201, Math. 160. (Identical with Hydr. 460)

462. Watershed Management (3) GC II Evaluating hydrologic impacts of management activities on watersheds to include silviculture, range, mining, and recreation use.
DEPARTMENTS AND COURSES OF INSTRUCTION

464a-464b. Introduction to Dendrochronology (3-3) GC (Identical with Geos. 464a-464b)

471. Water Quality Control (3) GC II (Identical with C.E. 471)

476. Natural Resource Economics (3) GC II (Identical with A.Ec. 476)


481. Simulation of Renewable Natural Resources (3) GC II Simulation of management impacts for multi-resource decision-making, including biologic, economic, and social factors. 2R, 3L. P, 430.

487. Forestry in Arid Environments (3) GC S Management and development of wood and other forest resources in developing nations. Designed for mid-level and upper-level resource professionals from developing nations. Field trip.

488. Development and Management of Water Resources (4) GC S Development and management of water resources on forest watersheds and rangelands in developing nations. Designed for mid-level and upper-level resource professionals from developing nations. Field trip.

489. Forest-Watershed Field Studies (4) II Field study of forest entomology and pathology, fire ecology (1 unit equiv.); forest measurements, inventory and analysis (2 unit equiv.); harvesting, processing of primary wood products (1 unit equiv.). P, 342, 410, 415. Fee $80.


557. Quantitative Methods in Dendrochronology (3) I 1984-85 (Identical with Geos. 557)

563. Plant-Water Relations (3) II (Identical with Cell. 563)

565. Hydrochemistry (3) II 1983-84 (Identical with S.W.E. 565)

566. Botanical Basis of Dendrochronology (3) II 1983-84 (Identical with Geos. 566)

576a-576b. Advanced Natural Resource Economics (3-3) (Identical with A.Ec. 576a-576b)

595. Colloquium
  a. Non-Point Source Pollution from Watersheds (3) II P, 460.
  b. Arid Land Forestry (2) II 1984-85
  c. Urban Forestry (2) II 1983-84
  d. Fire Ecology (2) II

655. Dendroclimatology (4) II 1984-85 (Identical with Geos. 655)

695. Seminar
  a. Watershed Management (1) [Rpt.] I II

Wildlife, Fisheries and Recreation Resources

William W. Shaw, Chairperson of the Division

Wildlife and Fisheries Science

A major in wildlife and fisheries science provides the student with a broad background for a professional career with state fish and game departments, with federal fish and wildlife or other natural resource management agencies, or for graduate study. In addition to the course requirements, it is recommended that students seek summer employment in related work with a state or federal agency. Students may obtain a major in wildlife and fisheries science with an option in wildlife ecology or in fisheries science.

In addition to the requirements for the curriculum in natural resources, the following courses are required for both options in wildlife and fisheries science: Chem. 103a-103b, 104a-104b, 241a, 243a; Ecol. 102; Econ. 201a; 201b or A.Ec. 217; Engr. 101 or 103, 102; G.Bio. 104; 320 or 321 or An.S. 213; N.R.R. 381; Phys. 102a, 180a; S.W.E. 200, 201; Sp.C. 102; W.F.Sc. 125. The wildlife ecology option also requires: Ecol. 472; Engr. 307 or 308; Math. 123 or 125a; 160 or 263; Ra.M. 382, 416; R.N.R. 202, 295a, 321; V.Sc. 400a or 400b; W.F.Sc. 340, 444, W.F.Sc. 446, 448, 484, 485. The fisheries science option also requires: Chem. 241b, 243b; C.E. 471; Ecol. 477; Geos. 101a or 151; Math. 117e, 118, 263; W.F.Sc. 441, 455R, 455L, 482.
125. **Introduction to Fisheries and Wildlife Science** (2) Study of the importance of fisheries and wildlife resources; basic principles of fish and wildlife biology and management; contemporary issues in the field. Matter/Krausman

213. **Animal Genetics** (3) I (Identical with An.S. 213)


401. **Aquatic Entomology** (3) GC II 1984-85 (Identical with Ento. 401)

430. **Principles of Nutrition** (3) GC I II (Identical with An.S. 430)

441. **Limnology** (4) GC I Study of lakes and streams; biological characteristics, as related to physical, chemical, geological, and historical processes operating on fresh waters. 2R, 6L. Weekend field trips. P, six units of chem. or phys. with lab. (Identical with Ecol. 441) Matter

444. **Wildlife Management** (4) GC I Management of wildlife as a resource; characteristics of wildlife species; principles of population dynamics in wildlife populations. 3R, 3L and field work. Weekend field trips. P, 125, G.Bio. 104; Ecol. 102 or Ra.M. 416. Krausman

446. **Wildlife Management Techniques** (4) GC II Field and lab. methods used in wildlife management; evaluation of wildlife habitats; census, productivity, diagnosis, and control of wildlife populations. 2R, 6L and field work. Weekend field trips. P, 444.

448. **Current Problems in Wildlife Ecology** (1) GC [Rpt.] I Discussions and assignments covering current problems, including the biological, economic, aesthetic, political, and sociological phases of wildlife management. P, 444 or 446. Sowls

455R. **Fishery Management** (3) GC II Methods and concepts pertaining to fishery investigations and management; application of principles for production of optimum fisheries to benefit man. P, 441, 444. Matter

455L. **Fishery Management Laboratory** (1) GC II Laboratory methods pertaining to fishery investigations and management. P, CR 455R, 482. Matter

482. **Ichthyology** (4) GC I (Identical with Ecol. 482)

484. **Ornithology** (4) GC II (Identical with Ecol. 484)

485. **Mammalogy** (4) GC I (Identical with Ecol. 485)

537. **Advanced Ecology** (2) II (Identical with Ecol. 537)

547. **Ecology of Wildlife Reproduction** (2) GC II Mechanisms by which environmental factors influence reproductive success in wildlife populations. P, Ecol. 102, V.Sc. 400b or Ecol. 467R. (Identical with Ecol. 547) N. Smith

584. **Selected Studies of Birds** (2) I II (Identical with Ecol. 584)

595. **Colloquium**
   a. Big Game Management (2) I 1984-85 P, 444.

630. **Issues in Fishery Science** (2) [Rpt.] II Procedures for critical evaluation of diverse fishery and aquatic science topics. Tash/Ziebell

649. **Fishery-Water Quality Relationships** (2) I Pertinent water quality parameters essential for fish life, and the effects of various substances and their interrelationships to fish and aquatic organisms. P, 441 or 455R; Chem. 241a. Ziebell

696. **Seminar** (1 to 3) I
   a. Fish and Wildlife Ecology (1) [Rpt.]

**Natural Resource Recreation**

Students in the natural resource recreation program are qualified to pursue professional careers with federal and state agencies as recreation specialists, or with private organizations. Sufficient flexibility has been created in the program to allow students to emphasize additional study in the professional areas of water-based recreation, resource planning, interpretation, park management administration and forest recreation management.

In addition to the requirements for the curriculum in natural resources, the following courses are required for natural resource recreation: Chem. 103a-103b, 104a-104b; Ecol. 102; Econ. 201a-201b; Engl. 101 or 103; 102; 307 or 308; W.F.Sc. 125; G.Bio. 104; Geos. 151;
430 DEPARTMENTS AND COURSES OF INSTRUCTION

Math. 118, 160; 123 or 125a; N.R.R. 381, 388, 395a, 424, 470, 475; Phys. 102a, 180a; Ra.M. 305, R.N.R. 202, 295a, 321; S.W.E. 200, 201; Sp.C. 102; Ws.M. 410; 342 or Ra. M. 382; 416; 480 or Pol. 481; W.F.Sc. 444; twelve units of technical electives.

350. Site Analysis (3) I (Identical with L.Ar. 350)
381. Natural Resource Recreation (2) I Recreation concepts, needs, land planning and management techniques for outdoor recreation in natural areas.
388. Environmental Interpretation (3) II Philosophy and techniques of interpreting the natural environment through media, visitor centers, nature trails and interpretative planning and design. 2R, 3L. P, 381. Shaw
425. Administration of Recreation (3) II (Identical with Ph.Ed. 425)
470. Economics of Outdoor Recreation (3) GC II Application of economic tools to recreation planning and management, including recreation demand and supply, recreation use projection methods, recreation resource valuation and policy issues. P, Econ. 201b or A.Ec. 204; Math. 160. (Identical with A.Ec. 470) King
475. Leisure Theories and Recreational Behavior (2) GC II Theories of leisure behavior and their implications for management of natural resources for outdoor recreation. P, 381, 388.

ROMANCE LANGUAGES
(See French and Italian or Spanish and Portuguese)

RUSSIAN AND SLAVIC LANGUAGES

Professor Joe Malik, Jr., Head
Associate Professors Alexander Dunkel, Boriss Roberts
Assistant Professors Adele Barker, Margaret Gibson, Roger Hagglund, Delbert Phillips

The department's primary emphasis is placed upon acquiring fluency in Russian. Secondary emphasis is placed upon the preparation of prospective teachers and upon preparation of students interested in graduate work or immediate employment.

The department offers the degrees of Bachelor of Arts and Master of Arts with a major in Russian. A Bachelor of Arts in Education and a Master of Education are also available with a teaching major in Russian.

The major: Thirty units (in addition to 101a-101b), including 301a-301b, 405a-405b, 407a-407b. No fewer than sixteen units must be upper-division course work. In addition, the student must take 310 or three units in the history of Russia or three units in government and politics of the Soviet Union.

The supporting minor should be chosen from art history, English, a second foreign language, music, or a social science. With the permission of the departmental adviser, other subjects may be selected.

The teaching minor: Eighteen units (in addition to 101a-101b), including 201a-201b or 205a-205b; 301a-301b; and four to six additional units selected with the consent of the major professor.

101a-101b. Elementary Russian (4-4) Both 101a and 101b are offered each semester. (The first year of work offered in a foreign language shall not be counted toward a minor.) Phillips
SECONDARY EDUCATION

201a-201b. Intermediate Russian (4-4) P, 101b.
205a-205b. Scientific Russian (4-4) Alternate course for 201a-201b, for students interested in reading and translating scientific Russ. P, 101b.
207a-207b. Russian Conversation (2-2) P, 101b.

250a-250b. Russian Humanities in Translation (3-3) Thematic and historical survey of the major Russian authors and works of the 19th and 20th centuries against the background of western cultural and literary traditions. Both 250a and 250b will be offered each semester.

300a-300b-300c. Russian Literature in Translation (3-3-3) Readings and discussion of representative Russian literary works from the earliest times through the Soviet period. Will not count toward fulfillment of language requirement or a major or minor in Russ. 300a, 300b, and 300c are all offered each semester.

301a-301b. Advanced Composition and Grammar (3-3) P, 201b or 205b.
305a-305b. Readings in Russian Texts (3-3) Reading of original texts, with emphasis on the acquisition of passive vocabulary through analysis of word roots, prefixes and suffixes. P, 201b or 205b.

310. Russian Civilization and Culture - Pre-Christian Era to the Present (3) I II Selected topics in Russian culture and civilization: architecture, film, fine art, literature, music and theater within their artistic, historical, ideological and sociological contexts.

405a-405b. Survey of Russian Literature (3-3) GC 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 Russ. Advanced degree credit available only with departmental permission. P, 301b or 305b.

501a-501b. Russian Stylistics (3-3) Designed to improve the student's practical mastery and understanding of Russ. at a higher and more sophisticated level. P, 301b.


579. Problems of Teaching Russian (3) I Survey of modern methods of language teaching, with emphasis on the particular problems presented by Russ.

581. Russian Phonology and Morphology (3) I 1983-84 P, 301b.


685. Old Church Slavic (3) II

686. Russian Drama (3) I 1984-85 Examination of the major dramatic works of nineteenth- and twentieth-century playwrights such as Gogol, Turgenev, Ostrovsky, Chekhov, Gorky and others of the Soviet period. P, 405b.

696. Seminar
a. Slavic Philology (3) I II
d. Russian Literature: 20th Century (3) I II
b. Russian Literature: 18th Century (3) I II
c. Russian Literature: 19th Century (3) I II
e. West Slavic Literature (3) I II

SECONDARY EDUCATION

Associate Professors Margaret B. Fleming, Bruce R. Ledford, Glenn S. Pate, James R. Rankin
Assistant Professors George Babich, D. Paul Robinson, Janice L. Streitmatter
Lecturer Edward J. Van Metre

Programs of the department are directed toward the pre-service preparation of secondary school teachers and the continuing in-service education of certified members of the teaching profession.

The department offers the Bachelor of Arts in Education and Bachelor of Science in Education with majors in subjects taught in Arizona junior and senior high schools. A nonteaching track is available for students preparing for education-related positions in business, government, military, social services, adult education, and industry. In addition, the department offers graduate programs leading to the Master of Education and Educational Specialist de-
degrees with a major in educational media. The degrees of Master of Education, Master of Arts, Master of Teaching, Educational Specialist, Doctor of Education, and Doctor of Philosophy are also available.

For information regarding the professional education sequence, please see the College of Education section of this catalog. Requirements for teaching majors and minors are listed under the appropriate departments in the Departments and Courses of Instruction section.

225. Introduction to Teaching (3) I II S Teaching as a profession: examination of current issues and trends, personal career development, and exploration of the social foundations of American education. Observation in elementary and secondary schools. 2R, 3L.


338. The Teaching of Secondary School Subjects Specific methods, objectives, organization of subject matter, and evaluation in the various subjects.
   a. Agriculture (4) I II 3R, 3L. P, Ed.P. 311, S.Ed. 409 or CR. (Identical with A.Ed. 338a)
   b. Business (3) I (Identical with B.C.Ed. 338b)
   h. Science (3) I
   j. Bilingual (3) I II
   l. Art (3) I II 2R, 2S. P, Art 230. (Identical with Art 338i)
   m. Secondary School Music (3) I (Identical with Mus. 338m)
   t. Theatre Arts (3) II (Identical with Dram. 338i)
   u. Social Studies (3) I II
   y. Mathematics (3) I

NOTE: All specific methods courses, or courses in the teaching of the several high school subjects, are listed under the general number 338, with letters designating the teaching areas. Required of prospective secondary teachers.

340. Teaching as a Profession (2) I II S Professional growth and development, résumé development, certification procedures, state and local educational structure, and major educational issues. P, 493a or CR.

403. Study of Exceptional Children (3) GC I II (Identical with Spec. 403)

405. Mathematics in the Secondary School (3) GC II Study and analysis of curriculum changes in school mathematics, with emphasis on the design and content of experimental programs such as SSMCIS. P, three units of ed.; Math. 125b. (Identical with Math. 405)

408. English as a Second Language in Bilingual Education (3) GC I II (Identical with Engl. 408)

409. Principles of Vocational Education (2) II Social and economic values of vocational education; federal, state policies, and administration; theories and principles, with special reference to programs in the secondary school. (Identical with A.Ed. 409)

410. Teaching English Composition (3) GC I II (Identical with Engl. 410)

411. Teaching of Literature (3) GC I II (Identical with Engl. 411)

412. The Teaching of the English Language (3) GC I II (Identical with Engl. 412)

414. Teaching of Modern Languages (3) GC I II Specific methods, objectives, organization of subject matter and evaluation in modern languages. (Identical with Fren. 414 and Span. 414)

417. Visual and Auditory Aids in Teaching (3) GC I II Operation of AV equipment; preparation of various teaching aids. (Identical with Elem. 417 and Li.S. 417)

418. Educational Photographic Media (3) GC I Basic photographic techniques, as applied to the teaching process; still and motion picture photography; individual training in filming, developing and editing. Field trip.

427. Bilingual/Bicultural Education Curriculum Development (3) GC II (Identical with Ed.F.A. 427)

429. Pedagogical Linguistics: Applied Linguistics for Language Teachers (3) GC II (Identical with Or.S. 429)

435. Secondary School Reading in the Classroom (3) GC I II (Identical with Rdg. 435)

441. Instructional Systems Curriculum Development (3) GC I II S Basic skills and knowledge required for curriculum developers to analyze, design, construct and evaluate instructional programs.
Techniques of Teaching Adults (3) GC II Techniques and issues of adult learning and the dynamics of the teaching and learning processes.

Teaching Vocational Office and Distributive Education (3) GC II (Identical with B.C.Ed. 482)

Development and Instruction of Adult Vocational Education Programs (3) GC I (Identical with B.C.Ed. 483)

Organization and Supervision of Vocational Education Programs (3) GC I (Identical with B.C.Ed. 484)

Cooperative Vocational Education Programs (3) GC II (Identical with B.C.Ed. 485)

Microcomputers in Education (3) GC I II S (Identical with Ed.F.A. 487)

Internship
a. Student Teaching in Secondary School (6 to 10) I II P, Ed.P. 311; 329, 330, 435; passing score on CAT, 338 or CR; CR 494b. Students must meet all other College of Education requirements and have satisfactory grades in major subject and professional courses. Application should be made several months in advance.


Practicum
b. Secondary School Reading (1 to 3) I II P, 435, CR 493a. (Identical with Rdng. 494b)

Methods and Materials in Bilingual Education (3) GC I II (Identical with Elem. 526)

Career Education (3) I (Identical with Coun. 531)

The Middle School/Junior High (3) II History, purposes, curriculum, and administration of the middle school/junior high.

Multicultural Instructional Materials Development (2 to 4) S Study tours to various regions and countries to produce audiovisual instructional materials. (Identical with Elem. 545)

Law for Teachers and Student Personnel Workers (3) II (Identical with Ed.F.A. 567)

Colloquium
c. Language Experiences in Learning (3) II S (Identical with Elem. 595c, which is home.)

Workshop
b. Educational Film and Video in the Classroom (3) I
f. Investigating the Environment (1 to 3) I II S (Identical with Elem. 597f)
o. The Teaching of English (3) I II S (Identical with Engl. 597o, which is home)
r. Curriculum for Self Development (3) S (Identical with Elem. 597r)
w. Southern Arizona Writing Project (3-9) [Rpt./12 units] I II S (Identical with Elem. 597w and Engl. 597w)

English Grammar for ESL (3) I (Identical with Engl. 612)

Teaching of ESL (3) I (Identical with Engl. 613)

Coordination of Instructional Media Programs (3) II Study of organization and distribution practices of media utilization; budgeting, public relations, and implementation of media preparation and media-service programs. P. 417. (Identical with Elem. 616 and Li.S. 616)

Preparation of Instructional Materials (3) II Study of techniques used in the development of instructional materials and processes. P. 417. (Identical with Elem. 617 and Li.S. 617)

Curricular Studies in School Mathematics (3) II 1984-85 Experimental programs in school mathematics, with emphasis on selection of content and on problems in design and evaluation. (Identical with Elem. 631)

Student Activities and Government (3) I Philosophy, values, and coordination of school activities in the secondary school, with emphasis on the theory, organization, and supervision of student government and interscholastic athletics.

Analysis of Secondary School Teaching (3) I II Analysis of the teaching process; preparation of behavioral objectives; study of recent methods, trends; analysis of current classroom evaluation techniques.

Organization and Functions of the Secondary School (3) I II Secondary school: its organization, structure and operation; role and responsibilities of the teacher, the administrator and other personnel.

Innovations in Secondary Education (3) II Change process in education, with emphasis on those elements which support or hinder change in the schools; detailed study of current secondary school innovations on the national and local levels.

Constructing the Secondary School Curriculum (3) I II Curriculum and its relationships; basic theories and techniques of curriculum construction discussed, evaluated, and applied.
639. **Investigations in Secondary Education** (3) I Critical study and evaluation of the investigations and experimental evidence underlying the aims and instructional practices of the various subject-matter fields of the secondary school.

640. **Human Relations in the Classroom** (3) II Analysis of human behavior in the classroom, with emphasis on case studies, role playing and group dynamics.

647. **The Principalship** (3) I S (Identical with Ed.F.A. 647)

648. **The Superintendency** (3) II S (Identical with Ed.F.A. 648)

695. **Colloquium**
   b. Secondary School Scope and Function (1 to 3) I II P, 635.
   c. Issues in Secondary Education (1 to 3) I II P, 635.
   d. Secondary School Curriculum (1 to 3) I II P, 638.
   e. Secondary School Instruction (1 to 3) I II P, 639.
   f. Secondary School Evaluation (1 to 3) I II P, 635.
   g. Master's Colloquium in Secondary Education (1 to 3) I II

697. **Workshop**
   a. Evaluating the Secondary School (1 to 3) [Rpt./2] I II
   b. Teacher Self-Appraisal (1 to 3) I II (Identical with Elem. 697b)
   c. Classroom Teaching Innovations (1 to 3) I II
   d. Democratic Processes in the Classroom (1 to 3) I II
   e. Personalization and Individualization of Instruction (1 to 3) I II
   f. Simulation and Gaming in the Classroom (1 to 3) I II (Identical with Elem. 697f)
   g. Values Education in the Classroom (1 to 3) I II
   h. Educational Implications of Prejudice (1 to 3) I II
   n. Problems and Processes in Teacher Appraisal (1 to 3) [Rpt./6 units] I II (Identical with Ed.F.A. 697n and Elem. 697n)

794. **Practicum**
   b. Bilingual Education (3) [Rpt./2] I (Identical with Ed.F.A. 794b, which is home.)

796. **Seminar**
   a. Secondary Education (1) [Rpt./6] I II

**SOCIAL WORK**
*(See Public Policy, Planning and Administration)*

**SOCIOLOGY**


Associate Professors Albert J. Bergesen, James T. Borhek, Courtney B. Cleland, Robert R. Evans, Celestino Fernández, Michael Hout, Gary F. Jensen, Jerry L. L. Miller

Assistant Professors Neil D. Fligstein, Joseph R. Hambenne (*Emeritus*), Carol Heimer, Douglas McAdam, Patricia L. MacCorquodale, Michael Sobel

Sociology is the scientific study of social relations in all kinds of human populations, ranging in size from two individuals (friends, a family) to nations. Sociologists study changing and stable patterns of social interaction, values and attitudes.

The Department of Sociology offers the following degrees: Bachelor of Arts, Master of Arts, and Doctor of Philosophy with a major in sociology.

**The major:** Thirty units, including 301, 375a-375b, and 401. A minimum of 24 units must be in upper-division courses.

**The supporting minor** is usually chosen from the social sciences, mathematics, or computer science, but another field may be selected with the approval of the student's departmental adviser.

**The teaching minor:** 21 units, including 301, 375a-375b, 401, and 251.

100. **Introduction to Sociology** (3) I II Sociological concepts and principles, with special reference to contemporary society.
150. Sociology of Women (3) I II Sociological approach to women's roles in American society, with emphasis on trends and problems relating to sex-role identification and socialization. P, 100 or 301. (Identical with W.S. 150)

160. Minority Relations and Urban Society (3) I II Analysis of minority relations and mass movements in urban society; trends in the modern world, with special reference to present-day race problems and social conflict. (Identical with B.L.S. 160 and M.A.S. 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 M.A.S. 161)

189. World Population (3) I II Basic concepts of population studies; analysis of social trends, problems and solutions in relation to environmental factors, with reference to both advanced and developing nations. P, 100 or 301.


202. Medical Sociology (3) I II Social determinants of health or illness; health workers and their organizations. P, 100 or 301.

240. Sociology of Childhood and Youth (3) I II Children, adolescents, and young adults in American society; their social roles, relationships, and problems. P, six units of soc.

251. Sociology of Education (3) I II Educational system as a basic social institution; its structure, impact on society, and effects on students; consideration of alternative structures. P, three units of soc. sci.


310. Culture and the Individual (3) I I (Identical with Anth. 310)

311. Social Change (3) I I Innovation and inertia in society; case studies of the impact of new technology, behavior and ideas; the problems of social progress. P, 100 or 301.

313. Collective Behavior and Social Movements (3) I I Study of riots, panics, crazes, reform and revolutionary movements; their origins, social bases, careers and consequences. P, six units of soc.

315. Political Sociology (3) I II Current competing theories of socio-political institutions. P, 6 units of soc. sci. (Identical with Pol. 315)


320. The Sociology of Knowledge (3) I I Relationship between social factors and knowledge, with reference to major problems and writers in the field. P, six units of soc.

321. Sociology of the Family (3) I I Analysis of the modern family and its characteristics in a social and historical setting. P, nine units of social science.

323. Religious Organizations in America (3) I I Analysis of religious bodies in the U.S., including the nature and variety of religious belief systems, the church as a voluntary association and as a bureaucracy, the role of the religious professional, and the relationship of churches to political and moral institutions. (Identical with Reli. 323)

324. Sociology of Sexuality (3) I I Impact of individual and community sexual attitudes and behaviors on other sociological and psychological functioning. P, three units of soc. and three units of another social science.

326. Industrial Sociology (3) I I Survey of the sociology of work and its organization, with emphasis on social supports of work motivation and effectiveness. P, six units of soc.

333. Group Dynamics (3) I I Study of small groups; their objectives, leadership, interpersonal relations, and effectiveness. P, 100 or 301; three additional units of soc. or psyc.

341. Juvenile Delinquency (3) I I Nature and causes of, and reactions to, juvenile delinquency. P, 201; three additional units of soc.

342. Criminology (3) I I Study of the social origins of criminal law, criminal behavior, and reactions to crime. P, six units of soc.

375a-375b. Social Research Methods (3-3) 375a: Problems of conceptualization and design; elementary techniques of data collection and analysis. P, six units of soc. sci. 375b: Techniques of statistical description and elementary statistical inference, as applied to social data. P, Math. 116. 2R, 3L.

384. Sociology of Latin American Societies (3) I I Analysis of their social structures and institutions, including government, religion, family, education, stratification, urban and rural development, economics, migration. P, 100 or 301; three additional units in soc. or anth. (Identical with Anth. 384)

401. Sources of Sociological Theory (3) I I Critical review of the works of leading sociologists; designed for soc. majors or minors. P, 301, six additional units of soc. sci.

402. Kinship and Social Organization (3) GC I (Identical with Anth. 402)
404. Sociology of the Southwest (3) GC I Populations, cultures, and social problems in their regional setting, with emphasis on the Southwest. P, 100 or 301; six additional units of soc. or anth. (Identical with Anth. 404, A.In.S. 404 and M.A.S. 404)


407. Peasant Communities (3) GC I (Identical with Anth. 407)

422. Complex Organizations (3) GC II Theories and research regarding large-scale organizations and their relations to the individual and society. P, nine units of soc.

435. Public Opinion and Voting Behavior (3) GC I, II (Identical with Pol. 435)

444. Group-Process Methods in Public Administration (3) GC II (Identical with P.P.A. 444)

450. Social Stratification (3) GC I, II Theories of social class, caste, and rank; social mobility in contemporary society. P, nine units of soc.* (Identical with Anth. 450)

*A major in another social science may substitute for three of these units.

457. Bio-Social Determinants of Socialization (3) GC II (Identical with C.D.F.R. 457)

459. Sociology of Male and Female Roles (3) GC II Social factors in sex-role identification and the perpetuation of sex roles; consequences for individuals and for society; emphasis on research. P, nine units of soc. (Identical with W.S. 459)

461. Race and Ethnic Relations (3) GC I, II Social processes involved in minority groups in terms of race, caste, class, ethnicity, politics, and religion. P, 100 or 301; six additional units of soc. or anth. (Identical with Anth. 461, A.In.S. 461, Bl.S. 461 and M.A.S. 461) Lieberson

486. Comparative Community Development (3) GC I Principles of social change applied to problems of community development, including analysis of specific programs. P, six units of soc. sci. (Identical with Anth. 486)

500a-500b-500c. Sociological Theory (3-3-3) Major issues in theoretical sociology. 2R, 3L. P, 401; one course in calc. (for 500b).

510. Political Sociology (3) Basic approaches in political sociology, with emphasis on the relationship of economic and political processes.

522. Advanced Sociology of Religion (3) Review of the classical literature in the sociology of religion, including critical reading of recent research.

525. Intermediate Complex Organizations (3) Basic review of classic and contemporary approaches to the study of complex organizations; formation, development, and internal processes.

530. Graduate Social Psychology (3) Basic study of classic and contemporary approaches with particular reference to socialization and the relationship between the individual and social structure.

541. Deviance and Social Control (3) Basic critical review of traditional and contemporary concepts and formulations of deviance and social control; evaluation of contemporary research bearing upon deviance theory and informal and formal mechanisms of social control. P, 201, 341 or 342.

550. Stratification and Class (3) Basic examination of concepts and research in the area of stratification, with emphasis on the classic statements and contemporary research.

560. Intergroup Relations (3) Analysis of recent research on the relations among racial and ethnic groups in society, with special attention to current empirical and theoretical issues. P, 461.

570a-570b. Social Statistics (3-3) Statistical analysis of sociological data. 2R, 3L. P, 375b.


580. Population Studies (3) I Theory and research in the fields of fertility, mortality, and migration, with emphasis on their relationships to social structure. An original research project is required.

589. Advanced Demography (3) Basic study of recent developments in demographic research on population trends. Lieberson

596. Seminar
   a. Advanced Problems in Research (1 to 3) [Rpt.] I II
   b. Advanced Problems in Deviant Behavior (1 to 3) I II
   c. Selected Problems in Sociological Statistics (1 to 3) I II
   d. Advanced Social Change (1 to 3) [Rpt.] I II
   e. Advanced Juvenile Delinquency (1 to 3) I II
   f. Macrosociology (1 to 3) I II
   g. Advanced Social Problems of Socialization (1 to 3) I II

SOILS, WATER, AND ENGINEERING


Associate Professors Moody D. Cannon, Wayne E. Coates, Kenneth E. Foster (Adjunct), David M. Hendricks, Dennis L. Larson, Ian L. Pepper

Assistant Professors Charles F. Hutchinson (Adjunct), Allan D. Matthias

Soils, water and engineering includes chemistry, physics and engineering applied to management of soil, water, air, energy and human resources in environments for plant and animal growth in both production agriculture and natural and urban situations.

The degree of Bachelor of Science in Agricultural Engineering is available through the College of Engineering. The degree of Bachelor of Science in Agriculture with majors in soil and water science and agri-mechanics and irrigation is available through the College of Agriculture. The department offers opportunities for study toward the Master of Science with majors in agricultural engineering and soil and water science and the Doctor of Philosophy with a major in soil and water science.

The requirements for the B.S. in Ag.E. are presented in the College of Engineering section of this catalog.

The major in soil and water science includes the minimum requirements as outlined under agriculture or agricultural science in the College of Agriculture section of this catalog. In addition to these requirements, the following courses are required: 200; 201; 296a; 314, or 316 and 317; 404; 431; and two of the following: 470, 411, or 435. Also Chem. 241a or 322 and 323; Math. 125a or 123; Geos. 101a or 151; Phys. 102a and 180a. Majors are encouraged to take additional classes in chemistry, physics, and mathematics beyond the minimum, as well as classes in computer science and statistics.

The major in agri-mechanics and irrigation includes the minimum requirements as specified under the College of Agriculture section of this catalog. Required courses include 100a-100b, 121a-121b, 200, 201, 296a, 312, 311, 313, 404, 406; C.E. 110, 151; Math. 117e, 118; Phys. 102a-102b, 180a-180b.

The College of Agriculture curriculum in agricultural business and options in turfgrass management and international agriculture, are also available to students majoring in the Department of Soils, Water and Engineering. Courses to be included in each option will be selected in consultation with the student’s adviser.

100a-100b. Agricultural Mechanics (3-3) GRD Principles and techniques in construction and maintenance. 100a: Utilizing wood, concrete masonry materials and electrical energy. 100b: Metal fabrication process in agricultural occupations and production applications. 100a is not prerequisite to 100b.

120a-120b. Agricultural Engineering Problems (1-1) 1984-85 Application of engineering principles to the solution of problems in agriculture. 120a is not prerequisite to 120b. Wiersma

121a-121b. Agricultural Engineering Practices (1-1) 1983-84 Function, operation, construction, maintenance and safety of agricultural machines and equipment. 121a is not prerequisite to 121b. Wiersma

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


296. Proseminar

a. Crops and Soils (1) [Rpt. /2 units] I II (Identical with PI.S. 296a, which is home)

311. Farm Power (3) I Principles of operation, construction, utilization, and adjustment of internal combustion engines, tractors and electric motors, and selection of farm power. 2R, 3L. Hundtoft

312. Farm Machinery (3) II CDT Construction, selection, adjustment, operation, and servicing of the principal tillage, seeding, cultivating, fertilizing, harvesting, and pest control equipment. 2R, 3L. Coates
313. **Farm Structures and Equipment** (2) I 1984-85 Functional requirements of farm buildings, properties of and techniques in use of building materials, construction methods, and elementary design. 
Wiersma

314. **Soil Management** (3) I CDT Evaluation of soil factors affecting water-plant relationships; farm planning for soil conservation; soil and water management on irrigated soils. 2R, 3L. Field trips. P, 200. Stroehlein

316. **Soil Fertility** (2) II CDT Fertility status of semiarid and arid soils; factors affecting availability of the essential elements; influence of physical, chemical, and biological conditions on soil fertility; practices for assessing and improving soil fertility. P, 200. Stroehlein/Tucker

317. **Soil Fertility Laboratory** (1) II Practical application of the basic concepts of soil fertility presented in 316, through demonstration and experimentation under lab., greenhouse and field conditions. Field trip. P, CR 316.

325. **Solar, Wind and Biomass Energy Utilization** (2) II Principles of operation and evaluation of equipment to collect solar, wind and biomass energy and convert it to usable forms of energy. 1R, 3L. Field trips. P, Math. 117e. Larson

330. **Introduction to Remote Sensing** (3) I (Identical with Geog. 330)

402. **Introduction to Pesticides and Their Use** (2) GC II (Identical with Pl.P. 402)

404. **Irrigation Principles and Practices** (3) GC II CDT Principles of irrigation, irrigation water supply, conveyance and measurement of water, water requirements, surveying applications in irrigation and evaluation of irrigation systems. 2R, 3L. Field trip. P, 200, Math. 117e. Fangmeier

405. **Hydrology of Unsatuated Media** (3) GC I (Identical with Hydr. 405)

406. **Applied Hydraulics** (3) GC I GRD Fundamentals of hydraulics applicable to the irrigation of agricultural lands, including fluid properties, hydrostatics, irrigation flow characteristics, open channel and pipeline applications, and measurement of flowing water. P, Math. 117e, 118, Phys. 102a.


411. **Soil Chemistry** (3) GC I CDT Soil chemical interactions with water, air, plants and pollutants. P, 200, Chem. 103b, 104b. Bohn


422. **Irrigation Engineering** (3) GC II GRD Design and operation of irrigation and drainage systems for agricultural lands, surface, sprinkler and trickle systems, wells, water measurement and irrigation scheduling. 2R, 3L. P, CR 406 or C.E. 321. (Identical with C.E. 422) Fangmeier

423. **Agricultural Systems** (3) GC II 1984-85 Application of systems analysis to agricultural problems; modeling and use of operations research methods. P, S.I.E. 270. Larson

425. **Agricultural Engineering Design** (3) GC I Selected design problems in the fields of agricultural machinery, buildings, and irrigation. 1R, 6L. P, six units of agricultural engineering courses at the 400-level. Larson

431. **Soil Morphology, Classification and Survey** (3) GC I Theory and practice of describing characteristics of soils; principles of soil classification and the classification systems; methods and applications of soil surveys. 2R, 3L. Field trips. P, 200, 201, Geos. 101a or 151. Post


461. **Soil and Water Conservation** (3) GC II 1984-85 Consideration of major world soil and water conservation problems and solutions; principles of soil erosion by wind and water and their effects on world food problems. 2R, 3L. Field trips. P, 200. Post

463. **Energy from Biomass** (3) GC II Biomass energy sources; collection and processing methods; thermal, anaerobic digestion and fermentation conversion; energetics, economic and environmental issues. 2R, 3L. P, A.M.E. 340a. (Identical with Nu.E. 463) Larson

470. **Soil Physics** (3) GC 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 or CR. Warrick

494. **Practicum**

  a. Agricultural Engineering Design (3) I II
Workshop

- Irrigation (1 to 2) GC I II

Management of Arid Lands and Salt-Affected Soils (3) II Principles and practices of soil, water, and crop management under arid and semiarid conditions, the use of diagnostic procedures for evaluating soils and waters, reclamation, and economics of irrigation project development. 2R, 3L. Field Trip. Dutt

Chemical Analyses of Soils and Plants (4) II Principles and methods of chemical analyses of soils, water, and biological materials with emphasis on instrumental techniques. 2R, 6L. P, Chem. 322, 323; Phys. 102b, 180b. Hendricks

Drainage of Irrigated Lands (3) II Origin and nature of drainage problems in arid lands; drainage theories, investigations and design for irrigated agriculture and land reclamation. Field trip. P, 406 or 470. (Identical with C.E. 507)

Soil Genesis (3) II Physical and chemical processes and mineralogy of weathering and soil formation; quantitative pedology; the soil as part of the ecosystem. Field trips. P, Geos. 101a and Chem. 103b. (Identical with Geos. 541) Hendricks

Hydrochemistry (3) II 1983-84 Solute composition of naturally-occurring waters, chemical reactions affecting the solute content of water, relations and effects of above on water quality criteria and pollution, analytical procedures used by water testing laboratories. 2R, 3L. P, Chem. 322 or C.E. 371 or 471. (Identical with Hydr. 565 and Ws.M. 565) Dutt

Colloquium

- Current Subjects in Soil Science and Agricultural Engineering (1) [Rpt. / 3] I II


Soil-Water Dynamics (3) II 1984-85 Water flow in soils; closely related problems of solute, pollutant, and heat transfer; emphasis on current concepts and research. P, Math. 253 or 254. (Identical with Hydr. 605) Warrick

Advanced Soil Chemistry (3) I 1984-85 Soil physical chemistry and the chemistry and experimental methodology relating to soil minerals. P, 411. Bohn

Seminar

- Soils, Water and Engineering (1) [Rpt. / 1] I II Wiersma

SOUTHWEST STUDIES

Southwest Center

Director: Michael C. Meyer
Assistant Director: Mardith Schuetz

Southwest studies are designed to bring new perspectives to regional subjects through an interdisciplinary approach.

Southwest Studies I (3) GC Environment of the Southwest and northern Mexico. Man's advent into the region from pre-contact times through Spanish, Mexican and U.S. expansion. (Identical with A.in.S. 456, La.S. 456, and M.A.S. 456)

Southwest Studies II (3) GC Artistic, literary and musical expressions of the Southwest and northern Mexico; native American, Hispanic, and Anglo contributions to the present time. (Identical with A.in.S. 457, La.S. 457, and M.A.S. 457)
The Department of Spanish and Portuguese offers courses in language skills, linguistics, pedagogy, composition and literature. It offers creative writing in Spanish. It provides academic direction in summer programs in Spanish in the Guadalajara Summer School and through Estudios Hispánicos en Segovia program in Segovia, Spain, and in a semester program in Portuguese at Pontificia Universidade Católica in Rio de Janeiro.

The department offers programs leading to the following degrees: Bachelor of Arts with majors in Portuguese and Spanish; Bachelor of Arts in Education with a teaching major in Spanish; Master of Arts with majors in Romance languages and Spanish; Master of Education with a teaching major in Spanish; and Doctor of Philosophy with a major in Spanish. For information concerning the Bachelor of Arts with a major in Romance languages, contact the department head. For further information regarding the graduate programs, please see the Graduate Catalog.

The major in Spanish for the B.A.: 33 units of upper-division courses in Spanish, including 370, 375, and 12 units selected from among 306, 400a-400b, and 401a-401b.

The major in Portuguese for the B.A.: 24 units, including 405a-405b and at least six units of literature courses in the 400 series. At least 16 units must be upper-division.

The supporting minor for majors in Spanish or Portuguese: recommended subjects are classics, drama, English, philosophy, modern languages, history and theory of art or of music, journalism, speech, anthropology, political science, economics, history, linguistics, psychology, sociology; other subjects as may be individually justified.

The teaching major for the B.A. in Education: 30 units in Spanish, at least 21 upper-division, including 370, 372, 414, and 470.

The teaching minor for the B.A. in Education: 20 units in Spanish, including at least 12 upper-division units.

Spanish and Portuguese 101a, 101b, 201a, and 201b are for the student who is learning a second language. Span. 101m is for the student with less than one year of high school Spanish who is not prepared for Span. 101b. Span. 101m is not open to the student who has taken 101a). Spanish and Portuguese 202a-202b are for the student who has already learned a second language. Span. 213, 303, and 373 are for Spanish speaking students: Span. 213 is equivalent to Span. 201a-201b; Span. 303 is equivalent to Span. 305; Span. 373 is equivalent to Span. 370. Elementary courses — 101a, 101m, 101b, and 213 — may not be counted toward the minor. 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.

The four semester language proficiency Group Requirement may be satisfied by completing with a passing grade Span. 201b, Port. 201b or Span. 213. It may also be satisfied by placing in the fifth semester on the departmental placement examination.

Honors: The department participates in the Honors Program.

Spanish

101a/101m-101b. First Year Spanish (4-4) CDT Oral approach. 101a: First-semester Span. for the student with no previous experience in Span. 101m: First-semester Span. for the student with some previous experience in Span. Credit allowed for 101a or 101m, but not for both; either prepares students for 101b. 101b: Second-semester Span. P, 101a or 101m or one year of h.s. Span.
201a-201b. Third and Fourth Semester Spanish (4-4) CDT Credit allowed for 201a or 213, but not for both; credit allowed for 201b or 213, but not for both. P, 101b or two years of h.s. Span.

202a-202b. Intensive Spanish (4-4) 202a is the equivalent of 101a and 101b; 202b is the equivalent of 201a and 201b. P, knowledge of another Romance language.

202cG-202dG-202eG. Intensive Spanish (8-8-8) Offered in Guadalajara only. 202cG is the equivalent of 101a-101b. 202dG is the equivalent of 101b-201a. 202eG is the equivalent of 201a-201b. P, knowledge of another Romance language.

213. Oral Communication in Spanish (4) I II Designed for native speakers of Span. only; considered to be at the third-semester level. Credit allowed for this course or 201a-201b, but not for both. (Identical with M.A.S. 213)

303. Comprehensive Spanish for the Bilingual (4) I II Speaking, reading and writing skills; designed for the native speaker of Span. with some formal study of the language. Credit allowed for this course or 305, but not for both. (Identical with M.A.S. 303)

305. Composition and Conversation (3) [Rpt./1] I II Two hours conversation, 1 hour composition. P, 201b or four yrs. of h.s. Span.

306. Introduction to Types of Literature (3) I II P, 201b.

331. Spanish-American Literary Masterpieces in Translation (3) I Representative masterpieces of Spanish-American literature. Will not count toward fulfillment of the language requirement or the major or minor in Span.

332. Spanish Literature in Translation (3) I 1984-85 Représentative works of Spanish literature from the earliest times to the present. Will not count toward fulfillment of the language requirement or the major or minor in Span.

350. Selected Spanish Prose (3) I 1983-84 Major Spanish prose works from the Middle Ages to the present.

351. Selected Spanish-American Prose (3) II 1983-84 Major Spanish-American prose works from the Conquest to the present.

354. Selected Spanish Theatre (3) I 1984-85 Major Spanish dramatic works from the Renaissance to the present.

355. Selected Spanish-American Theatre (3) II 1984-85 Major Spanish-American dramatic works from the Conquest to the present.

370. Intermediate Grammar (3) [Rpt.] I II P, 201b or four yrs. of h.s. Span. Consult dept. before repeating course.


372. Phonetics (3) I II

373. Intermediate Grammar for the Bilingual (3) I II For native speakers of Span. only. Credit allowed for this course or 370, but not for both. (Identical with M.A.S. 373)

375. Intermediate Composition and Conversation (3) [Rpt.] I II Two hours conversation, one hour composition. P, 305. Consult dept. before repeating course.

395. Colloquium s. Hispanic Literature (3) S Offered in Segovia only. P, 101a, 101b, 201a-201b.

400a-400b. Survey of Spanish Literature (3-3) GC 400a: From the beginning through the 17th century. 400b: 18th-20th centuries. 400a is not prerequisite to 400b.

401a-401b. Survey of Spanish-American Literature (3-3) GC 401a: From the beginning through the 18th century. 401b: 19th and 20th centuries. 401a is not prerequisite to 401b.

402. Survey of Mexican Literature (3) GC S Major works by Mexican writers. Offered in Guadalajara only. P, five semesters of Spanish.

405. Advanced Composition and Conversation (3) GC I II Study and practice in formal discussion and expository writing. P, 375.

414. Teaching of Modern Languages (3) GC I II (Identical with S.Ed. 414)


422. Introduction to Romance Philology (3) GC I 1984-85 Survey of the development of the modern Romance tongues from the Latin language. P, knowledge of two Romance languages. (Identical with Fren. 422, Ital. 422, Port. 422, and R.Lg. 422)

423a-423b. Theory of Spanish Syntax (3-3) GC 423a: Introduction to grammar as a theoretical construct; principles of transformational generative grammar exemplified in Span.; examination of traditional grammatical concepts in the new framework. 423b: More detailed and further-ranging analysis of Span. grammar within the general theory. P, 370. (Identical with Ling. 423a-423b)

425a. **The Literature of the Caribbean** (3) 1984-85 (Identical with Engl. 425a)

427. **Applied Spanish Linguistics** (3) GC I Pedagogical applications of syntactic theory; introduction to phonological theory of Span. for pedagogical purposes; applied phonetics. (Identical with Ling. 427)

430. **Spanish Civilization** (3) GC I Spanish milieu; geographical, political, and cultural aspects of Spanish civilization.

431. **Spanish-American Civilization** (3) GC II Spanish-American milieu; geographical, political, and cultural aspects of Spanish-American civilization.

435. **Cervantes and His Works** (3) GC II

441. **Children’s Literature in Spanish** (3) GC I Survey of children’s literature in Span., with special attention to the needs of American schools and libraries. P. 306. (Identical with Li.S. 441 and M.A.S. 441)

443. **Mexican-American Literature** (3) GC II Study of the literature, in Span. and Engl., created by the Mexican-American in the United States. (Identical with Li.S. 443 and M.A.S. 443)

445. **Novel of the Mexican Revolution** (3) GC I

447. **Contemporary Mexican Literature** (3) GC II S Major novelists of modern Mexico; their works, narrative perspective, characterization, language, time, space, and themes. P, five semesters of Span. (Identical with M.A.S. 447)

450. **Spanish-American Short Story** (3) GC S Development of the modern short story in Latin America, with examples from various countries and authors. Offered in Guadalajara only. P, five semesters of college Span.

470. **Advanced Grammar** (3) GC I II P, 370.

473. **Spanish for the Bilingual Classroom Teacher** (3) GC II Practical Span. for the elementary and secondary school subject-matter teacher who uses Span. as the medium of instruction. P, 370 and 375. (Identical with M.A.S. 473)

510. **Bibliography** (3) II 1983-84 Bibliographical methods and principal bibliographies.

511. **Literary Theory and Criticism** (3) II 1984-85 Historical survey of theoretical writings on literature, with their implications for practical criticism.

540. **Introduction to Medieval Literature** (3) I 1984-85 Close study of the *Poema de mio Cid*, Berceo’s *Milagros*, Juan Manuel’s *Conde Lucanor*, selections from Juan Ruiz’s *El libro de buen amor*, and from Santillana’s poems.

541. **Major Medieval Authors** (3) I 1983-84 Representative works from the 11th to the 15th century and their current critics.

550. **Spanish American Lyric Poetry from Colonial Times through Independence** (3) I 1984-85

551. **Spanish American Lyric Poetry from the 1830's through the 1920's** (3) II 1984-85

552. **Spanish American Lyric Poetry from the 1930's to the Present** (3) I 1983-84

553. **Spanish American Narrative from the Discovery through Independence** (3) I 1983-84 Chronicle, epic, and early novel.

554. **Spanish American Narrative from the 1830's through the 1920's** (3) II 1983-84 Novel, short story, narrative poetry, and the *articulo de costumbres*.

555. **Spanish American Narrative from the 1930's to the Present** (3) I 1984-85 Novel and short story.

556. **Spanish American Theatre** (3) II 1983-84 Major dramatic works from Colonial times to the present.

557. **Spanish American Essay** (3) II 1984-85 Major essayists from Independence to the present.

560. **Golden Age Prose** (3) II 1984-85 The *Celestina*, chivalric, picaresque, and pastoral novel from the late 15th through the 17th century.

561. **Golden Age Poetry** (3) II 1983-84 The major poets from the early 16th through the 17th century.

562. **Golden Age Theatre** (3) I 1983-84 The major dramatists from the early 16th through the 17th century.

563. **Neoclassicism and Romanticism** (3) I 1984-85 The emergence of Spanish Romanticism from the Enlightenment.

564. **Realism and Naturalism** (3) II 1984-85 Major prose writers of the 19th century from Galdós to Blasco Ibáñez.

565. **The Generation of ’98** (3) I 1983-84 Major literary expressions concerning the problems of Spain and the Spaniard from the late 19th century to 1936.

566. **Contemporary Spanish Novel** (3) I 1984-85 The novel since the Civil War.

567. **Poetry and Drama since the Civil War** (3) II 1983-84

620. **History of the Spanish Language** (3) I 1983-84

621. **Spanish in the Americas** (3) I 1984-85
696. **Seminar**
   a. Philology and Linguistics (3) I II
   b. Spanish Literature (3) I II
   c. Spanish American Literature (3) I II

**Portuguese**

101a-101b. **Elementary Portuguese** (4-4) CDT Both 101a and 101b are offered each semester.
201a-201b. **Intermediate Portuguese** (4-4) CDT Both 201a and 201b are offered each semester. P, 101b or two yrs. of h.s. Port.

202a-202b. **Intensive Portuguese** (4-4) P, knowledge of another Romance language or permission of instructor. 202a is the equivalent of 101a-101b; 202b is the equivalent of 201a-201b.

383. **Literature of Brazil in Translation** (3) II 1984-85 Will not count toward fulfillment of the language requirement or the major or minor in Port.

400a-400b. **Survey of Brazilian and Portuguese Literature** (3-3) GC 1984-85 400a: Brazilian literature. 400b: Portuguese literature. P, 201b or 202b.

402a-402b. **Brazilian Civilization** (3-3) GC P, 201b or 202b.

405a-405b. **Advanced Composition and Conversation** (3-3) GC Two hours conversation, one hour composition. P, 201b or 202b.

422. **Introduction to Romance Philology** (3) GC 1984-85 (Identical with Span. 422)

429. **Pedagogical Linguistics: Applied Linguistics for Language Teachers** (3) GC II (Identical with Or.S. 429)

**Romance Languages**

696. **Seminar**
   a. Portuguese Literature (3) [Rpt.] I II
g. Brazilian Literature: 16th-18th Centuries (3) I II
h. Brazilian Literature: 19th Century (3) I II
i. Brazilian Literature: 20th Century (3) I II

**Special Education**

Assistant Professors Shirin Antia, Candace Bos, C. June Maker, Maria Nahmias, Ivan S. Terzleff, John Umbreit, Aldine S. von Isser

The Department of Special Education offers programs leading to the Master of Arts, Master of Education, Educational Specialist, Doctor of Education, and Doctor of Philosophy degrees with a major in special education. By a judicious choice of electives and individual studies, a considerable emphasis on multicultural education may be developed within the major.

Students seeking admission to the department's programs must obtain the approval of the department head. For graduate degree requirements, please see the Graduate Catalog. Requirements for the 18-unit nonteaching minor include 403, 408, 419 and 574.

403. **Study of Exceptional Children** (3) GC I II Incidence, characteristics, and educational problems of exceptional children. (Identical with Ed.F.A. 403, Elem. 403 and S.Ed. 403)
444 DEPARTMENTS AND COURSES OF INSTRUCTION

407. Introduction to Learning Disabilities (3) GC I
II Theories and history of programs for the learning-disabled - definition, characteristics, etiology. P, 403.

408. Diagnosis and Remediation of Learning Problems (3) GC I
II Educational and psychological assessment of children with learning problems; development of competencies required to teach such children. P, 403 or CR. Not open to students in the learning disabilities concentration.

423. The Special Education Teacher (3) GC I
II S Information to aid teachers in dealing with responsibilities and concerns in school settings with regard to P.S. 94 -142, Education for All Handicapped Children Act.

470. Mental Retardation (3) GC I
II History and philosophy of educational programs for the mentally retarded; etiology, classification, and characteristics of the retarded, with consideration of their educational, social, and interpersonal problems. P, 403 or CR.

472. Physically Handicapped Child (3) GC I
Characteristics, etiology, and educational implications of physical handicaps and special health problems. P, 403.

473. Education of Children with Behavioral Disorders (3) GC I
Educational programs for children who are emotionally disturbed or socially maladjusted. P, 403.

504. Issues in Learning Disabilities (3)

505. Methods of Teaching the Learning-Disabled (3)
II Remediation of academic areas and learning processes involving perception, integration, and expression, with emphasis on methods of planning and implementing instructional programs. P, 407, 506, and permission of dept.; CR 594.

506. Methods for Diagnosing Specific Learning Disabilities (3)
I Educational and psychological assessment of academic areas and learning processes involving perception, integration, and expression, with emphasis on testing and diagnostic teaching. P, 407 or CR and permission of department; CR 594.

507. Teaching Severely Handicapped (3)
I Specific information, techniques, and methods applicable to the systematic instruction of severely and multiply handicapped children and adolescents. P, 403.

511. Teaching Mentally Retarded Children and Youth (3)
Techniques, organization of materials, and classroom management at the elementary level. P, 470.

514. Methods of Teaching the Visually Handicapped (3)
I Curriculum development and adaptation in various educational programs; adaptation of classroom materials and procedures for use with blind and partially-sighted children; emphasis on methods of teaching reading, writing, and mathematics.

515a -515b. Tactile Communication (3 -3)

526. Methods and Materials in Bilingual Education (3) GC I
II (Identical with Elem. 526)
550. Administration and Supervision of Special Education Programs (3) I Practical aspects of organization and development of special education programs, problems of public relations, personnel, case finding, evaluation, placement, and records.

572. Teaching the Physically Handicapped (3) II Methods of teaching children who have physical handicaps or special health problems.

573. Teaching Children with Behavioral Disorders (3) II Various methods and techniques for teaching the emotionally disturbed. P, 473.


575. Observation and Participation in Special Education Programs (1 to 3) I II Specific types of exceptional children, physical limitations, causes and effects, personality factors, psychological implications, and specific educational approaches to their individual problems. Field trips and class observations. P, 403. Special sections in each category of the handicapped to be arranged in the departmental office.

581. Language Development for the Exceptional Child (3) I Pragmatic, semantic and syntactic aspects of language development in exceptional children; cognitive and social bases for intervention.

582. Teaching Language to Hearing Impaired (3) II Receptive and expressive language assessment; techniques of teaching language to hearing impaired children.

585. Speech for the Hearing Impaired (3) II Oral/aural communication development; methods for assessing and teaching speech and auditory skills.

593. Internship Note: Special sections in each category of the handicapped to be arranged in the departmental office.

594. Practicum
b. Communication Development for Hearing Impaired Children (1 to 6) I II

c. Reading and School Subjects for the Deaf (1 to 10) I II

595. Colloquium
a. Behavioral Disorders (3) I Open to majors only.

c. Severely Handicapped (3) I P, 403.

597. Workshop
a. Personal Management and Daily Living Skills for the Visually Handicapped (1 to 3) GC I II

b. Orientation and Mobility of the Visually Handicapped (1 to 3) GC I II
d. Role and Function of the Resource Teacher (1 to 3) I II

616. General School Administration (3) I (Identical with Ed.F.A. 616)

620. Applied Research with Children (3) II Review of principles and practices underlying applied research with exceptional children; practice in preparation of research proposals; conduct of research emphasized.

621. Methods of Teaching Preschool Handicapped (3) II Deals with competencies required to teach all categories of handicapped preschool children except deaf/blind. Field trips. P, 575, 622, 495g, 695h.


664. Theory and Behavior in School Administration (3) II (Identical with Ed.F.A. 664)

671. School Finance (3) I (Identical with Ed.F.A. 671)

675. The Law and American Education (3) I (Identical with Ed.F.A. 675)

695. Colloquium
a. Recent Advances in Special Education (1 to 4) I II

b. Behavior Disorders (1 to 4) I II
c. Issues and Trends in Special Education (1 to 4) I II
d. Learning Disabilities (1 to 4) I II
e. Mental Retardation (1 to 4) I II

f. Neurologically Impaired (1 to 4) I II

h. Multidisciplinary Approaches to Preschool Handicapped (1) I P, 403; CR 575.
i. Working with Families of Young Handicapped Children (1) II P, 403, 495g.

j. Application of Child Development Research to Exceptional Children (1) II P, 403, 495g.
SPEECH AND HEARING SCIENCES

Associate Professor Linda Swisher
Clinical Instructors Ron Leavitt, Arlene Matkin
Director, Speech-Language Clinic: Anthony B. DeFeo
Assistant Director, Speech-Language Clinic: Linda B. Lilley

The Department of Speech and Hearing Sciences prepares students for careers in basic and clinical sciences (speech-language pathology, audiology, speech science, and hearing science) in university, laboratory, medical or other clinical settings, or as public school clinicians. Professional certification in the state of Arizona and with the American Speech-Language-Hearing Association requires graduate study with the acquisition of at least thirty semester credits or a Master of Science degree.

The department offers the following degrees: Bachelor of Science in Speech and Hearing Sciences, Master of Science and Doctor of Philosophy with a major in speech and hearing sciences. For graduate admission and degree requirements, consult the Graduate Catalog.

The major: In addition to the group units required for the B.S., as described in the College of Arts and Sciences section of this catalog, this major requires 36 units, including 260, 280, 370, 467, and 483. Students must also meet the requirements in one of the following options:

A. (For students enrolled in the traditional undergraduate degree program): These students take plan A science/mathematics and social science requirements in groups V and VI, Bachelor of Science group unit requirements.
B. (For students enrolled in the American Indian professional training program): Sp.H. 450, 451, and at least four units of 499. These students take plan B science/mathematics and social science requirements in groups V and VI, Bachelor of Science group unit requirements.

A twenty-unit minor is also required (see Faculty of Fine Arts section of this catalog). At least 24 units in the major must be taken in residence. Minimum total units for the degree with this major — 125.

106. Voice and Articulation (2) I II Designed to improve voice, articulation, and fluency patterns in speech. Class members’ presentations are videotaped and analyzed. Individual lab. practice.
107. Survey of Hearing, Language, and Speech: Normal and Disordered (3) I II Role of speech, hearing, and language in human communication; normal processes and disorders in speech, language, and hearing; directed observations in labs. and clinics.
108a-108b. Effective Listening (2-2) Exploration of the principles of listening and perception in communication with associated exercises.
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) I Anatomy, neuroanatomy, physiology of the auditory mechanism; acoustics and psychoacoustics; decibel scale, normal auditory function. 3R, 3L.
367. Phonetics (3) I Scientific study of speech sounds; articulatory phonetics, transcription, dialects and articulatory errors.
370. Speech Pathology (3) I Types, causes, symptoms, and theory of retraining disorders of speech. P, 260, 367, or CR.
450. Structure of Speech and Language (3) GC I Study of the nature of language and linguistics; current approaches in linguistics.
451. Acquisition of Speech and Language (3) GC II Normal development of speech and language in the child; relationships with cognitive and social development. (Identical with Ling. 451)
461R. Speech and Hearing Science Instrumentation (2) GC I Consideration of some common and specific instruments and methods employed in speech and hearing labs. and clinics. P, 260, 280 or CR.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>461L</td>
<td>Speech and Hearing Science Instrumentation Laboratory (1) P, CR 461R.</td>
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<tr>
<td>471R</td>
<td>Articulation Disorders and Therapies (2) GC II Etiology, diagnosis, prognosis, and therapy for the articulatory aspects of communication problems. P, 370; 367; CR or subsequent registration in 471L (for majors).</td>
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<tr>
<td>471L</td>
<td>Laboratory in Articulation Disorders (1) GC I II Open to majors only. P, 471R or CR.</td>
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<td>483</td>
<td>Audiology (3) GC I Principles and techniques of auditory testing, and the interpretation of hearing tests. P, 280.</td>
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<td>484</td>
<td>Audiologic Rehabilitation: Adults (3) GC II Speech reading; auditory training; problems encountered with amplification units; social, psychological, educational, speech, and language difficulties encountered by the hearing handicapped. P, 280.</td>
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<tr>
<td>494</td>
<td>Practicum a. Speech Pathology (1 to 2) [Rpt./6 units] I II Open to majors only. P, 370; 471R or CR. b. Audiology (1 to 2) [Rpt./6 units] I II Open to majors only. P, 483; 484 or CR.</td>
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<tr>
<td>500</td>
<td>Workshop a. Speech, Language and Hearing Problems in Children and Adolescents (3) GC I S Field trips.</td>
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<td>553R</td>
<td>Language Disorders in Preschool Children (2) Etiology, evaluation and therapy for children with delayed language and/or language disabilities; relationships with learning disabilities; dialect and bilingualism.</td>
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<tr>
<td>553L</td>
<td>Laboratory in Preschool Language Disorders (1) II</td>
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<tr>
<td>554R</td>
<td>Adult Aphasia (2) II Etiology, evaluation and therapy for language disorders associated with brain damage. P, 370; 450 or 451; CR or subsequent registration in 554L (for majors).</td>
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<tr>
<td>554L</td>
<td>Laboratory in Adult Aphasia (1) II P, 554R or CR.</td>
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<td>560a-560b</td>
<td>Experimental Phonetics (3-3) 560a: Systematic examination of current experimentation and research in speech as motor behavior, with emphasis on physiological investigations of normal respiration, phonation, resonance, and articulation; critical evaluation of research design. P, 260. 560b: Systematic examination of current experimentation and research in speech as an acoustical phenomenon; critical evaluation of research design. P, 260, 461. 2R, 3L. 560a is not prerequisite to 560b.</td>
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<tr>
<td>565R</td>
<td>Aerodynamic Evaluation and Management of the Speech Mechanism (2) II Principles and clinical methods of aerodynamic evaluation and management of the disordered speech mechanism, with practical experience provided through case studies and class experiments. P, 260, 461, 560a.</td>
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<tr>
<td>570R</td>
<td>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, 483; CR or subsequent registration in 570L (for majors).</td>
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<tr>
<td>570L</td>
<td>Laboratory in Evaluation Process (1) I II Open to majors only. P, 570R or CR.</td>
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<td>572R</td>
<td>Disorders of Phonation (2) I Etiology, diagnosis, prognosis, and therapy for disorders of voice; speech for the laryngectomized. P, 260.</td>
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<tr>
<td>572L</td>
<td>Disorders of Phonation Laboratory (1) I Open to majors only. P, 572R or CR.</td>
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<td>573R</td>
<td>Disorders of Fluency (2) II Primarily a study of stuttering: identification, nature and assessment; theoretical considerations; management approaches; proportionate attention to other anomalies of fluency. P, 370; CR or subsequent registration in 573L (for majors).</td>
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<tr>
<td>573L</td>
<td>Laboratory in Disorders of Fluency (1) I II Open to majors only. P, 573R or CR.</td>
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<tr>
<td>579</td>
<td>Organization and Administration of Speech and Hearing Programs (3) II Problems in organizing a speech and hearing program: philosophy, case load, space, staff, budget, interagency cooperation.</td>
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<tr>
<td>580</td>
<td>Industrial Audiology (2) II Auditory and non-auditory effects of noise, industrial hearing conservation, noise measurement and control.</td>
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<tr>
<td>581</td>
<td>Evaluation and Selection of Hearing Aids (3) I Development of hearing aid evaluations; circuitry of hearing aids and their physical characteristics; speech intelligibility and the electroacoustics of low-fidelity circuitry; patient evaluation and counseling. P, 483; CR or subsequent registration in 494b (for majors).</td>
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</table>
582. Disorders of Hearing (3) II Pathologies of the hearing mechanism and their auditory manifestations in both adults and children. P, 280, 483.

583. Special Auditory Tests (3) II Special audiologic procedures to differentiate conductive versus sensorineural, sensory versus neural, central versus peripheral, and organic versus functional hearing disorders. Open to majors only. P, 483, 582.

584. Audiolgic Habilitation: Children (3) I Amplification, room acoustics, auditory and visual processing, evaluation and remedial programming for children with mild to moderate hearing impairment. P, 483 or 589.

585. Physiological Acoustics (3) I Study of contemporary auditory theory and its historical development; theories related to the function of physiological and neurological mechanisms in the light of empirical findings; psychophysical findings related to physiological findings. 2R, 3L. P, 280.

586. Electrophysiologic Evaluation of the Auditory and Vestibular Systems (3) II Techniques, normative data, and clinical interpretation of auditory-evoked potential and electronystagmography tests. 2R, 3L.

587. 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. 2R, 3L. P, 280, 461.

589. Principles of Audiology (3) I Basic techniques of pure-tone audiometric testing; interpretation of audiograms; disorders of hearing; anatomy and physiology of the hearing mechanism; basic acoustics. Open to nonmajors only.

596. Seminar
   a. Experimental Phonetics (1 to 3) I II
   b. Clinical Audiology (1 to 3) I II
   c. Hearing—Physiology and Psychophysics (1 to 3) I II
   d. Language and Language Disorders (1 to 3) I II
   e. Speech Pathology (1 to 3) I II

693. Internship
   a. Speech Pathology (1 to 6) III Open to majors only. P, 494a.
   b. Audiology (1 to 6) I II Open to majors only. P, 494b.

SPEECH COMMUNICATION

Professors Henry L. Ewbank, Andrew A. King, Frank K. La Ban, Klonda Lynn (Emerita), Alethea S. Mattingly (Emerita), George F. Sparks (Emeritus)
Associate Professors Patricia D. Van Metre Acting Head, James W. Davis, Mary Z. Maher, Ronald J. Matlon, Robert W. Sankey, David A. Williams
Assistant Professor Uvieja Good Leighton
Lecturers William E. Bailey, Timothy A. Browning, F. Dave Nott

The Department of Speech Communication is concerned with the theory and practice of spoken discourse. The study of speech communication is designed for students who wish to concentrate on communication skills and understandings to prepare for careers in communication, business, government, law and teaching. It also provides substantive grounding for students who plan to pursue graduate work in the field.

The degrees offered by the department are the Bachelor of Arts in Speech Communication, Master of Arts and Doctor of Philosophy with a major in speech communication. The degrees of Bachelor of Arts in Education and Master of Education with a teaching major in speech communication are also available. Students should consult the Faculty of Fine Arts section of this catalog for undergraduate program requirements of the faculty. For graduate admission and degree requirements, students should consult the Graduate Catalog.

The major requires 33 units in speech communication, 18 of which must be upper-division course work. All majors must take 105, 136, 210, 300, 467, and either 303 or 325, courses which provide students with basic knowledge and training in communication studies. In addition to the required courses, students must select at least three units from each of the following groups: (1) Communication Theory: 112, 115, 303, 312, 313, 412, 428, 453. (2) Oral
Interpretation: 237, 238, 436, 445, 446, 447. (3) Rhetoric and Public Address: 181, 325, 414, 416, 418, 420, 422, 424a-424b. At least 18 units of the major must be taken in residence. A minimum total of 125 units is required for the degree with this major.

The teaching major requires the following 32 units: 105, 136, 210, 300, 303, 325, 418, 447, 467, 493 (Internship), 125a and 125b. A prerequisite for the internship for the teaching major is completion of 15 units of the speech requirements.

The teaching minor requires 21 units, including 105, 136, 210, 300, 303, 493 (Internship) and a choice of 325, 418, 447 or 467. A prerequisite for the internship for the teaching minor is completion of 15 units of the speech requirements.

The minor in communication for students interested in law or law-related or public policy professions is designed to improve communication skills and decision-making processes. It consists of a minimum of 22 units of Sp.C. 105, 136, 210, 125a, 325, 414, 418, and 420, and other electives needed to meet minor requirements of the student’s college.

Honors: The department participates in the Honors Program.

101a-101b. Speech for Foreign Students (3-3) Speech communication skills designed to meet the particular needs of foreign students. Initial placement is determined by testing. 101a is not prerequisite to 101b.

102. Public Speaking (3) I II Beginning course in the practice of public speaking, with emphasis on organization, effective thinking, and delivery.

105. Development of the Speaking Voice (3) I II Developing the speaking voice and cultivating its effectiveness; emphasis on voice quality, articulation, and intonational features as well as on nonverbal cues.

112. Business and Professional Communication (3) I II Analysis of the structure and function of speech communication in complex organizations. Interpersonal, group, and public communication experiences are provided.

115. Interpersonal Communication (3) I II Study and application of basic communication concepts to the description and analysis of interpersonal communication transactions.

125a. Speech Activities in Debate and Forensics (1) [Rpt.] I I Student participation in intercollegiate debate and forensics. Open only to members of the university speech team. Approval of the instructor is required prior to admission to this offering. No more than three units of 125 credit (a or b taken in any combination) may count toward graduation.

125b. Speech Activities in Interpreters' Theatre (1) [Rpt.] I I 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 three units of 125 credit (a or b) may count toward graduation.

136. Oral Interpretation of Literature (3) I II 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.

181. Public Address in Western Civilization (3) I II Role of public address in the social, political and intellectual history of western man; representative speakers and their speeches from classical times to the present.


237. Oral Interpretation of Classical Drama (3) I Backgrounds in and analysis of structure and content of dramatic masterpieces of world literature from the Golden Age in Greece through the Restoration, with emphasis on oral presentation of selected scenes.

238. Oral Interpretation of Modern Drama (3) I 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 for Radio and Television (3) I II Communication learnings and behavior for presenters on radio and television, includes backgrounds, current trends, and performance experience in various types of radio and television speaking. (Identical with R.T.V. 239)

300. Introduction to Speech Communication Theory (3) I Origin and development of basic concepts in speech communication theory and research; survey and analysis of theories and models in research.

303. Communication in Small Groups (3) I II Introduction to theory of small group communication, with practice and amplification of principles in small group discussion.

313. **Advanced Communication in Small Groups** (3) I Consideration of advanced problems in group interaction, with emphasis on the analysis and solution of communication problems. P, 303.

325. **Argumentation and Advocacy** (3) I II 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.

355. **Administering the Forensic Program** (3) I 1983-84 Philosophy, organization, and administration of competitive speech activities, debate, discussion, and individual events; individual and group activities in the administration of intercollegiate and interscholastic speech contests.

408. **Parliamentary Procedure** (3) II Theory, strategy, and practice of decision-making procedure in democratic organizations. (Identical with Pol. 408).


412. **Organizational Communication** (3) GC II Analysis of interpersonal and group communication practices affecting goal achievement in business, governmental, and professional organizations. P, 300 or Mgmt. 305.

414. **Classical Rhetorical Theory** (3) GC I Intensive reading and analysis of the works of major Greek and Roman rhetorical theorists. P, 325 or CR.

418. **Modern Rhetoric** (3) GC II 1984-85 Intensive reading and analysis of the works of major rhetorical theorists from the 18th century through the present. P, 414.

418. **Persuasion** (3) GC I II Theories of audience analysis and the motivation of human conduct: the study of rhetorical devices.

420. **Speech Communication in the Legal Process** (3) GC I II Analysis of communication questions and skills facing lawyers, judges, litigants, and jurors. Application of speech communication theories to legal concerns of interview, negotiation, and litigation. Field trips.

422. **Rhetoric of the British Empire** (3) GC II 1984-85 Significant public argument in the British Empire, with emphasis on the political, social and economic issues in the "Golden Age" of rhetoric: Chatham, Burke, Pitt, and Fox. P, 325, 414.

424a-424b. **American Public Address** (3-3) GC 424a: II 1983-84 History and criticism of American religious and reform speakers from Colonial times to the present. 424b: II 1984-85 Analysis of American political speaking from 1765 to the present. P, six units of speech. 424a is not prerequisite to 424b.

428. **Communication Theory and Research** (3) II 1984-85 Theories of communication and their research backgrounds; research methodology in communication behavior studies.

436. **Oral Interpretation of Shakespeare** (3) GC I 1983-84 Character analysis and presentation of selected scenes from representative comedies, histories, and tragedies. P, 237 or 238.

445. **Oral Interpretation of Poetry** (3) GC I Types of poetry analyzed, with emphasis on their differentiation for oral presentation; preparation for and presentations of a public recital. P, 136.


447. **Studies in Group Reading** (3) GC I 1983-84 Study in forms, styles, and aesthetics of Readers Theatre, Chamber Theatre, and the documentary; examination of essay, biography, short fiction, novel, and dramatic literature for group reading. P, three units of speech, dram. or Engl.

453. **Theories of Small Group Communication** (3) GC I Theories of small group communication, their research backgrounds, and their relevance to communicative interaction in small groups. P, 303 or 313.

467. **English Phonetics** (3) GC I II Scientific study of the sounds of speech; emphasis on laws and principles determining articulatory features, dialect variation, sound change, and sound as communication context.

525. **Rhetorical Criticism** (3) I 1983-84 Systems of criticism; rationale of approaches to the critical act; analysis of representative criticism of rhetorical events and movements.

567. **Applied Phonetics** (3) II 1984-85 Analysis of English dialect variations, with emphasis on interviewing procedures forming the basis of the Linguistic Atlas of the United States and on determining and modifying dialect forms of nonnative speakers of English; atlas field projects and tutorial work with nonnative speakers of English. P, 467 or ability to transcribe phonetically.

610. **Rhetorical and Communication Theory I** (3) I Historical development of theoretical and pedagogical perspectives on the process of generating and understanding public discourse.

620. **Rhetorical and Communication Theory II** (3) II Contemporary approaches to the process of human communication, psychological, philosophical, linguistic, literary, behavioral, and other perspectives.

636. **Interpretation of Individual Literary Styles** (3) I 1984-85 Intensive critical study of selected writings of one or two significant premodern and modern literary figures in terms of the oral presentation. P, 136, and six additional units in interpretation.
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
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<tbody>
<tr>
<td>637</td>
<td>Historical Theories of Oral Interpretation</td>
<td>(3) II 1983-84 Mechanical and natural schools of oral interpretation, their backgrounds, and their influence upon modern teaching and performance.</td>
</tr>
<tr>
<td>638</td>
<td>Modern Theories of the Performance of Literature</td>
<td>(3) II 1984-85 Twentieth-century theories of interpretation and their application, with emphasis on developing a rationale for criticism of performed literature.</td>
</tr>
<tr>
<td>660</td>
<td>Research Methodologies I</td>
<td>(3) I Historical and critical methods of investigating, analyzing, and evaluating rhetoric and literature.</td>
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<tr>
<td>670</td>
<td>Research Methodologies II</td>
<td>(3) II Experimental, descriptive, statistical, and computer-assisted methods of investigating, analyzing, and evaluating human communication.</td>
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</tbody>
</table>
| 696        | Seminar                                              | a. Rhetorical Criticism (3) [Rpt. / 1] I II  
|            |                                                       | b. Oral Interpretation (3) [Rpt. / 1] I II  
|            |                                                       | c. Rhetorical Theory (3) [Rpt. / 1] I II  
|            |                                                       | d. Speech Education (3) [Rpt. / 1] I II  
|            |                                                       | e. Communication Theory (3) [Rpt. / 1] I II  
|            |                                                       | f. Linguistic Investigations and Applications (3) I II (Identical with Ling. 696f)  
|            |                                                       | g. Argumentation (3)                                                                      |

**STATISTICS**

Professors Jean E. Weber, *Head*, Bruno Baldessari, Takis Pappioannou  
Assistant Professor Dalice Sim (Cancer Center)  
(Adjunct)

The Department of Statistics does not offer an undergraduate major but offers a major in statistics for the Master of Science degree and a Ph.D. minor for students in other disciplines. For further information please see the *Graduate Catalog*.

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<tr>
<th>Course Code</th>
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<tr>
<td>361</td>
<td>Statistics for Engineering and the Physical Sciences</td>
<td>(3) I II Probability theory, point and interval estimation, hypothesis testing and regression analysis; applications to quality control and reliability theory. P, nine units of calculus.</td>
</tr>
<tr>
<td>461</td>
<td>Elements of Statistics</td>
<td>(3) GC I II Advanced degree credit available for nonmajors only. (Identical with Math. 461)</td>
</tr>
<tr>
<td>464</td>
<td>Theory of Probability</td>
<td>(3) GC I (Identical with Math. 464)</td>
</tr>
<tr>
<td>465</td>
<td>Statistics for the Medical Sciences</td>
<td>(4) GC I Standard and nonparametric one- and two-sample procedures, ANOVA designs, linear and multiple regression, bioassay, prohibit analysis, and contingency tables. 3R, 3L. Not open to majors. P, two semesters of calculus. (Identical with Tox. 465)</td>
</tr>
<tr>
<td>466</td>
<td>Theory of Statistics</td>
<td>(3) GC II (Identical with Math. 466)</td>
</tr>
<tr>
<td>468</td>
<td>Applied Stochastic Processes</td>
<td>(3) GC II (Identical with Math. 468)</td>
</tr>
<tr>
<td>562</td>
<td>Sampling Theory and Methods</td>
<td>(3) II Introduction to planning, execution, and analysis of surveys, methods of sampling, estimation of population values, estimation of sampling error and efficiency of methods. P, one course in stat.</td>
</tr>
<tr>
<td>563</td>
<td>Nonparametric Statistics</td>
<td>(3) I Distribution free statistics, chi-square tests, related samples, independent samples, correlations, tests of significance, confidence bands. P, one course in stat.</td>
</tr>
<tr>
<td>663</td>
<td>Advanced Statistical Methods</td>
<td>(3) I Statistical inference in linear models; point and interval estimation and tests of hypotheses in linear regression, discriminant analysis and analysis of variance; nonparametric inference. P, 466.</td>
</tr>
<tr>
<td>664</td>
<td>Applied Multivariate Analysis</td>
<td>(3) II Consideration of multivariate statistical analyses, with emphasis on applications, interpretation of computer printouts and effects of violations of model assumptions. P, 660.</td>
</tr>
<tr>
<td>665</td>
<td>Applied Time Series Analysis</td>
<td>(3) I Methods used in time series analysis, with emphasis on applications, including computer analysis of data and consideration of violations of model assumptions. P, 660.</td>
</tr>
<tr>
<td>666</td>
<td>Advanced Experimental Design</td>
<td>(3) II Design and analysis of complex experiments, including methods of confounding higher order interaction terms, partial confounding, incomplete block designs and response surface methodology. P, 663.</td>
</tr>
</tbody>
</table>
SYSTEMS AND INDUSTRIAL ENGINEERING

Professors John S. Ramberg, Head, Lucien Duckstein, William R. Ferrell, Donald G. Schultz, Roger J. Weldon (Emeritus), A. Wayne Wymore, Sidney J. Yakowitz
Associate Professors Robert L. Baker, Donald R. Davis, Duane L. Dietrich, J. George Shanthikumar
Assistant Professors Joseph J. Pignatiello, Jr., Suvrajeet Sen, Chiang Wang

The Department of Systems and Industrial Engineering in the College of Engineering offers the degrees of Bachelor of Science in Systems Engineering, Bachelor of Science in Industrial Engineering, Master of Science with a major in either systems or industrial engineering, and Doctor of Philosophy with a major in systems engineering. For specific undergraduate program requirements, see the College of Engineering section of this catalog.

150. Introduction to System Theory (3) II Review of fundamental concepts of set theory; introduction to discrete systems and systems modeling using computer simulation. P, 170.

170. Problem Solving Using Computers (3) I II S Problem analysis, top-down modular design of algorithms for solving elementary engineering problems, structured programming techniques; FORTRAN 77 programming and an introduction to PASCAL programming. 2R, 3L. Credit allowed for this course or 272, but not for both. P, CR Math. 125a.

250. Introduction to System Design (3) I System design, from the problem-definition stage through the evaluation of the implemented system. P, 150.

258. 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. P, 170, Math. 125b.


270. Introduction to Engineering Analysis (2) I II S Application of numerical methods and computer programming techniques to the solution of numerical problems of engineering systems. P, Phys. 103a, S.I.E. 170 or 272.

272. Fundamentals of FORTRAN IV Programming (3) I II S Problem analysis, algorithms and documentation of programs; FORTRAN IV programming, with application to both technical and nontechnical problems. 2R, 3L. Credit allowed for this course or 170, but not for both. P, CR Math. 125a.

310. Human Factors in Engineering Design (3) I Principles and methods underlying the design of systems for effective and efficient use by people; emphasis on human information processing and cognitive tasks. P, Psyc. 100a, CR S.I.E. 320.


405. Digital Systems Simulation (3) GC I II Simulation modeling of systems using digital computer languages, emphasizing random variate generation, Monte Carlo, timekeeping structures and statistical design and analysis of simulation experiments; introduction to continuous simulation. P, 420, 440.

406. Engineering Quality Control (3) GC I Single, double, multiple, and sequential sampling plans; acceptance sampling plans of the Department of Defense, Shewhart Control Charts; cu—sum control charts; applications of quality control concepts in reliability analysis. P, 420 or A.M.E. 413a. (Identical with A.M.E. 406)

410. Analysis, Design and Measurement of Work (3) GC II Principles of the analysis, design, prediction and measurement of industrial work. Emphasis on application, physiological constraints, safety, morale and equity in the industrial setting. P, 310.


422. Engineering Decision Making under Uncertainty (3) GC I Application of principles of probability and statistics to the design and control of engineering systems in a random environment. Methodology includes utility theory, risk analysis and Bayesian decision analysis. P, 420.


442. Design of Delivery/Distribution Systems (3) GC II The design of distribution and delivery schemes using concepts of system theory, operations research, economics, statistics, and human factors; one case study is selected by the instructor, another one by the students. P, 405, 420, 440.

450. Deterministic Systems (3) GC II Analysis and design of linear deterministic systems in both the time and frequency domains using Fourier analysis, Laplace transforms and state space methods. Attention will be given to modelling physical and engineering systems. P, Math. 253.

453. Deterministic Control Systems (3) GC I The analysis and synthesis of deterministic linear control systems, with emphasis on design using both frequency-domain and state-variable approaches. P, 450.

462. Production Systems Analysis (3) GC I Production systems, product and process design, forecasting, production planning models, inventory models, material requirements planning, facility layout and materials handling. P, 340, 440.


465. Manufacturing Systems, Modelling, and Analysis (3) GC II Topics in production and systems with the main focus on automatic transfer lines, flow lines, dynamic job shops, flexible manufacturing systems, and group technology (cellular manufacturing) for discrete part manufacturing. P, 440.

470. Microprocessors in System Control (3) GC II Digital logic; microprocessor architecture, programming and input/output interfacing; control and monitoring of external devices; serial input/output and communication methods; microcomputer systems, busses and software. Hardware and software exercises. P, 170, E.C.E. 208.

473. Concepts in Information and Communication Systems (3) GC II Introduction to signals and signal processing; signal representations; information measures and channels; modulation and demodulation, detection, estimation. P, 450.

474. Human Interaction with Computers and Software (3) GC 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.

475. Information System Design (3) GC II 1983-84 The application of systems engineering methodology to the design, analysis, and implementation of information and information retrieval systems. P, 250 or 454.


505. Digital Systems Simulation (3) II Continuation of 405, with emphasis on current research problems including random variate generation, Monte Carlo, language development, and statistical analysis of output. P, 405.

506. Advanced Quality Control and Reliability (3) II Applications of modern statistical theory in quality control and reliability. Topics include Bayesian decision theory; multivariate methods: Markov processes and selected papers from the recent literature. P, 406 and 420. (Identical with A.M.E. 506)


540. Queueing Theory (3) I Application of the theory of stochastic processes to queueing phenomena; steady-state analysis of birth-death, Markovian and general single- and multiple-channel queueing systems; application of queueing models to production systems, computer and communication systems, airport, police patrol and firefighting. P, 440.
544. **Linear Optimization** (3) I Advanced linear-programming concepts and methods for continuous and discrete variable problems; large-scale optimization: theory and computation; applications to operations research and optimal control. P, 340.

550. **Theory of Linear Systems** (3) I An intensive study of linear systems from the state-space viewpoint, including criteria for observability, controllability, and minimal realizations; aspects of optimal control and filter theory. P, 450 or Math. 322.

554. **Mathematical System Theory** (3) GC I Mathematical theory of discrete systems and models for application to large-scale, complex, man-machine systems.

556. **Finite State Methods in Water Resources Management** (3) II (Identical with W.R.A. 556)


562. **Scheduling Theory** (3) I Introduction to problems of sequencing and scheduling for single, multiple, and parallel processor systems; discrete programming and heuristic procedures for flow-shop and job-shop models; network methods for project scheduling. P, 440.

563. **Facility Layout and Location** (3) II Mathematical characterizations of single and multifacility location models as minimum norm problems; mathematical programming methods for facility layout; investigation of computer-aided design systems. P 544.

565. **Multi-Objective Analysis of Engineering Systems** (3) II Systems design versus operation; multi-objective simplex; goal programming and other distance-based techniques; multi-attribute utility; techniques with qualitative criteria; interactive, quaninteractive and dynamic approaches; model choice; resource engineering applications. P, 440.


581. **Operations Research in Health Care Delivery** (3) II The role of quantitative decision-making in health care delivery; mathematical and statistical modeling techniques useful in evaluating quality and cost of health care from an institutional perspective. P, 440. (Identical with P.P.P.A. 581)

620. **Selected Topics in Probabilistic Systems** (3) II Topics include Markov and semi-Markov processes; regenerative processes; Markov decision theory; application in queueing, production and computer communication systems. P, 520, 540.

640. **Advanced Queueing Theory** (3) II Analysis of stochastic models of complex queueing and production systems; transient and steady-state analysis of single stage and network of queues; application of complex queueing models to production systems such as flexible manufacturing systems and flow lines. P, 540.

644. **Nonlinear Optimization** (3) II Theory of mathematical programming; convex analysis, duality, and optimality; investigation of linear, quadratic, geometric, and dynamic programming with applications in operations research, statistics, and optimal control. P, 544.


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### TOXICOLOGY

**Committee on Toxicology**

Professors H. Vasken Aposhian (Cellular and Developmental Biology), Thomas F. Burks (Pharmacology), Milos Chvapil (Surgery), J. Wesley Clayton (Pharmacology and Toxicology), Jack R. Cole (Pharmaceutical Sciences), Larry A. Crowder (Entomology), Richard C. Froede (Pathology), Albert Picchioni (Pharmacology and Toxicology), I. Glenn Sipes (Pharmacology and Toxicology), Cornelius Steelink (Chemistry)

Associate Professors Dean E. Carter (Pharmacology and Toxicology), Lois E. Prosser (Nursing)

Director Jarvis Moyers (University Analytical Center)
For a description of the program and a list of available courses, refer to Pharmacology and Toxicology (College of Pharmacy) elsewhere in this catalog.

**URBAN PLANNING**

Committee on Urban Planning

Professors Arthur L. Silvers (Urban Planning), Acting Chairperson, Robert D. Carpenter (Urban Planning), James P. Logan (Policy), Lawrence D. Mann (Urban Planning), Norman Williams, Jr. (Urban Planning)

Associate Professor Michael K. Block (Policy)

Assistant Professors Reid H. Ewing (Policy), Vernon L. Greene (Policy)

The program provides competence for analyzing systemic causes underlying public sector problems, and for evaluating likely impacts of program or policy alternatives. Students may choose specializations either in public sector planning*, or in policy analysis. Options may then be developed in land use and the environment, health and human resources, housing and transportation, and policy planning for application in governmental organizations at all levels.

The Master of Science degree is available with a major in urban planning. Upper-division undergraduates and graduate students may take work in planning complementary to their major fields.

Honors: The committee participates in the Honors Program.

*Students pursuing private sector careers may develop a specialization in corporate planning.

100. **Urban Land Use** (3) I Problems of the urban environment, taxing, zoning, and transfer of real property.

300. *Introduction to Planning* (3) II Development of urban and regional planning in the U.S. during the 20th century, with emphasis on contemporary issues and solutions. Credit allowed for this course or 501, but not for both.

373. *Water Resources in Energy Engineering* (3) I (Identical with C.E. 373)

457. *Statistical Techniques in Geography and Planning* (3) GC I (Identical with Geog. 457)

485. *Zoning Fundamentals* (3) I Survey of the zoning process; nature, structure, and function of zoning, problems of zoning administration; new concepts of zoning content and administration. P, 608 or Fin. 461 or Mgmt. 320.

*Open only to students who meet requirements for advanced standing as specified in the College of Business and Public Administration section of this catalog.

501. **Development of Urban Planning** (3) I Survey of the historical development of the planning profession; the evolution of American planning as a response to urban development. Open to majors only. Credit allowed for this course or 300, but not for both.

503. **Metropolitan and Regional Planning** (3) I Survey and evaluation of concepts and examples, including metropolitan, economic development, state and national, and environmental plans in the U.S. and abroad.

506. **Fundamentals of Physical Planning** (3) I Basic considerations in site analysis and planning, and transportation and utility systems; subdivision planning and plat review. P, 501.

507. **Social Service Planning** (3) [Rpt./1] I Survey of the variety of planning efforts designed specifically to increase social welfare through the delivery of services using historical, comparative, and evaluative perspectives.

563. **Perception of Environment** (3) I II (Identical with Geog. 563)

565a-565b. **Principles of Transportation Planning** (3-3) (Identical with C.E. 565a-565b)

575. **Housing and Residential Areas** (3) II Physical, social, and economic aspects of housing development and residential areas and their relationship to other land uses and functions.

596. **Seminar**

u. Interdisciplinary Environment-Behavior-Design (3) I (Identical with Idis. 596u, which is home)

604. **Analytic Methods in Planning and Management** (3) II Methods and models for program planning and policy analysis; forecasting, service demand, facility location in capital investment programming, task sequencing, program analysis and evaluation. P, 457 or Mgmt. 552 (Identical with P.P.P.A. 604)
605. Planning Theories and Perspectives (3) II A critical examination of normative and methodological assumptions of alternative planning models, with emphasis on developing a perspective on contemporary planning issues. P, 501.

608. Planning Law (3) II Land-use controls; the law of zoning, exclusionary zoning, restrictive covenants, comprehensive plan, environmental protection, eminent domain, nuisance.

609. Problems of Urban Change (3) II Problems presented by growth and change in the modern city; possible planning solutions. Field trips. Credit allowed for this course or Geog. 379, but not for both. (Identical with Geog. 609)

610a-610b. Projects in Urban and Regional Planning (2-3) Lab. and field projects simulating various aspects of professional practice. Open to majors only. P, 12 units toward M.S., 605.

659. Growth Management (3) II 1984-85 Current legal and planning techniques to regulate the rate of growth, the sequence of growth, and the eventual total size of towns, regions, and states; concentration on case studies. (Identical with Law 659)

669. Preservation of Historic Environments (3) II 1983-84 Current planning and legal methods to enhance the preservation of historic urban areas and structures; concentrated analysis of selected case studies. Field trips. (Identical with Law 669)

696. Seminar
a. The General Plan (3) [Rpt./6 units] III
b. Land-Use Regulation (3) [Rpt./6 units] III
c. Planning Administration (3) [Rpt./6 units] III
d. Energy Planning (3) [Rpt./6 units] III
e. Alternative Urban Futures (3) [Rpt./6 units] III
f. Environmental Planning (3) [Rpt./6 units] III

VETERINARY SCIENCE

Professors C. John Maré, Head, Edward J. Bicknell, Robert B. Chiasson, Leonard W. Dewhirst, Dewey E. Monty, Raymond E. Reed, James N. Shively, Raymond E. Watts (Emeritus) Associate Professors Donald W. DeYoung (Adjunct), Ronald W. Hilwig, Douglas H. McKelvie (Adjunct), Gavin L. Meerdink, J. Glenn Songer, Charles R. Sterling Assistant Professor Lynn A. Joens Lecturer Ted H. Noon

The department offers counseling to preveterinary students seeking to fulfill the requirements for admission to schools and colleges of veterinary medicine throughout the United States. For students interested in the care and health of animals but not necessarily pursuing a career in veterinary medicine, guidance is provided in a curriculum which will prepare the students for rewarding careers in animal health research and technology.

The degree of Bachelor of Science in Agriculture with a major in animal health science is available in the agricultural science curriculum. No major is offered in veterinary science. Programs of instruction leading to a Master of Science or Doctor of Philosophy degree may be arranged through departmental cooperation with the Committee on Animal Physiology.

The requirements for the major in animal health science may be found in the College of Agriculture section of this catalog under the curriculum in agricultural science. Since preveterinary studies do not constitute a major, students who elect a four-year preprofessional program must choose a major compatible with the course requirements of the veterinary college to which they seek admission. During completion of the animal health science major, students may complete all requirements for admission to veterinary schools in Colorado and Washington. These states have entered into a compact with the state of Arizona through the Western Interstate Commission for Higher Education (WICHE) under the terms of which certain qualified Arizona students may attend the veterinary schools of these states without paying nonresident tuition. Such students must have completed preveterinary training and must have been bona fide residents of Arizona for five years immediately preceding admission to veterinary school. Admission to the professional schools depends to a great extent upon the quality of the student's academic record.
250. **Basic Principles of Animal Anatomy and Physiology** (4) II Systematic anatomy and physiology of domestic species, stressing broad concepts and principles important in daily maintenance and progression of life. Designed for ans. majors. 3R, 3L. Field trips. Not available for credit toward the major in animal health science. P, three units of bio.

400a–400b. **Animal Anatomy and Physiology** (3-3) GC Physiology, gross and comparative anatomy. 400a: Nervous, musculoskeletal, immune, hemolymphatic, circulatory, and respiratory systems of domestic animals. 400b: Urinary, digestive, endocrine and reproductive systems P, G. Bio. 104, Chem. 103a-103b, 104a-104b.

403. **Parasites of Domestic Animals** (2) GC I Biology, distribution, economic importance, pathogenicity, diagnosis, treatment, and control of parasites of domestic animals, with emphasis on the disease-producing capabilities of parasites. P, four units of bio. (Identical with Ento. 403)

405. **Animal Diseases** (3) GC I Integration of management, husbandry, and preventive veterinary medicine, as related to animal diseases.

420. **Pathogenic Microbiology** (4) GC I II (Identical with Micr. 420)

423R. **General Pathology** (3) GC II Pathogenesis, pathophysiology and morphologic changes of human and animal diseases. P, Micr. 202 or 420. (Identical with Micr. 423R and Tox. 423R)

423L. **General Pathology Laboratory** (1) GC II Gross and histologic changes occurring in tissues and organs in selected human and animal diseases and disease processes. P, 423R or CR. (Identical with Micr. 423L and Tox. 423L)

450. **Medical Mycology** (4) GC I II (Identical with Micr. 450)


459. **Comparative Vertebrate Histology** (4) GC I Structure, identification and function of normal vertebrate tissues. 2R, 6L. P, eight units of animal bio. A vertebrate anatomy course is strongly recommended. (Identical with G. Bio. 459)

489. **Parasitology** (4) GC S (Identical with G. Bio. 489)

601. **Experimental Surgery** (2) II Exercises in the surgical procedures commonly necessary in animal experimentation, including aseptic technique, anesthesiology, surgical operations, and care of the postsurgical patient. 1R, 3L. P, three units of mammalian anat. (Identical with Micr. 601)

**WATERSHED MANAGEMENT**
*(See Renewable Natural Resources)*

**WILDLIFE AND FISHERIES SCIENCE**
*(See Renewable Natural Resources)*

**WOMEN'S STUDIES**

Committee on Women's Studies

Myra Dinnerstein, Chairperson
Professors Herman Bleibtreu (Anthropology), Herbert E. Carter (Arid Lands Resource Sciences), William Ittelson (Psychology), Eliana Rivero (Spanish and Portuguese)
Associate Professors Susan Hardy Aiken (English), Donna Guy (History), Ingeborg Kohn (French and Italian), Alice Schlegel (Anthropology)
Assistant Professors Shirley Fahey (Psychiatry), Nina Janik (Physical Education), Patricia MacCorquodale (Sociology), Christine Tanz (Psychology)
The minor in women's studies consists of at least twenty units selected by the student in consultation with the chairperson of the committee in charge and approved by the student's adviser. 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 pro-seminar.

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 in Western Culture: Plato to Plath (3) Women as depicted in leading works by outstanding male and female philosophers, painters, sculptors, and writers from the classical Greek period to the 1960s.

253a-253b. History of Women in the United States (3) I II (Identical with Hist. 253a-253b)

317. Women in Contemporary Society (3) I (Identical with C.D.F.R. 317)

341. Women and Health (3) I II (Identical with Nurs. 341)

417. Women Authors (3) I (Identical with Engl. 417)

418. Women in Literature (3) II (Identical with Engl. 418)

424. Gender and Social Identity (3) GC II (Identical with Anth. 424)

439. Women in the Literature of the Americas (3) 1983-84 (Identical with Engl. 439)

453. History of Women and Work (3) GC I (Identical with Hist. 453)

458. Feminism: A Comparative History (3) GC II (Identical with Hist. 458)

459. Sociology of Male and Female Roles (3) GC I II (Identical with Soc. 459)

476. Women and the Law (3) GC I 1984-85 (Identical with Pol. 476)

480. Women Entering Management (3) I II (Identical with Mgmt. 480)

489. Women in East Asia (3) GC I (Identical with Or.S. 489)

496. Proseminar a. Women's Studies (3) [Rpt./2] I II

571. Counseling Women (3) II (Identical with Coun. 571)

595. Colloquium e. Advanced Studies in the History of Women (3) I II (Identical with Hist. 595e, which is home)

ZOOLOGY
(See General Biology)
Arizona Board of Regents

EX OFFICIO

BRUCE E. BABBITT, J.D. ................................................................. Governor of Arizona
CAROLYN P. WARNER ................................................................. State Superintendent of Public Instruction

APPOINTED

VADA MANAGER, Assistant Secretary ................................................ May, 1983
S. THOMAS CHANDLER, LL.B., Assistant Treasurer ........................................ January, 1984
WILLIAM G. PAYNE, M.D. .............................................................. January, 1984
ESTHER N. CAPIN, M.Ed., Treasurer ................................................... January, 1986
DONALD PITT, J.D. ........................................................................ January, 1986
TIO A. TACHIAS ............................................................................... January, 1988
WILLIAM P. REILLY, President .......................................................... January, 1988
DONALD G. SHROPSHIRE, B.S. ......................................................... January, 1990
A. J. PFISTER, LL.B. ........................................................................ January, 1990
ADMINISTRATIVE OFFICERS

(Year of first University appointment in parentheses after each name)

HENRY KOFFLER (1982) ........................................ President of the University B.S., 1943, University of Arizona; M.S., 1944, Ph.D., 1947, University of Wisconsin; D.Sc., 1977, Purdue University.


ALBERT B. WEAVER (1958), Executive Vice President; A.B., 1940, University of Montana; M.S., 1941, University of Idaho; Ph.D., 1952, University of Chicago.

GARY M. MUNSINGER (1963), Senior Vice President for Resources; B.S., 1959, Kansas State College of Pittsburg; M.B.A., 1963, University of Arkansas.

LEE B. JONES (1964), Vice President for Research; Dean of the Graduate College; B.A., 1960 Wabash College; Ph.D., 1964, Massachusetts Institute of Technology.

RICHARD M. EDWARDS (1959), Vice President for Student Relations; B.S., 1961, Purdue University; M.S., 1964, University of Washington; Ph.D., 1964, E.Clem., 1974, University of Arizona.

ROBERT A. PETERSON (1978), Vice President for Administrative Services; B.S., 1963, University of Idaho; M.A., 1971, Portland State University.


GEORGE R. CUNNINGHAM, JR. (1977), Assistant Vice President for Planning and Budgeting; B.S., 1967, M.P.A., 1972, University of Arizona.

ARNO RICHARD KASSANDER (1954), Vice President for Research Emeritus; Professor Emeritus of Atmospheric Sciences; B.A., 1941, D.S.C., 1971, Amherst College; M.S., 1943, University of Oklahoma; Ph.D., 1950, Iowa State College.


WILLIAM R. NOYES (1968), Associate Vice President for Business Affairs; A.B., 1962, Stanford University; M.A., 1963, Fletcher School of Law & Diplomacy; Ph.D., 1968, University of California at Los Angeles.

CHARLES H. PEYTON (1958), Associate Vice President for Research; Director, Research Communications; A.B., 1951, West Liberty State College; A.B.T., 1953, The American Institute for Foreign Trade.

JANE H. UNDERWOOD (1968), Assistant Vice President for Research; Associate Dean of the Graduate College; B.A., 1960, University of California at Riverside; Ph.D., 1964, University of California at Los Angeles.

WILLIS R. BREWER (1949), Dean Emeritus, College of Pharmacy; Director, Med-Start Program; B.S., 1942, South Dakota State College; Ph.D., 1946, The Ohio State University.

BARTLEY P. CARDON (1980), Dean, College of Agriculture; B.S., 1939, M.S., 1940, University of Arizona; Ph.D., 1946, University of California at Berkeley.

JACK R. COLE (1957), Dean, College of Pharmacy; B.S., 1953, University of Arizona; Ph.D., 1957, University of Minnesota.


ROBERT LESTON HULL (1964), Dean Emeritus of the College of Fine Arts; Professor Emeritus of Music; B.Mus., 1939, M.Mus., 1941, University of Rochester; Ph.D., 1945, Cornell University.

DONALD J. IRVING (1982), Dean of the Faculty of Fine Arts, College of Arts and Sciences; B.S., 1955, Massachusetts College of Art; M.A., 1956, Ed.D., 1963, Columbia University.

LOUIS J. KETTEL (1968), Dean, College of Medicine; B.S., 1951, Purdue University; M.D., 1954, M.S., 1958, Northwestern University.

RICHARD P. KINKADE (1965-1971, 1982), Dean of the Faculty of Humanities. College of Arts and Sciences; B.A., 1960, Ph.D., 1965, Yale University.

DARREL S. METCALFE (1958), Dean Emeritus of Agriculture; B.S., 1940, University of Wisconsin; M.S., 1942, Kansas State College; Ph.D., 1950, Iowa State College.

HAROLD E. MYERS (1956), Dean Emeritus, College of Agriculture; B.S., 1926, Kansas State University; M.S., 1929, University of Illinois; Ph.D., 1937, University of Missouri.

HUGH ODISHAW (1972), Dean, College of Earth Sciences; A.B., 1939, M.A., 1941, Northwestern University; B.S., 1944, Illinois Institute of Technology; D.Sc., 1958, Careton College.

F. ROBERT PAULSEN (1964), Dean, College of Education; B.S., 1947, Utah State University; M.S., 1949, Ed.D., 1956, University of Utah.
HERBERT D. RHODES (1943), Dean Emeritus, Graduate College; B.S., 1935, M.S., 1936, University of Arizona; Ph.D., 1939, University of Illinois.

KENNETH R. SMITH (1980), Dean, College of Business and Public Administration; B.A., 1964, University of Washington; Ph.D., 1968, Northwestern University.

GLADYS E. SORENSEN (1958), Dean of Nursing; B.S., 1945, University of Nebraska; M.S., 1951, University of Colorado; Ed.D., 1965, Columbia University.

ROBERT S. SVOB (1942-44; 1946), Dean of Students; B.A., 1942, M.A., 1950, University of Arizona.

DAVID L. WINDSOR (1945), Dean of Admissions and Records; Secretary of the Faculty; B.A., 1943, M.A., 1951, University of Arizona.

* * * * *


ELLEN ALTMAN (1979), Director, Graduate School of Library Science; Professor of Library Science; A.B., 1957, Duquesne University; M.L.S., 1965, Ph.D., 1971, Rutgers University.

DANIEL E. BAILEY (1979), Director, University Computer Center; B.A., 1953; Ph.D., 1960, University of California at Berkeley.

JACQUES M. BECKERS (1979), Director of the Multiple Mirror Telescope Observatory; Candidate Degree (Bachelor's), 1955, Doctorandus Degree, 1959, Doctor in Astronomy, 1964, State University in Utrecht, The Netherlands.


WILLIAM A. CLAUSSS (1978), Executive Director of Continuing Education; B.S., 1962, Ohio University; M.Ed., 1967, Miami University; Ph.D., 1970, University of Miami.

B. SUE CRISWELL (1960), Director of the Medical Technology Program; B.S., 1964, North Texas University; M.S., 1968, Ph.D., 1969, Baylor University.

RALPH E. DEAL (1937), Director Emeritus, Purchasing; B.S., 1929, University of Arizona.

MURRAY DeARMOND (1969), Director, Student Health Service; B.A., 1957, DePauw University; M.D., 1961, Indiana University.


LEONARD W. DEWHIRST (1976), Director of the Agricultural Experiment Station; B.S., 1949, M.S., 1950, Ph.D., 1957, Kansas State College.

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SCLOSS, GERD TOBIAS (1958-74;1975), Professor Emeritus of Microbiology and Medical Technology; M.D., 1938, University of Berlin.

SCHLUETER, NANCY J. (1980), Head Coach of Women’s Swimming and Diving.

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SCHREIBER, JOSEPH FREDERICK, JR. (1959), Professor of Geosciences; Assistant Head of the Department; A.B., 1948, M.A., 1950, Johns Hopkins University; Ph.D., 1958, University of Utah.

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Mailing Address:

The University of Arizona
Tucson, Arizona 85721

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