College of Engineering and Applied Sciences and the College of Fine Arts. Consult the appropriate departments for statements of these requirements.

Major Teaching Fields Available

Art	German
Asian Languages	Health Sciences
Biological Sciences	History
Business, Office and Distributive Education	Home Economics
	Humanities
	Industrial Arts
Chemistry	Instrumental Music
Choral Music	Journalism
Communication	Mathematics
Dance	Physical Education
Economics	Physics
Engineering Sciences	Political Science
English	Russian
French	Social Studies
General Science	Spanish
Geography	Theatre
Geology	

Minor Teaching Fields Available. In addition to minors in the above fields, the following minors are available:

Anthropology	Library Science
Athletic Coaching	Photography
Driver Training and Safety Education	Physical Science
	Portuguese
Elementary Education	Psychology
	Reading
Industrial Education	Sociology
Latin	Special Education

Other minors can be developed for individual students with the approval of the chair of the Secondary Education Department, the chair of the department in which the minor is developed, and the College of Education Standards Committee.

Professional Education Options Available

Option A:

Professional Education. In addition to the courses listed under other requirements, all students registered under this option of the secondary curriculum are required to take 25 semester hours of work in Education, plus two courses in the teaching of Reading. The following must be included: SED 310 (or EDF

200), EDP 310, Education Elective, SED 311, 411, Methods of Teaching in the Major Teaching Field, RDG 467, 480 and SED 433.

Option B:

An on-site program stressing the integration of the content of professional education and participation in schools is also available to students who wish to select it. A team approach to instruction, involving University faculty and public school personnel is used. Students interested in this option should obtain materials and information from the Secondary Education Department.

Professional Education. In addition to the courses listed under other requirements, all students registered under this option of the secondary curriculum are required to take 25 semester hours of work in Education, plus two courses in the teaching of Reading. The following must be included: SED 400, 401, Methods of Teaching in the Major Teaching Field, RDG 467, 480, SED 433 and 434.

It should be emphasized that this program requires courses during specific semesters of the junior and senior years and that some of them must be taken concurrently. Students should apply to the Department of Secondary Education for Option B during the semester prior to enrollment in this sequence of courses.

Special Education Curriculum. This curriculum provides professional education courses and experiences designed to prepare students to teach mildly handicapped children and adolescents with learning and/or behavior problems. This curriculum leads to a Bachelor of Arts in Education degree and to certification for teaching the mentally handicapped, emotionally handicapped, or learning disabled in grades K-12.

Major. The major in this field is Special Education.

Supplementary Requirements. All Special Education majors must complete 27-30 semester hours of supplementary course requirements. Most of this course work is necessary for certification in the state of Arizona and provides a strong background in regular education.

Related Areas of Study. An additional 18 semester hours is required in related areas of study to give the students a breadth of preparation and experience beyond their major. Appropriate courses may be used to satisfy general education requirements as well as the requirements for the related area of study.

However, such courses must be approved by the student's advisor.

General Pattern. A program of 126 approved semester hours is required. The credit hours are divided as follows:

	Semester Hours
Freshman English	3-6
General Studies*	39
Assessment Semester	3
Special Education	30
Supplementary Requirements	27
Related Areas of Study	18
Electives	3-6
Total	126

*United States and Arizona Constitution and U.S. History, which are requirements for state teacher certification, may be included in the General Studies field of behavioral and social sciences.

Advisors in this curriculum have check sheets with recommended and required courses for each year of work. These check sheets contain appropriate patterns of course work for the area of exceptionality in which the student as a teacher will want to work. The check sheets also contain recommendations for electives. It is necessary for students to consult advisors in this curriculum in order to ensure the best possible program of training. This is particularly important inasmuch as the advisor must sign the checkout sheet for graduation which indicates that an approved program of course work has been developed.

Recommended Minor in Special Education. Majors in Secondary Education, in consultation with their advisors, may select a 24 semester hour minor in Special Education.

The minor does not meet Arizona certification requirements for teaching in Special Education, and does not include provisions for student teaching in Special Education.

Recommended Concentration in Special Education. Majors in Elementary Education, in consultation with their advisors, may select a concentration in Special Education which emphasizes mental retardation, emotional disturbance, or learning disabilities.

The concentration meets basic Arizona certification requirements for teaching in the Special Education area emphasized.

Selected Studies in Education Curriculum. This program is designed for undergraduate students who are interested in the field of education but do not intend to become public school teachers. Students may wish to prepare for a variety of positions outside as well as inside educational institutions. These may be with government agencies, religious organizations, foundations, business and industry, or in private, early childhood, or higher education, and even in public elementary or secondary schools, although not usually in a formal classroom setting.

The program offers the opportunity for such students to develop individualized curriculum plans tailored to their particular needs and interests. It provides an alternative to the regular program of the College of Education. Any undergraduate student in the College of Education may present a Selected Studies in Education plan. The plan must be developed in close consultation with a faculty advisor in the College of Education and must have the endorsement of the Undergraduate Standards Committee of the College. To be approved, a Selected Studies in Education plan must demonstrate that it is significantly different from established programs at the University in both intent and content.

Interested students should obtain application forms and other pertinent materials from the Office of Student Services.

Special Programs of Teacher Preparation. Several areas of concentration are available on the undergraduate level in connection with any of the undergraduate curricula. These are available as a sequence of courses to be taken in addition to the regular requirements of the undergraduate curriculum.

Library Science. Students desiring endorsement as a school librarian (K-12) must complete the requirements for teacher certification and a program approved by the Department of Educational Technology and Library Science. Undergraduates will complete the library science minor which consists of 24 semester hours, including 15 hours of prescribed library science courses, an approved elective in Library Science or Instructional Media, and 6 hours of student teaching in a school library. Students may also select library science as a field of specialization at the graduate level.

Teaching American Indian Children. Students pursuing a major teaching field in elementary education may, with the approval of their advisors, elect to take a special sequence preparatory to the teaching of American Indian children. This is appropriate for those who will have only a few Indian

children in a classroom, or for those who will have a classroom composed only of Indian children. Such students shall be required to complete satisfactorily the basic elementary program.

Students pursuing a major teaching field in secondary education may also take this special training for teaching American Indian children. Such students shall be required to complete satisfactorily the basic secondary major.

Students interested in pursuing an Indian Education concentration in conjunction with their elementary or secondary education programs should confer with faculty from the Center for Indian Education and faculty from their departments. Indian Education, Elementary, and Secondary Education faculty have curriculum check sheets which will assist the students to plan their programs in Indian Education. This concentration is normally a 27 semester hour sequence.

Teaching in Multicultural or Bilingual Settings. A modern teacher is called upon to provide instruction in a wide variety of classroom settings. In these settings will be children of different races or ethnic backgrounds. Often there will be children who speak little or no English or who are fluent in English and some other language. Students are encouraged to anticipate such assignments and to work to prepare for them.

The I. D. Payne Laboratory for Multicultural Education and the Center for Bilingual/Bicultural Education, working in close cooperation with all of the departments of the College, are valuable resources for students. A wide range of appropriate course work is available in each department. Students are advised to include in their programs as much work as possible in multicultural and bilingual education.

Certification for Teaching. The State of Arizona is the legal entity responsible for certifying teachers within the State. The delegated responsible agency is the Arizona Department of Education. The laws of the State and rules and procedures of the Department govern the issuance of certificates. From time to time changes occur in the laws and rules. Students are advised to be informed about the laws and rules. The Office of Stu-

dent Services keeps up-to-date information sheets describing all requirements for certification.

The College of Education is accredited by the National Council for Accreditation of Teacher Education for the preparation of elementary, secondary and special education teachers and for other professional positions. Students who complete the appropriate curriculum and applicable State requirements are recommended for certification to the Arizona Department of Education. They are also eligible for certification in other states.

Certification as a teacher should not be understood as employment. Teaching is a competitive field in which more persons seek positions than there are available openings. In general, teacher candidates who have special skills or are prepared to teach in more than one area are given preference by prospective employers.

Counselor Education

The doctoral programs of the Department of Counselor Education are approved in counseling psychology by the American Psychological Association.

PROFESSORS:
CABIANCA (ED B-401A), BLACKHAM. BLAESSER, DAANE, GUINOUARD. HAMM. HEIMANN, McWHIRTER, NOBLE, SNYDER

ASSOCIATE PROFESSORS:
CHRISTIANSEN, CHURCHILL, CUMMINGS. GROSS, MAZEN, MILLER. SHELL

ASSISTANT PROFESSOR:
ARCINIEGA, HARING, ROBINSON

CED 512 Introduction to the Helping Relationship. (3) F, S, SS
Introduction to the skills used in the helping professions and an examination of the settings in which they occur.

522 Personality Development. (3) F, S, SS
Interaction of affective and cognitive factors in personality development at different age levels. Various personality theories examined.

523 Psychological Tests. (3) F, S, SS
Standardized tests in the study of the individual with emphasis on test score interpretation in counseling.

534 Occupations and Careers. (3) F, S, SS
The world of work, career development, education and training for occupational entry and mobility.

545 Analysis of the Individual. (3) F, S, SS
Theory and methods commonly used in studying the individual. Observational methods, diagnostic inter-

views, structured and semi-structured methods for assessing personality. Prerequisite or corequisite: CED 522.

567 Group Procedures. (3) F, S, SS
Factors determining interaction, effectiveness and morale in small groups. Techniques of observation, assessment and leadership.

577 Counseling. (3) F, S, SS
Principles and application of counseling with particular emphasis on counseling theories. Prerequisites: CED 512, 523, 534, 545, 567, and admission to M.C. or CED doctoral degree program.

612, 613 Child Counseling. (3, 3) S
Applications of counseling theory in working with children in clinics and elementary schools. Practicum integrated with didactic instruction. Prerequisite or corequisite: CED 680 and approval of instructor.

622 Group Counseling. (3) F, S, SS
Theories and methodologies used in group counseling. Prerequisite: CED 577.

634 Organizational Development and Planned Change. (3) F, S
Organizational/individual dynamics: theory, analysis, techniques, and consultation/intervention strategies used in organizational development. Field consultation projects. Prerequisite: CED 567 and 577.

644 Psychology of Careers. (3) F, S
Structural and developmental theories of occupational choice. The role of counseling in the development of a career. Prerequisite or corequisite: CED 577.

655 Student Development Programs in Higher Education. (3) F
Emerging conceptual models of student development. Overview of student personnel and student affairs programs in community colleges, four-year colleges and universities. Observation or campuses.

656 The American College Student. (3) S
Selected theories of human development with application to academic/socio-psychological learning tasks of postsecondary environmental influences, including faculty expectations, campus sub-cultures.

666 Comparative Theories of Personality. (3) F
Comparative analysis of personality theories in relation to counseling practices. Prerequisites: CED 522, 577.

667 Patterns of Behavior Disorders. (3) F, S
Etiology, dynamics and treatment of a variety of psychological problems including traumatic reactions, anxiety, somatoform, dissociative, personality, affective, psychosexual and psychotic disorders. Prerequisite: CED 577.

670 Behavioral Counseling. (3) S
Theory, procedures and applications of behavior modification and therapy in working with children, parents, and adult clients in school, clinic and institutional settings. Didactic instruction, analysis of individual and group problems and directed experiences. Prerequisites: CED 680 and approval of instructor.

672 Marriage and Family Counseling I. (3) F, S
Introduction to marriage and family counseling theories. Emphasis is on a systems-communication model utilizing co-counseling. Practicum required (CED 680). Prerequisite: CED 577/622, CED 680 and approval of instructor.

673 Marriage and Family Counseling II. (3) S
Advanced analysis and application of systems communication counseling. Focus on marital and sexual counseling. Practicum recommended. Prerequisites: CED 672 and approval of instructor.

677 Advanced Counseling. (3) S
Counseling systems and theories and their practical application in case management; comparative case analysis. Prerequisite: CED 577.

681 Supervised Practice. (3) F, S
Supervised experiences in schools or community agencies. Prerequisites: CED 680 and approval of instructor.

Special Courses: CED 494, 498, 499, 500, 580, 583, 584, 590, 591, 592, 593, 594, 598, 599, 600, 680, 683, 684, 690, 691, 692, 693, 700, 780, 783, 784, 790, 791, 792, 799. (See pages 32-33.)

Educational Administration and Supervision

(Member: University Council for Educational Administration)

PROFESSORS:
(ED 107A), HUNNICUTT, MENKE, METOS, NORTON, STOUT, WARREN, WOOTTON

ASSOCIATE PROFESSORS:
FARRAR, LEVAN, WALKER, WEBB

ASSISTANT PROFESSORS:
DRAKE, MILLER

RESEARCH ASSOCIATE:
PADDOCK

EDUCATIONAL ADMINISTRATION

EDA 411 The Teacher and the Administration of Schools. (3) N; Norton
Introduction to educational administration for teachers. Considers legal organizational bases of schools. Teachers' roles in school administration included.

501 Competency/Performance in Educational Administration. (6) F, S, SS; Farrar, Norton
Nature of educational administration, foundational knowledge of competency in administration. This is a two-semester course during the academic year.

511 School Law. (3) F, S, SS; Drake, Webb, Wootton
Constitutional, statutory and case law that relates to all school personnel, pupils the school district and other governmental units. Contracts, dismissals, tenure, retirement, pupil injuries, liability of personnel and district, school district boundary changes, bonding.

524 Theory and Application of Educational Administration. (3) F, S, SS; Levan, Metos
History and development of public school administration in the United States, current organizational patterns for public education at local, intermediate, state, and national levels; current theoretical positions in educational administration.

525 Human Relations and Societal Factors in Educational Administration. (6) F, SS; Warren, Wootton
Interrelations between problems of educational administration and interdisciplinary social sciences. Communications skills, morale, authority and percep-

tion through the case approach. Education's relationship to the economy, futurist sociology, comparative and changing value systems. Activities include computer simulation laboratory and off-campus exercise.

526 Instructional Supervision. (3) F, S, SS; Hunnicutt, Metos, Norton
Administering curriculum improvement, in-service education, evaluating and improving teaching competence; administrative instructional responsibilities.

527 Managerial Functions in School Administration. (3) S, SS; Farrar
Relates to the work of the central district office staff and the school principal. Use of human resources, property management, and organization and management of time.

538 Administration of the Community School. (3) F, S, SS; Miller, Walker
Philosophy, history, organization and operation of the community-centered school. Introduction of the community education concept into a school system and making it operational.

544 Public School Finance. (3) F, SS; Webb
School budget procedures, accounting, revenues, state and county finance and problems relating to financing public education.

548 Community Relations in Education. (3) F, S, SS; Levan, Norton, Walker
Administrative factors of primary importance in developing community involvement in public schools. Emphasis on theory and skill of school system and individual communication.

549 Programming and Financing Community Education. (3) N; Miller, Walker
In-depth investigation of component programs effective as a vehicle for community education in area schools; plans which help schools change; models for funding community education. Prerequisite: EDA 538 or approval of instructor.

555 Educational Facility Planning. (3) F, SS; Farrar
School building needs, educational planning for facilities, responsibilities of architects, duties of contractors, equipping and furnishing of school buildings.

568 Role and Responsibility of Supervising Teacher. (3) N; Brook
Experiences and content for those planning to become supervisors of student teaching in teacher-education programs. In-service training for those in student teaching.

571 School Business Management. (3) A; Webb
Purchasing, budgeting, accounting, payroll management, auditing, financial reporting, insurance and administration of nonteaching personnel and services.

573 School Personnel Administration. (3) F, S, SS; Norton
Organization for personnel services; development of policy to govern selection, orientation, placement, remuneration, transfers, separations, and development of morale among instructional and noninstructional personnel.

576 The School Principalship. (3) F, S, SS; Drake, Hunnicutt, Norton, Walker, Warren
Problem and laboratory approaches used to provide application of administrative activities of elementary and secondary schools.

634 Instructional Leadership. (3) N; Hunnicutt, Metos, Norton
Curricular practices and processes used by instructional

leaders who plan, organize and coordinate the professional activities in elementary and secondary schools. Prerequisite: EDA 526.

658 Problems and Issues in Administering Community Education. (3) A; Miller, Walker
Provides community educators with an understanding and skill in school law, plant management, personnel administration, business practice, school legislation, community education history, research and utilization of local resources. Prerequisites: EDA 548 and 549.

673 School Personnel Administration: Issues and Problems. (3) N; Norton
Conceptual framework for school personnel administration, role relationships of the school personnel administrator, staff participation in policy making, allocating human resources in the school system. Prerequisite: EDA 573 or approval of the instructor.

675 Politics of Education. (3) N; Stout
Social science theory and research are used to consider the political context of educational policy making.

676 The School Superintendency. (3) S, Norton
Critical examination of the school superintendency and the primary functions of this educational position. The duties, responsibilities, activities and problems of the school superintendent are included. The unique leadership role of the school superintendent is examined. Prerequisite: approval of instructor.

679 Administration of Special Programs in Education. (3) N; Warren, Wootton
For personnel administering special educational services; responsibilities of superintendents, principals, supervisors, and directors for special education, student personnel, audiovisual, library science and others.

711 Administrative Leadership. (3) S; Norton, Stout
Emphasis on research in leadership; application of research findings to administrative and supervisory functions in educational endeavors. Prerequisites: 30 semester hours in Educational Administration; admission to doctorate.

722 Administration of Instructional Improvement. (3) F; Norton, Metos
Recent research relating to administrative and supervisory responsibilities for the improvement of the educational program. Effective processes by administrators, supervisors, consultants and coordinators. Prerequisites. 30 semester hours in Educational Administration; admission to doctorate.

733 Administrative Management. (3) A; Farrar
Recent research relating to school management. School finance, law, buildings, transportation, food services and supply management. Prerequisites: 30 semester hours in Educational Administration; admission to doctorate.

Special Courses. EDA 498, 580, 583, 590, 591, 592, 593, 594, 598, 599, 680, 683, 684, 690, 691, 692, 693, 700, 780, 783, 784, 790, 791, 792, 799. (See pages 32-33.)

NOTE: *A laboratory is maintained in the Southwest Regional Center for Community Education Development covering materials and practices in the field of Community Education. The use of the laboratory may be scheduled with the secretary in Room 108, Farmer Education Building.*

Educational Psychology

PROFESSORS:
FRY (ED B-301A), CAHEN, GAFFNEY, GRINDER, HELMSTADTER, KERR, KULHAVY, SATTLER, VAN WAGENEN

ASSOCIATE PROFESSORS:
HARRIS, KRUS, MEYER, NELSEN, STOCK

ASSISTANT PROFESSORS:
ARGULEWICZ, BETZ, CARROLL

EDP 310 Educational Psychology. (1-6) F, S, SS
Human behavior in educational situations presented through instructional modules. Students may re-enroll for credit to a total of six hours.

454 Introduction to Descriptive Data Analysis and Measurement. (3) F, S, SS
The nature of measurements and data. Frequency distributions, their descriptors and probabilities derived from them. Derived scores, correlation and regression. Qualities of tests.

510 Essentials of Classroom Learning. (3) F, S, SS
Theoretical and empirical foundations of learning in the classroom milieu. Critical exposure to research and method in instructional psychology.

514 Psychology of the Adolescent. (3) F, S, SS
Cognitive, physical, and social development of adolescents in contemporary society. Impact of family, school, and work place on adolescent development. Prerequisites: PGS 100 or EDP 310 or equivalents.

530 Theoretical Issues and Contemporary Research in Human Development. (3) S
Psychological theories, research and methods relevant to human development emphasizing the relations between early development and later performance.

532 Psychology of Exceptionality. (3) S
General psychological theory and experimental research relevant to exceptionality, emphasizing implications for educational programs which recognize unique learner characteristics. Field work.

534 Principles of Behavior Modification. (3) F
Principles of conditioning as applied to behavior modification; current research on the experimental analysis of behavior in educational psychology.

540 Theoretical Views of Learning. (3) F, S, SS
Classical and cognitive theories of learning, plus recent orientations. Illustrative experimental and rational foundations; implications for educational practice.

542 Psychology of Learning and Instruction. (3) S
Critical review and evaluation of research on learning variables relevant to acquisition and retention of instructional materials. Laboratory experience.

543 Life-Span Prose Comprehension. (3) S
Examination of prose learning across the adult life-span: research, models, methods, discourse analysis and scoring procedures. Prerequisite: EDP 540 or equivalent.

544 Psychology of Reading. (3) F
Alternate analyses of the reading process; designs and procedures for investigating instructional and noninstructional variables related to reading achievement. Prerequisite: EDP 454.

550 Basic Issues in Measurement. (3) S
Methodology of educational measurement with emphasis on test reliability, validity, homogeneity, and structure. Prerequisite: EDP 454.

552 Inferential Techniques of Data Analysis. (3) F, S, SS
Inferential procedures in educational research; probability, sampling design, statistical inference, hypothesis testing, and basic experimental design. Prerequisite: EDP 454 or passing score on qualifying exam.

554 Multivariate Procedures in Data Analysis. (3) F, S, SS
Contrasts, multiple classification analysis of variance and covariance, multivariate analysis of variance and multiple linear regression. Prerequisite: EDP 552.

555 Computer Utilization for Data Processing in the Behavior Sciences. (3) F
Introduction to data processing skills through the uses of major statistical programming packages. Prerequisites. EDP 454 and 552, 552 may be taken concurrently.

556 Data Processing Techniques in Measurement and Research. (3) S
Advancement of statistical design and measurement skills through development of data processing techniques and usage of special programs and data processing programs. Prerequisite: EDP 554.

560 Individual Intellectual Assessment. (1-6) F, S
Experience in administering and interpreting individual tests. Theoretical basis for ability testing, ethical considerations, and diagnostic use of test results. Initial enrollment, 3 hour minimum. Laboratory experience. Prerequisite: admission to a program in professional psychology or approval of the instructor.

562 School Psychology: Theory and Practice. (3) F
Development and present status of school psychology: overview of assessment and intervention strategies and professional issues.

563 Interventions in School Psychology. (3) S
Examination of interventions and intervention research relevant to school psychology practice. Field experience. Prerequisite: school psychology program or approval of instructor.

566 Diagnosis of Learning Difficulties. (3) F
Clinical diagnosis of learning difficulties emphasizing specific academic problems. Use and interpretation of diagnostic instruments in practical school situations. Prerequisites: EDP 560 and 562, or approval of instructor.

636 Experimental Analysis Methods in Human Development. (3) S
An experimental analysis alternative to statistics in the conception, design, and conduct of educational research. Emphasis on writing the research proposal. Approval of instructor required.

750 Research Heuristics and Technical Writing. (3) F
Rationales for research—suppositional and presuppositional logic, and the precision of problems. Writing practice emphasizing clarity of exposition.

754 Advanced Multivariate Analysis. (3) S'83
Multivariate experimental design, multivariate multiple comparison procedures, confidence intervals, covariance structure analysis, and analysis of qualitative data. Prerequisite: EDP 554.

756 Advanced Quantitative Methods. (3) S'83
Techniques for analyzing educational data, including multiple regression, factor analysis and canonical analysis.

Integration of general linear model measurement theory. Prerequisite: six hours in quantitative measurement courses or approval of instructor.

Special Graduate Courses: EDP 494, 498, 499, 580, 583, 584, 590, 591, 592, 593, 594, 598, 599, 680, 683, 684, 690, 691, 692, 693, 700, 780, 783, 784, 790. 791, 792, 799. (See pages 32-33.)

Educational Technology and Library Science

PROFESSORS:
HIGGINS (ED B-146), GERLACH, SATTERTHWAITE, SULLIVAN, VERGIS

ASSOCIATE PROFESSORS:
NILSEN, SCHON

ASSISTANT PROFESSORS:
BEYARD-TYLER, McISAAC

EDUCATIONAL TECHNOLOGY

EDT 405 Competency-Based Instruction. (3) F, S. SS
Students develop instructional objectives, select learning activities, and design assessment procedures for competency-based instructional programs.

501 Foundations of Educational Technology. (3) F
Introduction to instructional development. An examination of accomplishments and problems in the field.

502 Design and Development of Instruction. (3) F
Design, development, and formative evaluation of objectives-based instructional materials.

503 Research Techniques for Instructional Development. (3) S
Procedures for analyzing the effects of alternative instructional practices.

504 Educational Evaluation. (3) S
Issues and practices in summative educational evaluation, models of evaluation, evaluation of educational programs.

522 Computers in Education. (1-3) S, SS
Selection and utilization of computer programs for use in instructional and administrative settings.

523 Computer Programming for Instruction. (3) F, S, SS
Computer programming in BASIC for instructional purposes. Students develop computer-based instructional programs.

780 Practicum: Instructional Development. (1-3) S
Conducting and documenting selected instructional development activities.

791 Seminar. (1-3) F, S
Advanced techniques of technical writing.

792 Research. (1-3) F
Design and execution of instructional research on selected topics.

Special Courses: EDT 494, 498, 499, 580, 583, 584, 590, 591, 592, 593, 594, 598, 599, 680, 683, 684, 690, 691, 692, 693, 780, 783, 784, 790, 791, 792, 799. (See pages 32-33.)

INSTRUCTIONAL MEDIA

IME 411 Audiovisual Materials and Procedures in Education. (3) F, S, SS
Preparation and utilization of audiovisual materials and equipment in teaching. Lecture and laboratory.

455 Cinema and Television. (3) F, S, SS
Structure, development, and behavioral effects of theatrical motion pictures.

521 Design of Instructional Media. (3) S
Preparing specifications for instructional television, film, and slide/tape programs.

522 Audiovisual Production Techniques in Education. (3) F, S
Production and use of audiotapes, video tapes, slide programs, and graphic materials. Lecture and laboratory.

523 Audiovisual Resources for the Classroom. (3) F, S
Survey and evaluation of commercially available audiovisual materials for the classroom and library media center.

524 Instructional Photography. (3) F, S, SS
The camera, film exposure, composition and lighting. Dark room experiences in developing and printing black and white film. Lecture and laboratory.

525 Instructional Graphics. (3) F
Principles of design, production and utilization of graphic media in instructional materials. Lecture and laboratory.

526 Instructional Cinematography. (3) S
Principles of design, production, and utilization of educational motion pictures. Lecture and laboratory.

527 Instructional Television. (3) S
Design and production of instructional programs for television. Lecture and laboratory.

528 Advanced Photographic Media Production. (3) S
Design and production of multi-media instructional programs. Emphasis on slide/tape format. Prerequisite: IME 524 or approval of instructor. Lecture and laboratory.

533 Administration of Media Services. (3) S
Principles for administering audiovisual services in schools and universities. Prerequisite: six hours in IME or approval of instructor.

560 Current Issues and Problems in Audiovisual Education. (3) NR
Critical analysis of current practices in instructional media. Prerequisite: six hours in IME or approval of instructor.

Special Courses: IME 494, 498, 499, 500, 580, 583, 584, 590, 591, 592, 593, 594, 598, 599. (See pages 32-33.)

LIBRARY SCIENCE

LIS 410 Children's Literature. (3) F, S, SS
Selecting and using modern and classic literature with young readers.

411 Advanced Studies in Children's Literature. (3) S
Folk and modern literature for children. Storytelling, book talks, puppetry, and creative drama as motivational techniques. Prerequisite: LIS 410 or approval of instructor.

440 Classification and Cataloging. (3) F, S
Descriptive cataloging and Dewey Decimal Classification of print and nonprint library materials.

461 Selection of Library Materials. (3) F. S
Principles and procedures used in the selection of materials for the school library.

463 Library Materials for Children. (3) F
Selecting and using print and nonprint materials to support the elementary school curriculum.

464 Library Materials for Adolescents. (3) S
Selecting and using print and nonprint materials to support the secondary school curriculum.

465 Library Materials for Minority Students. (3) N
Library services and materials for children from Mexican American, Native American, Black, and other minority groups.

471 Basic Reference Resources. (3) F
Providing reference service in the school library. Content and use of basic resources

481 School Library Administration. (3) F. S
Prerequisites: LIS 440 and 461

510 Library Automation. (3) S
Library uses of computers. Fundamental concepts and issues in the field of library automation. Prerequisites: LIS 471 and 481 or approval of instructor

533 Current Library Problems. (3) F
Critical analysis of current practices and problems in school librarianship. Prerequisites: LIS 481 or approval of instructor

534 Evaluation of Literature for Young Readers. (3) F. S
Applying standards of literary criticism to literature for young readers. Prerequisite: LIS 410 or approval of instructor

584 School Library Internship. (3) F. S
Prerequisites: LIS 440, 461, 463 or 464, 471, 481. Concurrent enrollment in LIS 481 is permitted

Special Courses: LIS 492, 493, 494, 497, 498, 499, 580, 583, 584, 590, 591, 592, 593, 594, 598, 599. (See pages 32-33.)

Elementary Education

PROFESSORS
BITTER, DOYLE, GARCIA, MALNE, MANNING, MOYER, O'BEIRNE, PODLICH, RALSTON, RAY, SILVAROLI, STROM, WALLEN, YAMAMOTO

ASSOCIATE PROFESSORS
SCHALL (ED B-225), ANDERSON, CHRISTINE, EEDS, ENGELHARDT, GREATHOUSE, HARDT, HUDELSON, JACOBS, KAMINS, KNAUPP, KNIEP, SEARFOSS, STALEY

ASSISTANT PROFESSORS
COHEN, EDELSKY, FLORES, GILL, PETERSON, ROSEGRANT, STEERE, TIPPECONNIC, VALLEJO, WALKER

LECTURER
INGRAHAM

Laboratory and off-campus experiences may be included in courses marked with an asterisk.

BILINGUAL EDUCATION

BLE 498 Introduction to BLE Methods. (3) F. S
Provides an overview of models of bilingual education and focuses on general teaching strategies for bilingual classrooms. Primarily Spanish-English considerations

See also offerings under MCE, SED and SPE on pages 209, 211 and 213.

Special Courses: BLE 494, 498, 499, 592, 593, 594, 598, 690, 691, 784, 790, 791, 799 (See pages 32-33.)

EARLY CHILDHOOD EDUCATION

ECD 311 Social Studies in Early Childhood Education. *
(3) F. S. SS
Development of democratic living in all areas of the curriculum. Objectives, unit planning, problem solving, selection of content, scope and sequence, construction of instructional material and resources. Experiences with children.

312 Educational Environments: Nursery-Kindergarten. *
(3) F. S. SS
Considers all aspects of curriculum. Philosophy, principles, practices, problems and evaluation in the integrated experience program

322 Communication Arts in Early Childhood Education. * F. S. SS
Factors affecting language development. Setting conditions for learning in listening, speaking, reading and writing. Proficiency in handwriting and spelling required Prerequisite: ENG 213 or equivalent

411 Early Childhood Education: Programs and Materials. * (3) F. S. SS
Principles, experiments, research studies and recent trends as factors related to the education of children through seven years of age. Prerequisite: ECD 312

498 Pro-Seminar: Introduction to Early Childhood Education. (3) F. S. SS
An overview including professional options, historical roots, current theories and policy developments at national, state and local levels.

498 Pro Seminar: Educational Environments: Infants/Toddlers. (3) F, S, SS
Organizing, planning and implementing educational practices based on developmental theories which will enable early childhood educators to provide optimal learning environments for infants and toddlers.

498 Pro Seminar: Practicum in Early Childhood Education. (3) F, S, SS
Provides a field-based experience in several early childhood settings (outside the public schools). Prerequisites: EED 313 and ECD 498.

522 Developmental Social Experiences in Early Childhood Education. (3) S
Materials, techniques, esthetic expression, creative activities and values in the integrated curriculum. Prerequisite: ECD 311 or equivalent.

525 Communication Arts in Early Childhood Education. (3) F
Problems and trends of current programs and oral language development. Effort to bring together language acquisition findings with educational practices. Opportunity for self-directed learning/study. Prerequisite: ECD 322 or equivalent.

527 Mathematics in Early Childhood Education. (3) F
Theory and practice in the use of manipulative materials for teaching mathematics to preschool and primary grade children. Prerequisite: EED 380 or equivalent.

555 Modern Practices in Early Childhood Education. (3) F, S
Trends and practices, instructional and resource materials, methods and techniques in early childhood education. Prerequisite: ECD 312 or equivalent.

Special Courses: ECD 294, 298, 492, 493, 494, 497, 498, 499, 583, 584, 590, 591, 592, 593, 594, 598, 599, 680, 683, 684, 690, 691, 692, 693, 700, 780, 783, 784, 790, 791, 792, 799. See pages 32-33.

ELEMENTARY EDUCATION

EED 313 Child Development. * (3) F, S, SS
Principles underlying the total development of the child during the pre-school and elementary school years with observations in a variety of settings. Enhancement and understanding of the child in the physical, intellectual, social, and emotional areas of development. Discussion sessions may be scheduled.

320 Teaching Science to Children. * (3) F, S, SS
Develops students' personal philosophies of the nature of elementary school science: why teach science and how children learn science. Knowledge and skills in planning instruction, using instructional models, integrating the curriculum, employing current science program and materials and evaluating children's learning. Laboratory sections. Prerequisite: PSE 220 and 221 or equivalents.

333 Communication Arts in the Elementary School. * (3) F, S, SS
Factors affecting language growth. Setting conditions for learning to teach listening, speaking and writing skills. Emphasis on middle and upper grades. Proficiency in handwriting and spelling required. Prerequisite: ENG 213 or equivalent.

344 Elementary Curriculum. * (3) F, S, SS
The overall curriculum. Practical approaches to classroom organization and management in the elementary school. Practical procedures for implementing the program. Prin-

ciples and problems. Stresses multiple approaches to allow for diversity of circumstances and teaching style; interrelationships and synthesis.

355 Social Studies in the Elementary School. * (3) F, S, SS
The core function of social studies, scope and sequence, unit organization, methods of instruction, materials and resources for learning.

366 Observation and Participation. (3) F, S, SS
Students observe and work directly with elementary children in a classroom situation. Includes a critical evaluation of the student's experiences. Y grade only.

380 The Teaching of Mathematics in the Elementary School. * (3) F, S, SS
A beginning course in methods and materials used. Laboratory experiences with curriculum materials. Laboratory sections. Prerequisite: MAT 180, its equivalent, or successful completion of a mathematics proficiency examination.

434 Creative Communication in the Elementary School. (3) S
Considers creativity in communication at kindergarten through the eighth grade levels, defining the creative process and exploring programs. Speaking and writing experiences designed to develop proficiency in creative communication. Prerequisites: EED 322 or 333, or approval of instructor.

478 Student Teaching in the Elementary School. (3-15) F, S, SS; Staff
Supervised teaching in the area of specialization. A synthesized experience in curriculum, instruction, and classroom management. Prerequisite: EDF 200 or EED 366, 27 semester hours of the core in major field and admission to elementary teacher education curriculum.

511 Elementary Curriculum Development. (3) F, S, SS
Approaches to curriculum change, analysis of typical curriculum problems, strategies and procedures in improving current programs. Prerequisite: EED 344 or equivalent.

513 Child Development. (3) F, S, SS
Continuing analysis of principles, theories and research concerning the elementary school child and his development. An integrated approach to the study and facilitation of wholesome educational and psychological development.

526 Communication Arts in the Elementary School. (3) S
A critical examination of language arts curriculum and teaching practices in the elementary school, with a survey of approaches to teaching various forms of written composition, oral expression, and listening. Opportunities for self-directed study.

528 Social Studies in the Elementary School. (3) F
Problems and trends of current programs. Development of a balanced and articulated program of social studies. Prerequisite: EED 355 or equivalent.

529 Science in the Elementary School. (3) F, S
Problems and trends of current programs. Development of a balanced and articulated science program. Prerequisite: EED 320 or equivalent.

530 Outdoor Education. (3) S, SS
Use of various outdoor settings as laboratories for classroom related experience, study, observation, inquiry, research, and recreation.

537 Mathematics in the Elementary School. (3) F, S, SS
Contemporary mathematics programs used in elementary schools. Content, materials, and approaches to instruction. Prerequisite: EED 380 or equivalent.

544 Play Education. (3) F, S
Conflicting theories of play and the educational implications of each in a curriculum. A practical application in the lower levels of the elementary school.

581 Diagnosis Practices in Mathematics. (3) S, SS
Specific skills in diagnosing children's learning difficulties in mathematics. Includes practicum experiences in identifying strengths/weaknesses and remedial instruction. Laboratory sections.

585 Contemporary Issues in Elementary Education. (3) S, SS
Designed to develop understanding of a broad range of contemporary humanistic issues and to assist students in establishing an informed, professional view. Prerequisite: EED 511 or equivalent.

Special Courses: EED 294, 298, 492, 493, 494, 497, 498, 499, 580, 583, 584, 590, 591, 592, 593, 594, 598, 599, 680, 683, 684, 690, 691, 692, 693, 700, 780, 783, 784, 790, 791, 792, 799. (See pages 32-33.)

INDIAN EDUCATION

IED 411 Foundations of Indian Education. * (3) F, S
Historical development of Indian affairs and Indian education, including contemporary educational issues, traditional Indian concepts of education and Indian cultures.

422 Methods of Teaching Indian Students. * (3) F
Philosophies, methodologies, and materials used in Indian education. Examination of local and tribal classroom materials. Experimentation with new teaching concepts. Prerequisite: IED 411.

424 Curriculum and Practices for Indian Education. * (3) S
Curricula, philosophies, and research in Indian education. Techniques for curriculum development, change, and improvement. Prerequisite: IED 411.

425 Anthropological Applications in Indian Education. * (3) N
Values and cultural assumptions with their impact on Indian education. Case study approach in understanding social and cultural factors.

433 Counseling the Indian Student. * (3) A
Techniques and methods used in counseling with emphasis on understanding Indian cultures and values. Experimentation with new counseling concepts. Prerequisite: IED 411.

490 Problems of Teachers of Indian Students. (3) S
Current issues, trends and problems encountered by teachers. Viable solutions discussed. Research reviewed and evaluated. Prerequisite: IED 411.

498 Pro-seminar: Administration and Management of Indian Education. (3) A
Examines administrative practices, federal, state and tribal law, court decisions, personnel, program and fiscal management.

498 Pro-seminar: Development of Indian Cultural and Language Materials. (3) A
Provides a cultural/language approach to curriculum development. Examines philosophies and materials used in bicultural/bilingual curriculum.

511 Community Schools in Indian Education. (3) A
Development, implementation, and administration of Indian community schools. Techniques and methods for effective school-community relations.

522 Education of Indian Adults. (3) A
Development and implementation of Indian adult education, including program selection, content, and ingredients of successful programs.

544 Role of Tribal, State and Federal Government in Indian Education. (3) A
Examines responsibilities and relationships of each agency in the operation of Indian education programs. Analyzes legislation, financial resources, and tribal control.

594 Workshop in Indian Education. (6) SS
Practical approaches to teaching Indian students. Curriculum and materials development, community involvement, current issues and research examined.

Special Courses: IED 492, 493, 494, 497, 498, 499, 580, 583, 584, 590, 591, 592, 593, 594, 598, 599. (See pages 32-33.)

MULTICULTURAL EDUCATION

MCE 446 Teaching the Culturally Diverse Child. (3) F, S, SS
Physical, social, psychological and educational needs of children from culturally and linguistically different populations. Multidisciplinary approach will be followed.

447 Methods of Teaching the Culturally Diverse Child. (3) A
Techniques for organizing and providing special educational experiences for students from culturally and linguistically different populations. Prerequisite: MCE 446.

448 The Mexican American Child. (3) A
Consideration of variables in teaching Mexican American children. School programming based on bilingual, cultural and related factors.

Special Courses: MCE 492, 493, 494, 497, 498, 499, 580, 583, 584, 590, 591, 592, 593, 594, 598, 599. (See pages 32-33.)

READING EDUCATION

RDG 314 The Teaching of Reading. * (3) F, S, SS
For elementary teachers-in-training; aimed at improving classroom reading programs and practices. Required course provides basic teacher skills, evaluation, classroom environments and reading methods. Discussion sessions may be scheduled. Prerequisite: ENG 213 or equivalent.

315 Decoding in Reading. * (3) F, S, SS
A comparative analysis of phonetic and linguistic interpretations of the sounds and structures of English. Required course emphasizes how sounds (grapheme-phoneme correspondences) are related to the decoding process. Discussion sessions may be scheduled. Prerequisite: RDG 314.

456 Diagnosis of Reading Problems. (3) F, S
Acquaints the teacher-in-training with diagnostic procedures in reading. Clinic methods and materials will be presented with modifications for children with learning disabilities. Prerequisites: RDG 314 and 315.

467 Reading in the Content Areas: Secondary. (2) F, S, SS
Introduces reading procedures in subject matter fields. Emphasis: content reading principles and methodology, including decoding. Required for Secondary Education majors. To be taken concurrently with Secondary Reading Practicum (RDG 480) and either SED 310 or 400, or Student Teaching: SED 433.

480 Practicum: Secondary Reading. (1) F, S
Provides for practical application of content reading principles in an on-site secondary school setting. Required for Secondary Education majors. To be taken concurrently with RDG 467 during the student's professional field experience semester (see RDG 467).

481 Practicum: Elementary Reading. * (3) F, S
Teachers-in-training work directly with students who are disabled in reading. Techniques employed in treating disabilities. Required for Elementary Education majors. Prerequisite: RDG 314.

505 Developmental Reading. (3) F, S, SS
For classroom and special reading teachers. Specific professional skills in decoding, comprehension and evaluation. Recommended for special reading endorsement stamp. Prerequisite: Teaching certificate.

507 Reading in the Secondary School. (3) F, S, SS
Acquaints classroom teachers with techniques for efficient reading, vocabulary development and readability procedures. Prerequisite: Teaching certificate

533 Reading-Teaching Bilingual Students. * (3) S, F, SS
Acquaints teachers with theory and practice in second language acquisition and with strategies for developing word recognition and comprehension in native language and second language reading (Spanish-English emphasis).

544 Resource Specialist and the Content Area Teacher.
(3) S
For reading consultants, teachers and majors interested in the role of "reading teacher as a resource person to content area teachers." Prerequisites: RDG 507, 556 and 550 or 557.

550 Directed Experiences in Reading. (3) F, S, SS
Practicum experience utilizing diagnostic and instruction techniques of the classroom for corrective reading remediation. Participants tutor assigned students twice a week. Prerequisite: RDG 505 or instructor's approval. Laboratory sections.

556 Diagnostic and Treatment Procedures in Reading.
(3) F, S, SS
Basic and specialized diagnostic and instruction techniques for corrective and clinical reading remediation. Recommended for special reading endorsement stamp. Prerequisite: RDG 505.

557 Reading Clinic Experience. (3) F, S
Practicum experience utilizing specialized diagnostic and instruction techniques for clinical reading remediation. Participants tutor assigned students twice a week. Recommended for special reading endorsement stamp. Prerequisite: RDG 556 or approval of instructor. Laboratory sections.

581 Individualizing Reading Instruction. (3) F, S, SS
Acquaints experienced teachers with individualized reading programs. Lectures, visual aids and demonstrations should enable experienced teachers to conceptualize the rationale and practice of these programs.

630 Research in Reading. (3) F
For advanced graduate students interested in applied research problems, literature of reading instruction and major issues related to reading research. Approval of instructor required.

Special Courses: RDG 294, 298, 492, 493, 494, 497, 498, 499, 580, 583, 584, 590, 591, 592, 593, 594, 598, 599, 680, 683, 684, 690, 691, 692, 693, 700, 780, 783, 784, 790, 791, 792, 799. (See pages 32-33.)

Higher and Adult Education

PROFESSORS:
RICHARDSON (ED B-7F), FENSKE
ASSOCIATE PROFESSORS:
AXFORD, BOGART, ROSSMAN
ASSISTANT PROFESSOR:
OKUN

HIGHER EDUCATION

HED 522 Introduction to Higher Education. (3) F, S; Fenske
Introduction and orientation to the broad field of higher education.

533 The Community-Junior College. (3) F, S; Bogart
History, functions, organization and current issues. Meets Arizona community college course requirement for certification.

611 Curriculum and Methods of Instruction in Post Secondary Education. (3) S; Fenske
Curriculum development, instructional organization and improvement of instruction in two and four year colleges. Micro-teaching. Prerequisite: HED 522 or 533 or approval of instructor.

644 Financing Higher Education. (3) S; Richardson
Public and private funding of post-secondary education. Issues related to cost/benefit, tuition and student financial aid. Institutional planning, budgeting and financial management. Prerequisite: HED 522, 533, or approval of instructor.

689 Administration of Higher Education. (3) F; Richardson
Theory and practice in college governance including decision making, communication, and institutional research. Prerequisite: HED 522, 533 or approval of instructor.

Special Graduate Courses: HED 580, 591, 683, 684, 690, 692, 693, 784, 790, 791, 792, 799.

Note: Seminars covering such topics as current issues, higher education and the law, institutional advancement and support, institutional research, student financial aid, and collective bargaining are offered periodically.

ADULT EDUCATION

AED 511 Introduction to Adult Education. (3) F, S; Axford
Historical development, core content, and principal areas of application of adult education are covered.

512 Program Planning in Adult Education. (3) F; Rossman
Stresses the andragogical approach to planning programs for adults. Stress is on a redefinition of the role of the program planner and facilitator. Prerequisite: AED 511 or approval of instructor.

Secondary Education

Including Humanities Education, Safety Education, Educational Foundations and Social and Philosophical Foundations

PROFESSORS:

JOHN E. BELL (ED 409), ARMSTRONG, JAMES W. BELL, BELOK, COOK, EDWARDS, FRASIER, FULLERTON, GRIFFITH, HAGGERSON, HOOVER, KIESOW, LAMM, MITCHELL, MOULTON, PIERCEY, SHAFER, SVOBODA

ASSOCIATE PROFESSORS:

APPLETON, BROOK, CUMMINGS, FRAZIER, MANERA, METHA, THOMAS, WAMACKS, WURSTER

ASSISTANT PROFESSORS:

FINER, B. PARRISH, W. PARRISH, STAHL

SECONDARY EDUCATION

522 Educating the Middle-Aged and Older Persons. (3) S, Okun
Educational considerations and methods utilized in each of the principal age groupings of adults.

525 Characteristics of Adult Learners. F, Rossman
Characteristics of adults relevant to the instructional process. Implications for education of adults.

555 Adult Basic Education. (3) N; Rossman
Stresses the role of the teacher, student and programs in adult basic education. Consideration is also given to high school equivalency and other similarly related areas. Prerequisite. AED 511 or approval of instructor.

566 International Adult Education. (3) N; Axford
Review and comparison of various adult education programs and facilities in selected countries. Prerequisite: AED 511 or approval of instructor.

589 Administration of Adult Education. (3) S; Axford
The administration of agencies and programs of adult education. Prerequisite. AED 511.

664 Community Service, Extension and Continuing Education. (3) F, Axford
Objectives, organization and practices of post-secondary programs of continuing education, community and public service and extension. Prerequisite: AED 511 or HED 522 or 533.

733 Research in Higher and Adult Education. (3) F, S; Okun
Qualitative methodologies used in study of higher and adult education. Prerequisites: EDP 454 or equivalent.

Special Graduate Courses: AED 580, 591, 683, 684, 690, 692, 693, 784, 790, 791, 792, 799 (See pages 32-33.)

Note: *Seminars covering such topics as adult basic education materials, adult education issues, staff development, teaching adults, and proposal writing are offered periodically.*

SED 310 The Secondary School. (3) F, S, SS
Development of secondary education in America, observation and work with secondary school pupils may be required. Special discussion sessions may be scheduled. Prerequisite, admission to a Secondary Teacher Education program.

311 Principles and Curricula of Secondary Schools. (3) F, S, SS
Principles, purposes, organization and curricula of secondary schools. Prerequisite: EDP 310 and SED 310

400 (On-Site Program) Observation and Participation. (7) F, S
Observation and work with secondary school pupils in classroom situations, participation in weekly seminars. Prerequisites, admission to Secondary Teacher Education and on-site programs. Y grade only.

401 (On-Site Program) Methods, Curricula and Problems in Secondary Education. (7) F, S
Methods of teaching and evaluating, principles and curricula, special problems in secondary education. Prerequisite: SED 400.

411 Teaching and Evaluating in Secondary Schools. (3-4) F, S, SS
Procedures, methods, techniques and instruments of teaching and evaluating in secondary schools. Prerequisite: SED 311.

433 Student Teaching in the Secondary Schools. (3-12) F, S, SS
The practice of teaching. The relationship of theory and practice in teaching. Prerequisites. SED 411 and Special Methods or SED 401 and Special Methods. (Concurrent enrollment in SED 434 required for students in On-Site Program) Y grade only.

434 (On-Site Program) Seminar. (2) F, S, SS
Analysis and synthesis of on-site experiences with professional education team members. Prerequisites: SED 401 and concurrent enrollment in SED 433. Y grade only.

480 Special Methods of Teaching Social Studies. (3) F, S
Interdisciplinary approaches; production and collection of materials. Prerequisite: SED 311.

522 Secondary School Curriculum Development. (3) F, S, SS; J.E. Bell, Svoboda, Wamacks
Social processes, issues, principles, patterns, and procedures in curriculum development. Prerequisite: SED 433.

533 Improving Instruction in Secondary Schools. (3) F, S, SS; J.W. Bell, Stahl
Analyses of procedures, methods, techniques, and experiments in teaching in secondary schools. Prerequisite: SED 433.

555 Student Activities in Secondary Schools. (3) N; Armstrong
Development, purposes, and principles of student activities in secondary schools. Prerequisite: SED 433.

566 Evaluating Secondary School Programs. (3) N; Staff
Development of evaluative criteria for secondary school programs. Prerequisite: SED 433.

577 Issues and Trends in Secondary Education. (3) F, SS; Frasier
Analyses of lay and professional reports; problems and issues in American secondary education. Prerequisite: SED 433.

588 Human Relations in the Secondary Schools. (3) S, SS; Cook
Problems in human relations inherent in the interaction of pupils, teachers, administrators, non-professional staff and laymen. Prerequisite: SED 433.

711 Secondary Curriculum Development. (3) S, SS; Haggerson
Theories and processes of developing curriculum; evaluation of research. Prerequisites: SED 433, 522 or equivalent.

722 Improvement of Instruction in the Secondary School. (3) F, SS; J.E. Bell, Cook
Evaluation of the research; issues and theories related to the improvement of instruction. Prerequisites: SED 433, 533.

Special Courses: SED 294, 298, 492, 493, 494, 497, 498, 499, 580, 583, 584, 590, 591, 592, 593, 594, 598, 599, 680, 683, 684, 690, 691, 692, 693, 780, 783, 784, 790, 791, 792, 799. (See pages 32-33.)

HUMANITIES EDUCATION

HUE courses may be elected to meet General Studies requirements in Humanities and Fine Arts.

HUE 101, 102 Ideas and Values in the Humanities. (4, 4) F, S
Interrelation of art, architecture, literature, music, philosophy, religions, theatre and other performing arts in the modern world. Two lectures, two discussion meetings per week.

118 Encountering the Arts. (3) F, S
Introductory course emphasizing personal contacts with the fine and performing arts. Attendance of a wide range of events, with analysis and evaluation.

130 Introduction to Popular Culture. (3) F, S
Reflectins of American values in 20th century popular arts. Music, print, art, television, radio, movies, the esthetics of popular culture.

318 Artistic Styles and Forms. (3) S
Formal and stylistic aspects of the fine and performing arts. Development and progression of style and form in the various arts.

401 Humanities in World Cultures. (3-6) F, S, SS; Lamm
A humanities study program of foreign travel. Fine and performing arts of the various world cultures. May be repeated for credit. Prerequisite: approval of instructor.

480 Methods of Teaching the Humanities. (3) N, Frazier
Methods of instruction, organization, discussion and presentation of the courses in the interdisciplinary humanities. Prerequisites: HUE 101, 102 or approval of instructor.

530 Popular Culture in America. (3) F; Frazier
The uses of leisure time from a historical perspective. *Areas of concern include television and radio, film and stage, music, art and paperbacks.*

585 Philosophical Foundations of the Humanities. (3) S; Mitchell
Issues in intellectual traditions of the Western world that are basic to the interdisciplinary humanities. Prerequisite: Humanities education graduate status or approval of instructor.

Special Courses. HUE 294, 497, 499, 500, 584, 590, 591, 592, 594, 598, 599, 600, 680, 684, 690, 691, 692. (See pages 32-33).

SAFETY EDUCATION

SAE 466 Safety Education. (3) F, S, SS; Staff
Safety education in home, school and place of employment.

477 Driver and Traffic Safety Education, I. (3) F, SS; Staff
Preparation for teaching the classroom phase of driver education in the secondary school. Prerequisites: valid operator's license and SAE 466. COE only.

478 Driver and Traffic Safety Education, II. (3) S, SS; Staff
Preparation for teaching behind the wheel phase of driver education. Simulation included. Prerequisite: valid operator's license and SAE 477. COE only.

487 Organization and Administration of Driver and Safety Education Programs. (3) A; Staff
Curriculum, organization, and administration of programs in safety education. Will include field trips to visit nearby programs. Prerequisite: SAE 477.

488 Transportation Safety Systems and Programs. (3) N; Staff
Systems, problems, issues, and trends of transportation systems. Prerequisite: SAE 466.

Special Courses: SAE 492, 493, 494, 497, 498, 499, 580, 583, 584, 590, 591, 592, 593, 594, 598, 599. (See pages 32-33.)

EDUCATIONAL FOUNDATIONS

EDF 111 Exploration of Education. (3) F, S
Education as an instrument in the development of the individual and society; its significance as an American institution.

200 Self-Assessment for Teaching. (1-6) F, S
Instructional and field experiences to help students determine whether or not they want to become teachers.

333 Basic Issues in Education. (3) F, S
Important contemporary socio-philosophical issues educators face; analysis and problem-solving.

422 Group Dynamics and Education. (3) F, S; Moulton
Theory and use of group processes to facilitate human interaction and learning.

445 Education for Survival. (3) A; Moulton
Causes, extent, and seriousness of environmental degradation. Pollution, resource depletion, energy, overpopulation, conservation.

500 Educational Research. (3) F, S, SS; Armstrong, Fullerton, Hoover, Ralston, Wurster
Introductory course in the analysis, production, and use of educational research in the field.

Special Courses: EDF 294, 298, 492, 493, 494, 497, 498, 499, 580, 583, 584, 590, 591, 592, 593, 594, 598, 599, 600, 680, 683, 684, 690, 691, 692, 693, 780, 783, 784, 790, 791, 792, 799. (See pages 32-33.)

MULTICULTURAL EDUCATION

See offerings under MCE listing on page 209 (MCE, EED) and Educational Foundations (SED).

SOCIAL AND PHILOSOPHICAL FOUNDATIONS

SPF 411 History of American Education. (3) F; Belok
Social conditions, ideas and institutions which formed American education.

422 Educational Sociology. (3) S; Metha
Schools as agents of socialization and as social systems.

511 School and Society. (3) F, S, SS; Hardt, Metha, Moulton, Shafer
Interrelationship of school and society and the role of education in social change.

515 Education of Women. (3) F, S; Metha, Shafer
Analysis of roles and status of women; educational practices and alternatives.

520 Cultural Pluralism and Education. (3) N; Appleton
Philosophic analysis of the concept of cultural pluralism and its social implications for American education.

533 Comparative Education in the Western World. (3) F; Shafer
Educational practices and traditions in the leading nations of Europe and the Soviet Union.

534 Education and Change: Developing Nations. (3) S; Shafer
Education as economic and socio-political change agent in Africa, Asia, the Middle East and Latin America.

544 Philosophical Foundations of Education. (3) F, S, SS; Appleton, Belok, Haggerson, Mitchell
Theories of education in ancient, medieval, and modern classical and contemporary philosophies.

566 History of Education. (3) F, S, SS; Belok
Development of educational institutions and ideas in the Western World, from ancient times to the 20th century.

711 Social and Historical Foundations of Education. (3) S, SS; Belok, Shafer
Problems of American education and their socio-historical context.

Special Courses: SPF 298, 492, 493, 494, 497, 498, 499, 580, 583, 584, 590, 591, 592, 593, 594, 598, 599, 680, 683, 684, 690, 691, 692, 693, 780, 783, 784, 790, 791, 792, 799.

Special Education

PROFESSORS:
PREHM (ED 305), ABRAHAM, FAAS, MOORE, RUTHERFORD

ASSOCIATE PROFESSORS:
BROWN, D'ALONZO, HARTWELL, HOWELL, NELSON, PRIETO, ROBERTS, WISEMAN, ZUCKER

ASSISTANT PROFESSORS:
COHN, McCOY, RUEDA, SULLIVAN

SPECIAL EDUCATION

SPE 311 Orientation to Education of Exceptional Children. (3) F, S, SS
Includes gifted, mentally retarded, vision, hearing, speech, emotional disturbance, disadvantaged, specific learning disabilities and others.

312 Mental Retardation. (3) F, S, SS
Causation and characteristics of mental retardation in children and adults. Terminology, educational programming and therapeutic procedures are emphasized.

320 Participation with Exceptional Children. (3) F, S
Clinical and laboratory experience with exceptional children in cooperating clinics, institutions, schools, and agencies. Prerequisite: SPE 311, or concurrently.

321 Curriculum and Methods of Teaching the Mentally Handicapped. (3) F, S, SS
Developing curricula and methodology for trainable and educable mentally handicapped pupils in grades K-12. Prerequisites: SPE 311 and 312, or concurrently.

401 Evaluating Exceptional Children. (3) F, S, SS
Normative and criterion-referenced diagnostic techniques including formative evaluation. Emphasis upon application. A competency-based approach will be used. Prerequisites: SPE 311 and EDP 310.

402 Prescriptive Programming in Language, Reading and Arithmetic for Exceptional Children. (3) F, S, SS
Emphasizes methods, techniques and materials for use in prescriptive teaching. A competency-based approach will be used. Prerequisite: SPE 401.

403 Parent, School, Community Relations and the Exceptional Child. (3) F, S, SS
Counseling parents. Law and the handicapped, role and competencies of special education personnel, referral procedures and working with community agencies. Prerequisite: SPE 311 or approval of instructor.

436 Behavioral and Emotional Problems in Children. (3) F, S, SS; Prieto, Sullivan
Maladaptive behavior in children and adolescents. Exploration of the isolated developmental and maintenance variables contributing to the behavior patterns.

438 Methods of Teaching the Emotionally Disturbed. (3) F, S, SS; Rutherford
Development of a therapeutic educational atmosphere for socially-maladjusted and emotionally-disturbed children. Prerequisite: SPE 436.

455 Early Childhood and the Handicapped. (3) A; Staff
Early childhood education as it applies to the handicapped child. Methods, materials and techniques.

461 Characteristics and Diagnosis of Learning Disabilities. (3) F, S, SS; Faas, Staff

462 Methods of Remediating Learning Disabilities. (3) F, S, SS; Wiseman, Staff
Prerequisite: SPE 461.

465 Student Teaching in Special Education. (3-15) F, S
Prerequisites: (1) Approval of Special Education Department; (2) completion of SPE 401 and 402 and basic methods courses in area of specialization and in teaching reading and mathematics in the elementary school. 'Y' grade only.

511 The Exceptional Child. (3) F, S, SS; Nelson, Sullivan, Staff
Educational needs of handicapped and gifted children. (Not available to students who have completed SPE 311.)

512 The Mentally Retarded Child. (3) F, S, SS; Moore, D'Alonzo, Rueda
Etiology, diagnosis and management of mentally retarded children. Current trends in prevention, programming, and teacher preparation. (Not available to students who have completed SPE 312.)

514 Methods of Perceptual-Motor Training. (3) A; Staff
Development of the sensory-motor skills of handicapped children. Prerequisites: SPE 511 or equivalent, and basic course in one exceptionality.

515 Methods for the Remediation of Learning Problems of Exceptional Children. (3) F, S, SS; Howell
Methods and materials for remediating the basic academic problems of gifted and mildly-handicapped children. Prerequisites: SPE 511, or equivalent, a basic course in one exceptionality, or approval of instructor.

531 Behavior Management Approaches with Exceptional Children. (3) F, S, SS; Rueda, Zucker, Staff
Behavior management approaches with maladaptive behavior of exceptional children. Prerequisite: SPE 511 or equivalent.

574 Educational Evaluation of Exceptional Children. (3) F, S, SS; Howell
Design and statistical considerations of normative and criterion-referenced tests. Collection, recording and analysis of data from formative evaluation. Prerequisites: SPE 311 or 511 and a methods course in the teaching of reading and mathematics.

575 Current Issues in the Education of Exceptional Children. (3) F, S, SS; Abraham, Prehm, Nelson
Mainstreaming, noncategorical, financing, legal diagnostic, labeling, legislative and other critical and controversial issues related to the education of exceptional children.

578 Methods of Teaching the Mentally Retarded. (3) F, S, SS; D'Alonzo, Roberts
Specific methods, materials of instruction and curriculum development in teaching educable and trainable children. Prerequisite: SPE 312 or 512.

579 Vocational Programs for the Mentally Retarded. (3) A; D'Alonzo, Staff
Curriculum planning and methods of teaching in secondary school and post-school programs. Work evaluation, work-study, sheltered employment. Prerequisite: SPE 312 or 512.

581 Methods of Teaching the Trainable Mentally Retarded. (3) A; D'Alonzo, Roberts
Development of materials, procedures and programs for the trainable mentally retarded, preschool through adulthood. Prerequisite: SPE 312 or 512.

588 The Gifted Child. (3) F, S, SS; Cohn
Gifted children's characteristics, identification, needs, school and home environments, definitions, and misunderstandings. Research on Terman, Witty, and others.

589 Methods in Teaching the Gifted. (3) F, S, SS; Cohn
Methods in teaching elementary and secondary school gifted children. Newer techniques, including programmed and computer-assisted instruction, team teaching. Prerequisite: SPE 588.

674 Identification, Evaluation and Classification of Exceptional Children. (3) F; Howell
Analysis of the research and theoretical literature focused on the identification, evaluation, and classification of exceptional children.

675 Causation of Handicapping Conditions. (3) S; Moore
Analysis of the physiological and environmental factors which lead to handicapping conditions. Emphasis given to the develoment of primary prevention.

681 Instructional Program Development in Special Education. (3) S; McCoy
Instructional program planning, implementation, and evaluation for planning, presentation and evaluation of both college/university and inservice teacher training.

774 Characteristics of Exceptionality. (3) F; Prehm, Rueda
Analysis of the literature describing learning, educational, personal-social and cognitive characteristics of exceptional children.

775 Intervention Program in Special Education. (3) S; Rutherford, Prieto
Analysis of the research literature focused on intervention programs for preschool, school aged, and adolescent/adult exceptional persons.

781 Research and Evaluation in Special Education. (3) F; Zucker, Prehm, Cohn
Issues and problems in conducting research and/or evaluation programs involving exceptional children.

Special Courses: SPE 294, 298, 492, 493, 494, 497, 498, 499, 580, 583, 584, 590, 591, 592, 593, 594, 598, 599, 684, 690, 691, 692, 790, 792, 799. (See pages 32-33.)

College of Engineering and Applied Sciences

C. R. Haden, Ph.D.
Dean

Purpose

The purpose of the College of Engineering and Applied Sciences is to provide a university education of such fundamental background and scope that a student may achieve competency in engineering, agriculture, technology, computer science, or construction. Every effort is made to carry on a well-rounded, well-integrated program which will not only give the student proficiency for a professional career but also will develop character, judgment, ideals, breadth of view, and appropriate cultural attitudes. Students are taught to recognize the fact that their professional efforts will cause change and that they must accept responsibility for the social consequences of those efforts.

Organization

The material for the College of Engineering and Applied Sciences is presented as follows:

Division of Agriculture

Agribusiness

Environmental Resources in Agriculture

Department of Computer Science

Computer Science

Computer Systems Engineering

Division of Construction

General Building Construction

Heavy Construction

Specialty Construction

School of Engineering

Department of Aerospace Engineering and Engineering Science

Aerospace Engineering

Engineering Science

Department of Chemical and Bio Engineering

Department of Civil Engineering

Department of Electrical and Computer Engineering

Department of Industrial and Management Systems Engineering

Department of Mechanical and Energy Systems Engineering

Special Engineering Studies

Bioengineering

Manufacturing Engineering

Materials Science

Nuclear Sciences

System Engineering

Urban Systems Engineering

Interdisciplinary Engineering Studies

Business and Pre-Law

Geological Engineering

Premedical

Analysis and Systems

Engineering Core

Society, Values, and Technology

Division of Technology

Department of Aeronautical Technology

Aeronautical Engineering Technology

Aeronautical Industrial Technology

Department of Electronic Technology

Electronic Engineering Technology

Electronic Industrial Technology

Department of Industrial Technology
  Graphic Communications Engineering
    Technology
  Graphic Communications Industrial
    Technology
  Industrial Vocational Education
  Industrial Supervision
Department of Manufacturing Technology
  Manufacturing Engineering Technology
  Mechanical Engineering Technology
  Welding Engineering Technology

Research

It is the policy of the College to encourage exceptional upper division undergraduate students, as well as graduate students, to participate with faculty members in research activity. Many faculty members are conducting research on government or industry sponsored programs. Research activities include computer science and applications, materials science, solar energy, transportation systems, speech processing, computer design, turbine design, structural systems, waste recycling, solid-state electronic devices, power systems, environmental, biomedical, arid land agriculture, and many others.

Cooperative Education

Cooperative education (co-op) is a study-work plan of education which alternates periods of academic study with periods of employment in business and industry related to a student's major. Students who choose this program must complete at least 12 months of employment in order to receive the co-op certificate. The program can be completed in four calendar years but it is more realistic to plan on additional time. In addition to the co-op certificate, students graduate with both the academic background and practical experience gained from working with professionals in their chosen field. Working may also allow students with financial difficulties to continue their degree program.

Students are eligible upon completion of their freshman year. Transfer students are eligible after one semester of academic residence at this university. Further requirements include a specified minimum grade point average, completion of certain courses, approval of advisor, and acceptability to the employer. The academic credit earned varies with the different programs of study. For information on the program, contact the

Cooperative Education section in the Dean's Office.

Degrees

Baccalaureate Degrees. The completion of a four-year program of study in agriculture, computer science, construction, or technology leads to the degree of Bachelor of Science (B.S.). The completion of a four-year program of study in engineering or engineering-based interdisciplinary programs leads to the degree of Bachelor of Science in Engineering (B.S.E.) or Bachelor of Science (B.S.). The B.S.E. programs are offered through the engineering departments and the Special Engineering Studies. Course requirements comprising these majors are drawn primarily from the various engineering disciplines. The B.S. programs are offered through the Interdisciplinary Engineering Studies. Specialization course requirements comprising these majors are drawn primarily from non-engineering disciplines.

Integrated B.S.E.-M.S.E. Program. (For School of Engineering students only.) To provide greater program flexibility, qualified students may undertake a program which provides an integrated fourth- and fifth-year sequence of study in one of several fields of specialization in engineering. This gives the student an opportunity to meet the increasing demands of the profession for graduates who can begin their engineering careers at an advanced level.

Students admitted to this program are assigned a faculty committee which will supervise a program of study in which there is a progression in the course work and in which earlier work is given application in the later engineering courses for both the bachelor's and master's degrees. Entry into the integrated program will require an application submitted to the Dean through the faculty advisor and the chair. Applications will be reviewed by a School committee which will recommend the appropriate action to the Dean. The application may be submitted in the fifth semester.

Master of Science in Engineering Degree (M.S.E.). The Master of Science in Engineering degree is awarded upon successful completion of prescribed graduate level course work, engineering projects, and research endeavor. Entry into this program normally requires a bachelor's degree from an engineering program accredited by the Engineering

Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).

The pattern of course work applicable to the degree is potentially unique for each student, although each approved pattern is required to conform to the general guidelines for subject matter content for the degree as outlined in the *Graduate Catalog* and also to the criteria for advanced level accreditation of the ABET. The M.S.E. programs in civil, electrical, industrial, and mechanical engineering, and engineering science (see page 251) are accredited by the ABET.

Master of Science Degree (M.S.)
Engineering. This graduate program is designed to provide an opportunity to the competent student with a baccalaureate degree in engineering or other selected fields to specialize in a particular subject area within engineering. This objective may be attained through the satisfactory completion of undergraduate deficiency course work and of graduate-level course work, and project or research endeavor. Students with non-engineering baccalaureate degrees normally enroll in this degree program.

Master of Science Degree
Agriculture. This program provides competent students with opportunities to complete advanced studies with emphasis on research in agriculture.

Master of Technology Degree
Technology. This degree program is designed for flexibility which permits the student to select a combination of courses in technology and supporting areas to meet individual career goals. Selected areas of concentration are designed to provide graduates with technical and professional skills for use in preparation for and advancement in leadership positions found in industry and education. The areas of concentration include: Aeronautics, Electronics, Graphic Communications, Industrial Vocational Education, Industrial Supervision, Manufacturing, Mechanical, and Welding.

Doctor of Philosophy Degree
Engineering. The degree Doctor of Philosophy is awarded in engineering upon the satisfactory completion of an approved program of graduate study, research and dissertation. For specific reference to this degree, see the Graduate College section of this catalog or the *Graduate Catalog*.

Degrees in Education
Technology. The Division of Technology offers in conjunction with the faculty in the Department of Secondary Education, College of Education, the following degrees in education: Bachelor of Arts in Education, which is open to students preparing to teach Industrial Arts in elementary and secondary schools; Master of Education, Doctor of Education, and Doctor of Philosophy with a concentration in Industrial Education.

General Information
Definition of Terms. The terms used in this College to describe offerings are defined below for purposes of clarity.

Program of Study. A broad term describing the complete array of courses included in the study leading to a degree. Example: engineering, technology, construction, agriculture, computer science.

Field of Specialization—A specialized group of courses contained within the program of study. Example: program of study—engineering; field of specialization—civil engineering. Example: program of study—agriculture; field of specialization--agribusiness.

Area of Emphasis (technical electives), Pattern or Concentration is a selection of courses within a field of specialization or among one or more fields of specialization. The number of technical electives varies from curriculum to curriculum. In a number of the fields of specialization the technical electives must be chosen from pre-selected groups. For this reason the choice of specific technical electives for an area of emphasis should be done with the advice and counsel of an advisor. Example: field of specialization—mechanical engineering; area of emphasis—thermosciences.

Admission. Students who wish to be admitted to full freshman standing in the College of Engineering and Applied Sciences should present certain secondary units which are specified in the requirements of the Department, Divisions and the School of Engineering. Students who have omissions or deficiencies in secondary school subject matter preparation may be required to complete additional university credit course work which may not be applied toward their degree.

Transfer Students. Students who contemplate transferring into this College from other institutions, whether they be community col-

leges or four-year institutions, should study carefully the pertinent sections under this College pertaining to their particular program and, if possible, consult an advisor in this College prior to enrolling in that other institution. This will assure a smooth transition at the time of transfer. The Department, Divisions, and School may impose additional admission and graduation requirements to those minimums specified by the College.

Transfer students may also obtain a copy of the "Approved General Studies Courses" for this College by writing to the Dean. Credit is granted for transferred courses which are adjudged to be equivalent to corresponding courses in the selected program of study, subject to grade and senior residence requirements. Credits will be accepted by transfer from a junior college to meet lower division requirements only. It should be noted that some courses taken in other colleges of this University or other universities may be acceptable for general University credit but may not be acceptable toward the degree requirements of this College. Determination of those particular courses acceptable to a specific degree program will be made within the appropriate Department, Division or School with the approval of the Dean.

Advisement and Counsel. For assistance and counsel in planning a program of study, each student will be assigned a faculty advisor who is familiar with the chosen field of specialization and who must be consulted before registering each semester. In addition, a student advisement coordinator is available in the Dean's Office to all students for counsel and assistance.

English Proficiency Requirement. English proficiency is required. As a minimum each student must complete ENG 101 and ENG 102, or ENG 104, but any student whose written or spoken English in any course is unsatisfactory may be required to take additional course work by the appropriate division director or department chair. See statement on English Proficiency, page 27.

Pass-Fail Grades. Students enrolled in the College of Engineering and Applied Sciences will not receive degree credit for pass-fail courses taken at this institution. In addition, no courses in this college are offered for pass-fail credit. Students requesting credit for pass-

fail courses taken at another institution must file a Petition for Variance form. Each request will be judged on its particular merits.

Entry into Upper Division Courses. Prior to enrolling in courses at the 300-level and above, all students in good academic standing must secure the approval of their advisor. Students who are not in good academic standing must secure the approval of their advisor *and* division director or department chair. Students whose grades in 300-level courses are unsatisfactory may be required to retake one or more courses for which credit has previously been granted.

The Department, Divisions and School have certain additional requirements that must be met in addition to the above College requirements.

Academic Honors. Students who maintain a 3.5 or above cumulative index are awarded, at the College Honors Convocation, a Certificate of Scholastic Excellence, and/or are listed in the Honors Convocation program. Students completing baccalaureate degree requirements will receive the appropriate Honors designations on their diplomas consistent with the requirements specified by the University.

Students in the College of Engineering and Applied Sciences are encouraged to seek information concerning entry into those honor societies for which they may qualify. Membership in such organizations enhances the student's professional stature. The following honor societies are active within the College: (1) Tau Beta Pi—National Engineering Honor Society, (2) Eta Kappa Nu—Electrical Engineering Honor Society, (3) Alpha Pi Mu—Industrial Engineering Honor Society, (4) Pi Tau Sigma   Mechanical Engineering Honor Society, (5) Sigma Lambda Chi—Construction Honor Society, (6) Alpha Zeta   Agriculture Honor Society and (7) Tau Alpha Pi   National Honor Society, Engineering Technologies. Information on any of these organizations may be obtained from any of the Department, Division or School offices, or the Office of the Dean.

ROTC Students. Students pursuing a commission through either the Air Force or Army ROTC programs will be required to take from 12 to 20 hours in the Department of Aerospace Studies or Department of Military Science. To preclude excessive overloads, these students should plan on at least one additional

semester to complete degree requirements. ROTC students must also meet all other degree requirements of this College.

General Studies

Higher education should provide the student not only with competency in the chosen subject field, but also with experiences which facilitate the student's growth in ability to perceive significant relationships, to make intelligent value judgments, to express ideas with ease, clarity and good taste and to develop the qualities of character and personality requisite for a successful career. The development of moral, ethical and social concepts, along with a sound professional attitude, is required. It is expected that the attainment of an interest and pleasure in the above pursuits will be an inspiration to continued study. Courses are selected with the aid of an advisor to provide planned sequences and to place emphasis on the interrelationships that exist among fields of knowledge.

The College requires a minimum of 6 hours in behavioral and social sciences, and a minimum of 6 hours in humanities and fine arts, with a total of 16 hours in these areas combined; 8 hours of science and mathematics; and 12 hours of General Studies electives to fulfill the General Studies requirement. These requirements are described below:

General Studies—Agriculture, Computer Science, Construction and Technology

Students in each of the Divisions of Agriculture, Construction and Technology and in the Department of Computer Science shall consult their advisors for the approved list from which courses may be selected.

General Studies—School of Engineering

The humanities and fine arts and the behavioral and social sciences requirements for students pursuing a baccalaureate program in Engineering are more closely structured than for other degree programs (see page 242).

General Studies and Elective Courses Offered for Students in Other Colleges

This College offers a number of courses in agriculture, computer science, construction, engineering and technology which may be acceptable for General Studies or elective credit in other colleges upon approval of an advisor. The courses in engineering under the heading "Society, Values, and Technology" are specifically oriented to General Studies relating technology to social problems. Students in other colleges should consult with their advisors if they wish to take such courses.

Division of Agriculture

R. R. Chalquest, D.V.M., Ph.D., Director

PROFESSORS:
CHALQUEST (AG 281), GORDON, MILLER, MONTY, MOODY, RICHARDSON, ROBINSON, STILES, TAYSOM, WEEMS

ASSOCIATE PROFESSORS:
ASHOOR. BRADY, MADDY, RASMUSSEN, WHYSONG, WOOLVERTON

ASSISTANT PROFESSORS:
BACKHAUS, BROCK, EDWARDS, RACCACH, RIGHETTI, SEPERICH

Purpose

The Division of Agriculture provides an integrated program in both agribusiness and environmental resources in agriculture with various subfields of study. Since the agribusiness/food chain is the largest single component of the Gross National Product (GNP) of the U.S. and most other nations, the academic program is designed for a broad array of students drawn from farm and urban backgrounds alike. Numerous job opportunities exist for graduates in the functional levels and management positions of the agribusiness or natural resource industries and agencies. These academic programs stress the basic factors that tie world resources, their utilization and their protection together so that the student is prepared to deal with the changes and opportunities of the future. Because national and international governmental policies are crucial in influencing the success of industrial, regional or local agribusiness and environmental enterprises, understanding of the role of government is also stressed. The overall objective is to prepare students for careers in the management or natural resources sector of the agribusiness-food-natural resource system, including both public or private. The undergraduate programs also provide fundamentals for students seeking further graduate degrees and specialization.

General Information

Admission. Students who are beginning their initial college work in the Division of Agricul-

ture should present secondary school units in accordance with the minimum University requirements. There are no secondary school agricultural course requirements.

The academic programs are especially adapted for the student with an urban background but interested in foods, plants, or animals. Transfer students are accepted but must complete the core courses of the specific program to graduate.

Retention. A student is expected to make satisfactory progress toward completion of degree requirements in order to continue enrollment in the Division of Agriculture. Any one of the following conditions will be considered unsatisfactory progress and will result in the student being placed on provisional (probationary) status:

1. A deficiency of 15 grade points.
2. A semester or summer session with grade point average less than 1.50.
3. Two successive semesters, summer sessions, or combinations of these with grade point averages below 2.00.
4. Grades of D, E, W, or I in more than half the credit hours appearing on the official enrollment record for any semester.

Disqualification. After two successive semesters on probationary status a student who fails to meet the retention standards will be disqualified.

Organization

The Division of Agriculture is comprised of students, faculty, administrators, staff and physical facilities including the ASU Field Laboratory. The academic programs are organized into two separate degree programs: agribusiness and environmental resources in agriculture. Options for specialization within these degree programs are as follows:

Agribusiness *(Field of Specialization)*

Concentration	Area of Emphasis
Agribusiness	Agribusiness Management
	Agribusiness Marketing
	International Agriculture
	Pre-Veterinary Medicine
Food Industry	Food Quality Assurance
	Food Industry Management

Environmental Resources in Agriculture *(Field of Specialization)*

Concentration	Area of Emphasis
Natural Resource Management	Land Reclamation
	Range Ecology
	Resource Systems
Urban Horticulture	Commercial Horticulture
	Landscape Horticulture

Center for Arid and Tropical New Crop Applied Science and Technology (NEWCAST)

The Division of Agriculture, in conjunction with the U.S. Departments of the Interior, Agriculture and Commerce/Minority Business Development Agency, has established a Center for Arid and Tropical New Crop Applied Science and Technology (NEWCAST). The purpose of NEWCAST is to carry out projects that would lead to the commercialization of arid and tropical zone indigenous plants in the United States, Trust Territory, U.S. possessions of the Pacific Islands and selected less-developed countries through the development of viable new crop agribusinesses.

Degrees

Bachelor of Science (B.S.). The Division of Agriculture offers the Bachelor of Science degree in Agribusiness and in Environmental Resources in Agriculture. A minimum of 126 hours of credit, including University General Studies, the Division and field cores, and area of emphasis courses lead to the Bachelor of Science degree. Forty percent of the semester hours required for graduation must be upper division.

Master of Science (M.S.). The Division of Agriculture offers the Master of Science degree in Agribusiness and in Environmental Resources in Agriculture. A minimum of 30 credit hours of graduate level course work is required for the degree. Additional details for this degree are given in the *Graduate Catalog.*

Curricula in Agriculture

Curricula in Agriculture include the General Studies requirement, the Division of Agriculture core requirement, the field of specialization core requirement, together with the area of emphasis courses and elective courses to complete the graduation requirement of 126 credit hours. Prior to entering the junior year, each student with the aid of an

advisor, is expected to select a field of specialization and an area of emphasis.

The agribusiness curriculum is built on the integrated conceptual and analytical description of the agribusiness/food system. The basic study of animals, plants and their utilization is, therefore, expanded to include analysis of the food and farm supply, distribution, processing and retailing industries. Because of the major impact of government on the agribusiness/food chain, a detailed study of governmental regulatory and "promotional" programs nationally and internationally is also made. An important aspect of agribusiness is facilitating and coordinating the various levels of the food supply system through the commodity market system.

The environmental resources in agriculture curriculum concern two related but dissimilar environments, one natural and one man-made. The natural environment includes consideration of the renewable agricultural resources of plants, soil and water. It involves the study of complex range and forest ecosystems and the restoration of disturbed lands. The man-made environment entails the landscape about us for use and beauty, both outdoors and indoors, as well as parks and recreational areas. Closed environments for plant growth, such as greenhouses or hydroponics houses, are also included.

Agriculture Core

All students pursuing a Bachelor of Science degree in the Division will complete the following general core courses:

			Semester Hours
AGB	300	Livestock Management	3
AGB	310	Crop Management	3
AGB	380	Government Regulations in Agriculture	3
ERA	346	Environmental Conservation	3
		Total	12

Agribusiness

The agribusiness degree program emphasizes the complex (commodity) system in which each farm supply/farming/production/processing/distribution/service or retailing unit is placed. Understanding the interactions within the system as well as the nature of integration and differentiation into new functional units takes precedence. Building on requirements which cover the animal and crop industries, the program emphasizes the financing and inputs for production, marketing and

management of agricultural products after such have entered business channels. The curriculum is designed to give the student both business and scientific knowledge regarding agribusiness/food enterprises and agencies. This knowledge can be applied to the functional, facilitating and behavioral aspects of the agribusiness/food chain. The course of study also includes examination of the coordination mechanisms that hold the system together and that help balance supply and demand (e.g., cash and futures markets, farm cooperatives, contractual and vertical integration, international commodity agreements, etc.). The course of study also includes analysis of the critical role of government both as a coordinating entity and as one that affects the profitability or success of any agribusiness/food endeavor more than any other single factor.

Students selecting agribusiness as a degree program are required to take the following courses:

			Semester Hours
AGB	101	Food Chain	2
CHM	101	Introductory Chemistry	4
MAT	115	College Algebra and Trignometry (4) or MAT 210 Mathematical Analysis	3
ECN	201	Principles of Economics	3
AGB	312	Agricultural Marketing	3
AGB	364	Food Technology	3
AGB	442	Agribusiness Management I	3
AGB	490	Recent Advances in Agribusiness	1
		Total	22-23

Agribusiness, as a concentration, contains the following areas of emphasis:

Agribusiness Management combines business and agriculture training. It focuses on management techniques applicable to positions in the agricultural industry. It applies business principles to agricultural resource management, thus providing foundations for functional leadership in any agricultural enterprise. Graduates from this area are qualified to enter a broad range of agricultural enterprises and eventually to obtain management status.

Agribusiness Marketing involves the flow of agricultural products and services through all the functional, institutional and behavioral marketing systems. Specialized courses in

marketing channels and structures give appropriate depth in this area.

International Agriculture relates world-wide food resources to the requirements and potentials of the various nations. Particular emphasis is given to economic development and to the international trade of food products throughout the world. Special courses are offered to form a unique curriculum which is designed to train either the U.S. or foreign student to work in the enhancement of agricultural programs in the foreign countries. It provides a basic knowledge of U.S. agricultural techniques and extends to the global aspects of agriculture. Graduates in this area should be particularly qualified to aid in the development of the world's agricultural potential to provide food and services to meet the world's expanding requirements. Jobs exist in the commercial agricultural industry sector, U.S. government agencies and foreign government agencies.

Pre-Veterinary Medicine is primarily designed to meet the entrance requirements of professional veterinary medical schools in the United States and Canada. Selection of this area will permit students to complete the pre-veterinary requirements for entrance to professional veterinary school. The curriculum permits the student to obtain some course work in agribusiness, especially as it relates to professional practice and industry. This background also provides an important alternative for the student who does not actually enter veterinary school. Completion of all requirements for a Bachelor of Science degree in agribusiness at ASU is provided by completing additional credits, if desired. A pre-veterinary medicine student who elects to earn a Bachelor of Science degree in the Division of Agriculture may do so by taking three years at ASU, completing 94 semester hours of credit, with a minimum of 60 semester hours at ASU, and by completing the agriculture and General Studies requirements. The student may then receive a written statement from the Dean of the College of Engineering and Applied Sciences giving senior-in-absentia privileges. The student will be eligible to receive the B.S. degree after the Registrar's Office receives a recommendation from the dean of the professional school and a transcript of credit indicating the student has completed a total of 126 semester hours with a cumulative index of 2.00 or better.

Although this area of emphasis is primarily intended for the student preparing to enter professional veterinary medicine as a career, it is also an excellent basis for future graduate degree programs or many of the scientifically related jobs in agribusiness and government.

Food Industry, as a concentration, contains the following areas of emphasis:

Food Quality Assurance is a scientific and technical area within the food industry. Strong emphasis is given to basics such as chemistry, analytical techniques and food safety. Employment opportunities for graduates exist with most food industries and regulatory agencies who must maintain continuous quality control and inspection programs.

Food Industry Management emphasizes food processing and distribution systems. This includes organization, buying, sales and regulatory aspects of the food enterprise. Students become aware of the uniqueness of the food product, especially the perishable products. Employment opportunities for graduates exist in the food industry.

Typical Curriculum for Agribusiness

		First Year	Semester Hours
AGB	101	Food Chain	2
AGB	130	Plant Science	3
AGB	150	Animal Science	3
CHM	101	Introductory Chemistry	4
MAT	115	College Algebra and Trignometry	4
ENG	101	and 102 First Year English	6
		Social and Behavioral Sciences Courses	6
		General Electives Courses	4
		Total	32

		Second Year	
ECN	201	and 202 Principles of Economics	6
		Agribusiness Electives Courses	12
		Humanities and Fine Arts Courses	6
		General Electives Courses	9
		Total	33

		Third Year	
AGB	312	Agricultural Marketing	3
AGB	364	Food Technology	3
AGB	300	Livestock Management	3
AGB	310	Crop Management	3
AGB	380	Government Regulations in Agriculture	3

ERA 346 Environmental Conservation 3

Field of Specialization Courses ... 9

Total 30

Fourth Year

AGB 442 Agribusiness Management I 3

Field of Specialization Courses ... 18

General Electives Courses 9

Total 32

Environmental Resources in Agriculture

The environmental resources in agriculture degree program involves the study of available environmental resources, such as air, water, soil and others related to plant and animal life. Variations in these resources, both natural and man-made, are considered. Two different environments are identified. These include the natural environments, such as rangelands and forests, and man-made environments, such as urban landscapes and hydroponic houses.

The natural resource management concentration emphasizes a unified approach to the study of ecosystem characteristics as they relate to man's use of renewable resources. A major challenge in resource management is to achieve proper use within the constraints imposed by the complex interdependence which exists within ecosystems. The systems approach is developed as a basis for the study of this complexity. Applications of the systems approach to resource management are considered using examples drawn from Arizona's forest, range and agricultural ecosystems.

The urban horticulture concentration is designed to help beautify the areas in and around homes, gardens, industry and the general landscape. Increased urbanization results in a very different plant population than exists on farms. The lawns, shrubs, trees, flowers and home gardens involve specific requirements for plants, seeds, fertilizers, pesticides and machinery. Public areas, particularly parks and golf courses, require skilled management by superintendents. Production of plants in climate-controlled greenhouses is emphasized as an important agricultural enterprise in arid and urban areas.

Students selecting environmental resources in agriculture as a degree program are required to take the following courses:

Semester Hours

BIO 101 and 102 Biological Principles
and Processes 8

MAT 141 Mathematics for the Social, Life
and Management Sciences 4

CHM 113 General Chemistry 4

CHM 231 Elementary Organic Chemistry 4

ERA 325 Soils 3

ERA 326 Soils Laboratory 1

ERA 350 Applied Quantitative Methods 3

Total 27

Natural Resource Management, as a concentration, includes the following areas of emphasis:

Land Reclamation is the study of problems associated with disturbed natural lands and restoration methods for such disturbances. Specific training in soil science, plant materials and rehabilitation techniques built on a base of knowledge in the biological, physical and agricultural sciences is emphasized. Students choosing this option may apply their skills as employees in the mining, petroleum, energy and construction sectors of private industry or in government agencies regulating these activities.

Range Ecology emphasizes the study of renewable rangeland resources based on a firm basckground of agricultural and biological sciences. The specific areas of plant, animal and soil sciences with ecology comprises primary training in range ecology. Students completing this option may choose careers as professional range conservationists for federal and state agencies or in private industry. Range conservationists perform work concerned with inventorying, analyzing, improving, protecting and managing the natural resources of rangelands and related grazing lands.

Resource Systems is a scientific approach to describing ecological processes and solving problems associated with natural resource use utilizing systems ecology. This option specializes in an education building on a strong science and quantitative background. Students trained in the resource systems option are sought by governmental agencies involved in resource allocation, regulation and management.

Urban Horticulture, as a concentration, includes the following areas of emphasis:

Commercial Horticulture is concerned with the production and marketing of plants grown in either fields or greenhouses. Propagation, nutrition and growing techniques are emphasized. Business courses are included to ensure financial as well as horticultural knowledge. Graduates find employment in the nursery

industry as greenhouse operators, or often establish their own businesses.

Landscape Horticulture is involved with the establishment and maintenance of landscape plants. Skill in landscape planning and designing may be achieved by taking relevant courses in art and landscape architecture. Skilled maintenance requires knowledge of pest control, plant nutrition, soils, agricultural chemicals, pruning and plant physiological responses to the environment. Graduates may choose careers in park management, golf course supervision, or landscape design and maintenance. Many establish their own services.

Typical Curriculum for
Environmental Resources in Agriculture

First Year

			Semester Hours
ENG	101	and 102 First Year English	6
MAT	141	Mathematics for the Social, Life and Management Sciences	4
CHM	113	General Chemistry	4
		Agriculture Electives	6
		Social and Behavioral Sciences Courses	6
		General Electives Courses	6
		Total	32

Second Year

BIO	101	and 102 Biological Principles and Processes	8
CHM	231	Elementary Organic Chemistry	4
ERA	325	Soils	3
ERA	326	Soils Laboratory	1
		Humanities and Fine Arts Courses	8
		*Option Requirements	6
		Total	30

Third Year

AGB	310	Crop Management	3
AGB	300	Livestock Management	3
ERA	350	Applied Quantitative Methods	3
ERA	346	Environmental Conservation	3
AGB	380	Government Regulations in Agriculture	3
		*Option Requirements	17
		Total	32

Fourth Year

ERA	490	Recent Advances in Environmental Resources	1
		General Electives Courses	5
		*Option Requirements	26
		Total	32

Option Requirements as Listed for Individual Programs

AGRIBUSINESS

AGB 101 Food Chain. (2) F
Dependence of the quality, quantity and cost of national food supplies on technology, marketing and world agricultural policies.

130 Plant Science. (3) F,S
Plant growth and development in the rural and urban environment. Two lectures, 3 hours laboratory.

150 Animal Science. (3) F, S
Comparative growth, development and propagation of farm animals. Two lectures. 3 hours laboratory.

160 Veterinary Medicine Today. (2) N
Introduction to the role of the veterinarian as related to the fields of food supply and veterinary medicine.

300 Livestock Management. (3) F,S
Methods of managing livestock enterprises, economics, loss prevention and marketing. Prerequisite: AGB 150.

302 Food Supply. (2) S
Impact of national policy and world agriculture on the cost, quantity and quality of the U.S. food resources.

305 Nutritional Science. (3) F, S
Energy and nutrients in living systems. Prerequisite: CHM 101.

306 Nutritional Science Laboratory. (1) F,S
Experimental trials involving the principles of nutrition and the physiological roles of nutrients in metabolism. Corequisite: AGB 305. Three hours laboratory.

310 Crop Management. (3) F, S
Crop management factors and their application. Crop plans are prepared. Prerequisite: AGB 130.

312 Agricultural Marketing. (3) F, S
Marketing arrangements for agricultural products.

320 Anatomy of Agricultural Animals. (4) S
Gross and microscopic structural anatomy of organ systems of agricultural animals; concepts of physiological processes discussed. Prerequisites: AGB 150 or BIO 101, 102. Three lectures, 3 hours laboratory.

332 Agribusiness Finance. (3) N
Agribusiness investment management and financial institutions that serve agriculture. Prerequisite: ECN 201.

333 Agribusiness Purchasing. (2) N
Working with supplies for agribusiness, including standards, inventories and records.

335 Establishing an Agribusiness. (3) N
Establishing entrepreneurship in agriculture, including legal status, financing, planning, marketing and management. Prerequisite: junior standing.

350 Livestock Marketing. (3) N
Livestock marketing functions, including commodities, trading and hedging.

353 Applied Animal Nutrition. (3) S
Feedstuffs, feeding standards and their application in meeting nutritional needs of animals producing food and fiber. Prerequisite: AGB 305.

356 Animal Breeding. (3) S
Genetics applied to animal breeding. Prerequisite: ZOL 110 or AGB 150.

360 Crop Physiology. (4) N
Physiology of crop plants with emphasis on plant nutrition and environmental factors. Prerequisite: AGB 130. Three lectures, 3 hours laboratory.

363 Veterinary Practices. (2) S
Observation of and participation in veterinary medicine and surgery supervised by local veterinarians. Four hours per week with veterinary practitioner plus one hour per week seminar. Open to advanced pre-veterinary students only

364 Food Technology. (3) F. S
Processing and preservation of food products.

365 Food Technology Laboratory. (1) F, S
Experiments and procedures in processing and packaging foods. Corequisite: AGB 364. Three hours laboratory

366 Meats. (3) S
Meat purchasing, retail cut identification, meat preparation and preservation for the customer. Prerequisite: AGB 150 or FON 142.

367 Meat Science. (3) F
Basic science of muscle and meat in animal production, processing and utilization. Prerequisite: AGB 150 or FON 142.

368 Food Quality Assurance. (3) F
An introduction to processed food quality assurance. statistical sampling and inspection procedures. Prerequisites: AGB 364 and ERA 350.

369 Food Quality Instrumentation. (3) S
Processing control and scientific instrumentation used in food quality assurance laboratories. Two lectures, 3 hours laboratory. Prerequisites: AGB 368, CHM 115.

370 Companion Animals to Man. (3) S
Selection, breeding, health and care of pets. Includes their social and economic impact on urban living.

371 Pet Nutrition. (3) F
Review and application of nutrition principles in feeding man's companion animals. Prerequisite: CHM 101 or BIO 100.

372 Light Horse Management. (2) F, S
Breeds, care, selection and handling of horses.

375 Horse Breeding and Management. (3) S
Considers current methods of improving genetic traits and reproductive performance of horses. Prerequisite: AGB 372. Two lectures, 3 hours laboratory.

376 Horse Feeding and Nutrition. (2) S
Ration formulation to meet nutrient requirements for growth, reproduction and performance of horses. Prerequisite: AGB 372.

380 Government Regulations in Agriculture. (3) F, S
The development and implementation of government regulations that affect the management of agribusiness. Prerequisite: junior standing.

390 Agricultural Accounting. (3) F
Basic accounting applications commonly used by agricultural industries, including tax and management information systems.

402 Agricultural Cooperatives. (3) F; Edwards
Organization, operation and management of agricultural cooperatives.

403 Agribusiness Public Relations. (3) S; Edwards
The image of agriculture, including consideration of the agricultural press. Prerequisite: AGB 312.

405 Future Food Supply. (3) F, Edwards
Food and agricultural supply forecasting, senario development and analysis, and alternative response strategies.

412 Commodity Trading I. (3) F; Staff
Trading on futures markets. Emphasis on the hedging practices with grains and meats. Prerequisite: AGB 312.

413 Commodity Trading II. (3) S; Staff
Trading on futures markets. Emphasis on the hedging practices with financial and currency instruments. Prerequisite: AGB 312.

414 Advanced Commodity Trading. (3) N; Staff
Advanced analysis of trading techniques with emphasis on hedging in the futures markets. Prerequisite: AGB 412 or AGB 413.

425 Food Safety. (3) S, Raccach
Food hazards prevention, detection, assessment and neutralization. Regulatory agency enforcement programs are emphasized. Prerequisite: AGB 364.

426 Food Chemistry. (4) S; Ashoor
The biochemical and chemical interactions that occur in raw and processed foods. Prerequisites: CHM 231 and AGB 364. Three lectures, 3 hours laboratory.

428 Comparative Nutrition. (3) F; Moody
Nutrient requirements and utilization for farm animals. Prerequisites: AGB 305 and CHM 231.

430 Range Livestock Management. (3) F; Taysom
Operation and management of beef cattle and sheep, emphasizing range conditions. Prerequisite: AGB 300.

431 Intensified Livestock Management. (4) S; Moody
Principles, operations and management techniques in high density animal growing units. Prerequisites: AGB 300, AGB 353. Three lectures, 3 hours laboratory.

432 Feedlot Management. (3) N; Staff
Management aspects of feedlot operation. Case studies and management problem analysis will be included.

433 Diseases of Domestic Animals. (3) S; Staff
Control and prevention of infectious and noninfectious diseases of domestic animals

434 Endocrinology. (3) F; Weems
Functions of the endocrine glands in the regulation of animal physiological processes. Prerequisite: AGB 435 or ZOL 360.

435 Animal Physiology I. (4) F, S; Monty
Control and function of the nervous, muscular, cardiovascular, respiratory, and renal systems of domestic animals. Prerequisites: CHM 113, BIO 101. Three lectures, 3 hours laboratory.

436 Animal Physiology II. (3) N; Monty
Control and function of the endocrine, digestive and reproductive systems of domestic animals. Principles of adaptation of animals to their environment. Prerequisite: AGB 435 or ZOL 360.

437 Animal Physiology Laboratory. (1) N; Monty
Selected physiological experiments to accompany AGB 436. Three hours laboratory.

438 Physiology of Animal Reproduction. (4) F; Weems
Development, function and control of the reproductive system of domestic animals. Prerequisite: AGB 150. Three lectures, 3 hours laboratory.

440 Food Marketing. (3) F; Edwards
Food packaging, distribution and retailing. Prerequisite: AGB 364.

441 Meat Technology. (3) S; Seperich
Processing and utilization of meat products. Prerequisite: AGB 367. Two lectures, 3 hours laboratory.

442 Agribusiness Management I. (3) F. S; Edwards
Principles of management: planning, organizing, integrating, measuring and developing people in agribusiness organizations.

443 Agribusiness Management II. (3) S; Edwards
Principles of human resource management with emphasis on the special problems of agribusiness systems. Prerequisite: AGB 442.

444 Agribusiness Analysis. (3) F; Gordon
Identifies the size, scope and organization of the various agriculturally oriented industries.

445 Advanced Crop Management. (3) S; Richardson
Latest techniques in producing, harvesting and utilizing the major field crops with emphasis on those grown under irrigated environments. Prerequisite: AGB 310. Two lectures, 3 hours laboratory.

450 International Agricultural Development. (3) F; Stiles
Transition of developing countries from subsistence to modern agriculture. Technology transfer and food improvement programs are emphasized. Prerequisite: AGB 312.

451 International Food Resources (3) S; Stiles
Methods of improving agriculture and food levels in developing regions of the world. Emphasis on actual case studies. Prerequisite: AGB 312.

452 World Food Dynamics. (3) N; Stiles
Transition and development of raw agricultural commodities into nutritional food products. Emphasis given to food expansion in developing countries. Prerequisite: AGB 302 or AGB 364.

453 World Agricultural Resources. (3) S; Stiles
World production and consumption of agricultural products, international relationships and agencies concerned with world agricultural development problems. Prerequisite: AGB 101.

454 International Agricultural Trade. (3) S; Staff
Dimensions, locations, mix, methods and changes of international trade in agricultural products. Prerequisite: AGB 312.

455 Agricultural Marketing Channels. (3) F; Staff
Operational stages of agricultural commodities in normal distribution systems and implementation of marketing strategies. Prerequisite: AGB 312.

458 International Agribusiness. (3) N; Staff
Identification and analysis of methods, problems and future of international agribusiness operations. Emphasizes special problems associated with international agribusiness systems. Prerequisite: AGB 312.

460 Agribusiness Management Systems (3) F; Maddy
Application of the computer to management systems in agribusiness. Prerequisites: ERA 350 and an introductory computer science course.

470 Advanced Government Regulations (3) F; Maddy
Implications of current federal regulations on agribusiness management. Prerequisite: AGB 380.

474 Agribusiness Policy. (3) F; Gordon
Development, implementation and profitability of agribusiness strategy. Prerequisite: AGB 312.

490 Recent Advances in Agribusiness. (1) N; Staff
Reports and discussions of current topics and problems associated with agribusiness. May be repeated for credit.

492 Recent Advances in Food Sciences (1) N; Staff
Discussion and critical evaluation of current topics in food and quality control research. May be repeated for credit.

508 Advanced Agricultural Marketing. (3) N; Staff
Theory and analysis of marketing farm commodities, risks and effect of future trading on cash prices.

510 Advanced Agribusiness Management I. (3) S; Edwards
Assessment and current problems in managing human and financial resources in agribusiness. Case studies and analysis of special agribusiness problems. Prerequisite: AGB 442.

511 Advanced Agribusiness Management II. (3) F; Edwards
Analysis of physical and social resource requirements within agribusiness systems. Prerequisite: AGB 442.

512 Food Industry Management. (3) N; Staff
Operations and management of food processing factories, food distribution centers and retail food handling firms.

516 International Agricultural Techniques. (3) F; Stiles
Coordination of production and marketing techniques to consumption objectives with agricultural products in foreign countries.

518 World Agricultural Development. (3) S; Stiles
Factors that influence production, processing and marketing of agricultural products in developing countries.

520 Advanced Agribusiness Analysis I. (3) F; Gordon
Vertical integration and differentiation in food and agricultural industries. Prerequisite: AGB 444.

521 Agribusiness Coordination. (3) S; Gordon
Organizational alternatives for agribusiness with emphasis on cooperatives and trading companies. Prerequisite: AGB 444.

525 Advanced Agribusiness Management Systems. (3) S; Maddy
Application of computer systems to agricultural management problems and processes. Emphasis on parametric linear programming. Prerequisite: AGB 460.

530 Advanced Agribusiness Policy. (3) S; Gordon
Organization, investment, and management of various agribusiness structures. Includes cooperatives, trading companies and joint ventures. Prerequisite: AGB 312.

535 Advanced Food Science. (3) F; Seperich
Chemical and physical nature of processed foods. Emphasis on food product development. Prerequisite: AGB 364.

536 Advanced Food Quality Instrumentation. (3) S; Ashoor
Food analysis using sensitive laboratory instrumentation and methodology. Prerequisite: AGB 322. Two lectures, 3 hours laboratory.

Special Courses: AGB 484, 494, 498, 499, 500, 580, 584, 590, 591, 592, 593, 594, 598, 599 (See pages 32-33.)

ENVIRONMENTAL RESOURCES IN AGRICULTURE

ERA 310 Bioeconomics of Natural Resources. (3) S
Economic principles and methods as applied to natural resource evaluation and management. Investigation of alternative strategies of resource use. Prerequisites: ECN 201, ERA 346.

325 Soils. (3) F, S
Fundamental properties of soils, their relation to plant growth and the nutrition of man and animals. Relation of

soils to environmental quality. Prerequisite: CHM 101 or 113, or equivalent.

326 Soils Laboratory. (1) F, S
Selected exercises to broaden the background and understanding of basic soil principles. Corequisite: ERA 325. Three hours laboratory.

332 Agricultural Chemicals. (3) S
Composition, properties and use of agricultural commercial fertilizers and pesticides and their effects on soil, air and water quality.

333 Water Resources. (3) S
Sources, their development and conservation in arid regions for agricultural and urban uses.

346 Environmental Conservation. (3) F, S
The conservation of wildland and agricultural resources emphasizing the systems approach for studying ecosystem complexity.

350 Applied Quantitative Methods. (3) F
Statistical methods with applications in natural resource management and the agricultural sciences. Use of digital computer. Prerequisite: MAT 141 or equivalent.

360 Range Ecosystems. (4) S
The interrelations of vegetation, soils and grazing animals. Evaluation and simulation of grazing animal impact. Prerequisites: ERA 346, BIO 320, or equivalents. Four hours lecture/recitation.

364 Range Ecosystems II. (3) S
Effects of herbivory, fire and site disturbances on nutrient cycles and energy flows. Range nutrition, multiple-use relationships. Prerequisite: ERA 360.

365 Ecosystem Hydrology. (3) S
Hydrologic, physical, biological and ecological principles applied to watershed management. Impact of ecosystem manipulations on water yield and quality. Prerequisites: ERA 325, 346. One weekend field trip.

375 Land Reclamation I. (3) F
Overview of habitat situations requiring rehabilitation following man's use and rehabilitation techniques. Prerequisites: ERA 325, 326 and 346. Field trips.

380 Environmental Horticulture. (3) F
Plant culture and use in urban agriculture. Prerequisite: AGB 130.

381 Propagation of Plant Cultivars. (3) S
Principles and skills in propagating landscape trees and shrubs by seminal and vegetative means, including fruit plants. Prerequisite: AGB 130. Two lectures, 3 hours laboratory.

382 Lawns and Greens. (3) S
Selection, establishment and maintenance of turf grasses for lawn, park and sports areas. Two lectures, 3 hours laboratory.

386 Indoor Landscape Plants. (3) S
Selection and care of container-grown house plants.

400 Range Ecogeography. (3) S; Brock
Structure, function and plant composition of range ecosystems. Simulation of change resulting from man's use of resources. Prerequisite: ERA 360.

402 Methods in Range Ecology. (4) F; Whysong
Vegetation sampling and inventory as related to animal-habitat relations. Prerequisites: ERA 350 and 360. Three lectures, 3 hours laboratory; weekend field trip.

407 Range Plants. (4) S; Brady
The distribution, ecological characteristics, identification and values of plants on western rangelands. Laboratory

emphasizes taxonomy and identification of grasses. Prerequisite: BOT 370 or equivalent. Three lectures, 3 hours laboratory.

410 Population Habitat Relations. (3) S; Whysong
Interactions among animal populations and their habitat. Systems simulation of population dynamics as influenced by competition and management strategies. Prerequisite: ERA 360. Three lectures, one weekend field trip.

420 Range Improvement Practices. (3) F; Brock
Brush and weed control, revegetation, burning, fertilization, fencing, grazing systems, and water development. Emphasis on principles and current improvement practices. Prerequisite: ERA 360. Three lectures, one weekend field trip.

425 Soil Taxonomy. (3) F; Brock
Fundamental principles of soil genesis, morphology and classification, including properties of significance in mapping and interpreting soil survey information. Prerequisite: ERA 325. Two lectures, 3 hours laboratory.

430 Landscaping Principles. (3) F; Staff
Planning and planting for maximum beauty and utility, including energy conservation. Prerequisite: ERA 380 or equivalent.

438 Woody Plant Marketing. (3) F; Backhaus
Production of trees and shrubs for wholesale and retail marketing. Prerequisite: ERA 380 or equivalent. Two lectures, 3 hours laboratory.

440 Crop Growth and Development. (3) F; Backhaus
Environmental factors affecting the adaptation, distribution, growth and development of crops. Prerequisite: AGB 130.

448 Soil Ecology. (3) F; Righetti
Soils viewed in an ecosystem context, soil-plant relationships, nutrient budgets and abiotic factors that influence soil processes. Prerequisites: ERA 325, 326, BIO 320 or approval of instructor. Two lectures, 3 hours laboratory.

452 Irrigation. (3) F; Robinson
Water measurement, conveyance and conservation with emphasis on crop production and soil-plant water relations. Prerequisite: ERA 325.

460 Applied Systems Ecology. (3) S '83; Whysong
The systems approach applied to analysis and management of natural resource ecosystems. Use of simulation models. Prerequisites: ERA 350 or equivalent; one course in ecology.

463 Greenhouse Systems. (3) F; Staff
Functional design and integrated management of greenhouse and hydroponic systems. Prerequisite: ERA 325. Two lectures, 3 hours laboratory.

470 Land Reclamation II. (3) S; Righetti
Problems of re-establishing vegetation on disturbed sites. Special revegetation techniques, surface modifications and government regulations. Prerequisites: ERA 375, 407, 420, 448, or approval of instructor. One weekend field trip.

480 Natural Resource Planning. (3) S; Brock
Principles and techniques of planning for management and conservation of natural ecosystems. Use of optimization models and decision theory. Preparation of management plan. Prerequisites: ERA 402 and senior standing. Three lectures, one weekend field trip.

490 Recent Advances in Environmental Resources. (1) N; Staff
Current literature and significant developments involving environmental resources. May be repeated for credit.

540 Plant Responses to Environmental Stresses. (3) F; Brock
Reaction of plants to environmental stresses; herbivores, fire, pesticides, mechanical treatments, aerial pollutants and soil amendments. Prerequisites: BOT 360, ERA 420, or approval of instructor. One weekend field trip.

548 Plants, Soils and Environmental Quality. (3) F; Staff
Effects of air quality on plants and soils, and their role in removing contaminants from the atmosphere. Prerequisite: ERA 325.

550 Vegetation Dynamics. (3) F; Brady
Succession concept and its use in site evaluation. Habitat type concept. Herbivory as an ecological process. Prerequisites: ERA 364, BOT 420, or approval of instructor.

560 Systems Ecology. (3) S '83; Whysong
Quantitative description and mathematical modeling of ecosystem structure and function. Techniques for model construction and simulation. Prerequisites: six hours in ecological studies, computer programming, ERA 350 or equivalent. Two lectures, 3 hours laboratory.

570 Reclamation of Critical Habitats. (3) S; Righetti
Characteristics of habitats that pose problems for vegetation re-establishment growth and development. Maintaining the integrity and esthetic value of habitats sensitive to human activity. Prerequisites: ERA 448, 470, 540, 550, or approval of instructor. Two lectures, 3 laboratory. Field trips.

Special Courses: ERA 484, 494, 498, 499, 500, 580, 584, 590, 591, 592, 593, 594, 598, 599. (See pages 32-33.)

Department of Computer Science

PROFESSORS:
_____ (EC G-136C), WOODFILL

ASSOCIATE PROFESSORS:
HUEY, LEWIS, LOVELL

ASSISTANT PROFESSORS:
COLLOFELLO, FORD, HANSCHE, PHEANIS, WOODFIELD

Computers have had a significant impact on our way of life. This impact may even be greater in the future as the full potential of modern computing systems and techniques is realized. Computer science is concerned with the study, design, development, construction, and application of modern machinery, computing techniques and appropriate languages for general information processing, for scientific computation, for the recognition, storage, retrieval and processing of data of all kinds, and for the automatic control and simulation of processes.

The curricula offered by the Department of Computer Science are designed to prepare the student to be a participant in this rapidly changing area of technology by presenting an in-depth treatment of the fundamentals of computer science. The Department offers three undergraduate degrees: a B.S. and a B.S.E. from the College of Engineering and Applied Sciences, and a B.S. from the College of Liberal Arts (see page 72 for the Liberal Arts B.S. requirements).

Admission. Students who wish to be admitted to full freshman standing in the computer science program should present certain secondary school units in addition to the minimum University entrance requirements. A total of 3½ units is required in mathematics, including advanced algebra, geometry and trigonometry.

Students who have omissions or deficiencies in subject matter preparation may be required to complete additional university credit course work which may not be applied toward a computer science degree. Courses usually taken to satisfy omissions or deficiencies include one or more of the following: MAT 115 College Algebra and Trigonometry, MAT 117 College Algebra, and MAT 118 Plane Trigonometry.

Minimum Scholastic Requirements. In addition to an overall C (2.00) average, all computer science students are required to obtain a minimum grade of C (2.00) in all required CSC courses and those courses in the B.S. degree program used as Computer Science electives.

Bachelor of Science

The Department of Computer Science offers a B.S. degree designed to give the student in-depth knowledge in computer science. All students pursuing a Bachelor of Science degree in Computer Science will complete the following required core courses:

Computer Science Core

			Semester Hours
CSC	100	Introduction to Computer Science I	3
CSC	101	Introduction to Computer Science II	3
CSC	200	Assembly Language Programming	3
CSC	210	Data Structures	3
CSC	320	Computer Organization	3
CSC	340	Structure of Programming Languages	3
CSC	410	Introduction to File and Database Structures	3
CSC	420	Computer Architecture I	3
CSC	430	Elementary Concepts of Operating Systems	3
CSC	450	Analysis of Algorithms	3
		Total	30

In addition to the above computer science core, all B.S. degree students within the College of Engineering and Applied Sciences must complete the following requirements:

Computer Science Electives 16

    CSC 421 4

    Courses chosen from the Computer Science elective list and approved by the advisor 12

Mathematics Content 20

    MAT 270, 271 Calculus with Analytic Geometry I & II (or MAT 290, 291 Calculus I & II (10)) 8

    MAT 242 Elementary Linear Algebra ... 2

    MAT 243 Discrete Mathematical Structures 3

    ECE 383 Probability and Statistics for Engineers (or MAT 326 Intermediate Statistics (3)) 2

    Mathematics content electives approved by advisor 5

Technical Electives 15

    Courses chosen from the technical elective list and approved by the advisor

General Studies 26

    PHY 115, 116, 117, 118 University Physics I & II with Lab 10

    Humanities and Fine Arts[1] 6-10

    Social and Behavioral Sciences[1] 10-6

English Proficiency 6

    ENG 101, 102 First Year English (or ENG 104 Advanced First Year English (3)) 6

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[1] *A minimum of 16 credits of Humanities and Fine Arts/Social Behavioral Science is required with at least 6 credits in each area.*

Technical Writing 3

    ECE 400 Engineering Communication (or ENG 301 Writing for the Professionals (3)) 3

Unrestricted Electives 12

Total Degree Requirements 128

Computer Science Program of Study
Typical Four-Year Sequence
Freshman Year

First Semester

			Semester Hours
CSC	100	Intro. to C.S.I.	3
ENG	101	First Year English[1]	3
MAT	270	Calculus w/Analy. Geom. I	4
General Studies Elective			3
Unrestricted Elective			3
			16

Second Semester

CSC	101	Intro. to C.S. II	3
ENG	102	First Year English[1]	3
MAT	271	Calc. w/Analy. Geom. II	4
General Studies Elective			3
Unrestricted Elective			3
			16

Sophomore Year

First Semester

CSC	200	Assembly Lang. Prog.	3
CSC	210	Data Structures	3
MAT	243	Discrete Math Struct.	3
PHY	115	University Physics	4
PHY	117	Univ. Physics Lab	1
General Studies Elective			3
			17

Second Semester

CSC	320	Computer Organiz.	3
CSC	340	Structure Prog. Lang.	3
ECE	383	Problty/Stats. Engrg.	2
PHY	116	University Physics	4
PHY	118	Univ. Physics Lab.	1
General Studies Elective			3
			16

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[1] See page 218 for English exemption.

Junior Year

First Semester

CSC   420   Comp. Architecture I 3

CSC   421   Microcomputer Fund 4

Math Elective 3

Technical Elective 3

Unrestricted Elective 3
                                                                 ──
                                                                 16

Second Semester

CSC   410   File/Database Struct. 3

CSC   430   Elem. Operating Sys. 3

MAT   242   Elem. Linear Algebra 2

Computer Science Electives 3

Math Elective 2

Technical Elective 3
                                                                 ──
                                                                 16

Senior Year

First Semester

CSC   450   Analysis Algorithms 3

ECE   400   Engrg. Communications 3

Computer Science Electives 6

Technical Elective 3
                                                                 ──
                                                                 15

Second Semester

Computer Science Elective 3

General Studies Elective 4

Technical Electives 6

Unrestricted Elective 3
                                                                 ──
                                                                 16

Bachelor of Science in Engineering

The Department of Computer Science administers the B.S.E. Engineering Special Programs curriculum with an emphasis in Computer Systems Engineering. The requirements for this degree are the same as those specified by the School of Engineering for the B.S.E. degree. The Computer Systems Engineering emphasis is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).

Computer Systems Engineering Emphasis

The following courses are required as part of the Engineering Core:

			Semester Hours
CSC	100	Introduction to Computer Science I (replaces ECE 122)	3

ECE   383   Probability and Statistics
                  for Engineers 2

In addition to the engineering core, the following courses are required for the Computer Systems Engineering program:

CSC   101   Introduction to Computer
                  Science II 3

CSC   200   Assembly Language Programming   3

CSC   210   Data Structures 3

CSC   320   Computer Organization 3

CSC   340   Structure of Programming
                  Languages 3

CSC   420   Computer Architecture I 3

CSC   421   Microcomputer Fundamentals 4

CSC   422   Digital Systems Design I 3

CSC   423   Digital Systems Design II 4

CSC   430   Elementary Concepts of
                  Operating Systems 3

MAT   243   Discrete Mathematical Structures   3

Area of Emphasis (Technical Electives) 15

Technical electives are selected in consultation with an advisor from an approved list.

Master of Science

Curricula leading to the Master of Science degree are offered. Consult the Department for requirements.

COMPUTER SCIENCE

CSC 100 Introduction to Computer Science I. (3) F, S
Concepts of problem solving, algorithm design, structured programming, fundamental algorithms and techniques, computer systems concepts. Suitable for nonmajors. Prerequisite: MAT 115.

101 Introduction to Computer Science II. (3) F, S
Computer systems concepts, advanced programming techniques, file systems concepts and applications, development of large reliable programming systems, team programming. Prerequisite: CSC 100.

180 Computers and Society. (3) N
Impact of computers on society; topics including computer technology, privacy, ethics; computers in the home, business, and industry; recent developments.

181 Programming in Basic. (3) F, S
Simple programming language, time-shared communication with computers, elementary data processing. Lecture and laboratory.

182 Elementary Fortran Programming. (2) F, S
Definition, formulation and flowcharting, leading to the solution of complex problems by digital computer, using Fortran. Computer solution required for projects. Prerequisite: MAT 115.

183 Programming in Fortran. (3) F, S
A human-oriented, systems approach to problem definition, formulation, and solution, using Fortran. Computer solution required for projects. Prerequisite: MAT 115.

200 Assembly Language Programming. (3) F, S
Data representations, instruction formats, addressing

modes, control structures, data structures, macros, conditional assembly, assemblers and linking loaders. Corequisite: CSC 101.

210 Data Structures. (3) F, S
Representation of fundamental data types; data structures such as arrays, stacks, queues. linked lists, trees. Data abstraction. Dynamic storage allocation. Prerequisite: CSC 101.

304 Introduction to Cobol. (3) F
Fundamental concepts of the Cobol programming language. Emphasis on structured programming. Prerequisite: CSC 100.

305 Introduction to PL/I. (3) S
Basic concepts of the programming language PL/I. Prerequisite: CSC 100.

309 High Level Languages. (3) N
Survey of high level programming languages and their applications to numeric, string, and list processing. Prerequisite: CSC 101.

320 Computer Organization. (3) F, S
Logic circuits, Boolean algebra, MSI circuits, data representation, complement arithmetic, register transfer design, micro-operations and control, memory, input/output. Prerequisite: CSC 200.

340 Structure of Programming Languages. (3) F, S
Formal specifications for language syntax and semantics, control and data structures, static and dynamic runtime environments, introduction to language translation. Prerequisites: CSC 200, 210.

355 Introduction to Automata Theory. (3) S
Representations of finite state machines, equivalence and reduction, homing and distinguishing experiments, machine identification, machine decompositions, memory and information loss. Prerequisite: MAT 243. (Also listed as MAT 302)

383 Applied Fortran Programming. (3) F, S
Advanced Fortran: character handling, machine dependency, sorting and merging, plotting, tapes, disks, time-sharing terminals and library programs. Lecture and laboratory. Prerequisite: CSC 182 or 183.

400 Advanced Assembly Language Programming. (3) F; Pheanis, Woodfill
Assembly language treatment of recursion, coroutines, interpretive routines, multiple buffering of I/O, dynamic storage allocation, various data structures. Prerequisites: CSC 200, 210.

410 Introduction to File and Database Structures. (3) S; Hansche, Lewis
File organization and management. Relevant data structures, access methods, storage devices. Widely used algorithms. Survey of database structures and techniques. Prerequisite: CSC 210.

412 Database Systems. (3) A; Hansche, Lewis
Introduction to various database implementation languages, emphasizing a comparison of Codasyl and relational database concepts. Prerequisite: CSC 410.

420 Computer Architecture I. (3) F, Huey, Woodfill
Digital computer integration: design of instruction codes, control, microprogramming, input and output, memory structures, concurrently processing hardware; software considerations. Prerequisite: CSC 320.

421 Microcomputer Fundamentals. (4) F, S; Pheanis, Woodfill
Programming, hardware, and software of a microcomputer system are used as vehicles to teach fundamentals of digital system design. Lecture and laboratory. Prerequisites: CSC 200, 320.

422 Digital Systems Design I. (3) F, S; Pheanis, Woodfill
Logical design and internal operation of the processing and control units of a computer. Data representations. Relation to memory and I/O units. Prerequisite: CSC 421 or EEE 322. (Also listed as EEE 422).

423 Digital Systems Design II. (4) S; Pheanis, Woodfill
Computer organization emphasizing the interface to memory and I/O. Interrupt structures, busing, I/O, memory technology and hierarchy. Hardware/software interface considerations. Prerequisite: CSC 422 or EEE 422. (Also listed as EEE 423).

430 Elementary Concepts of Operating Systems. (3) S; Collofello
Design and implementation of supervisory system components. Input/output methods, process management, multiprogramming and multiprocessing systems, storage management, file systems. Prerequisites: CSC 210, 420.

438 Systems Programming Projects Lab. (3) S; Hansche, Pheanis
Design and implementation of systems programs: text editors, file utilities, assemblers, relocating linking loaders, resource managers, schedulers, etc. Prerequisite: approval of instructor.

440 Compiler Construction I. (3) F; Hansche
Introduction to programming language implementation. Implementation strategies: compilation, interpretation, translation. Major compilation phases: lexical analysis, semantic analysis, optimization, code generation. Prerequisite: CSC 340.

450 Analysis of Algorithms. (3) F; Ford
Design and analysis of computer algorithms using analytical and empirical methods; complexity measures, design methodologies, survey of important algorithms. Prerequisite: CSC 210.

457 Theory of Formal Languages. (3) A; Ford, Hansche
Theory of grammar, methods of syntactic analysis and specification, types of artificial languages, relationship between formal languages and automata. Prerequisite: MAT 243. (Also listed as MAT 401).

460 Software Project Management and Development I. (3) F; Collofello, Woodfield
Software life cycle analysis; programming teams; project documentation and milestones; requirements and specifications; design, testing, and maintenance tools and techniques. Prerequisite: senior standing.

470 Computer Graphics. (3) N; Hansche
Display devices, data structures, transformations, interactive graphics, three-dimensional graphics, hidden line problem. Prerequisites: CSC 210, MAT 213.

473 Functional Language Applications. (3) A; Hansche
Structured operators applied to structured operands in implementation languages for scientific and business applications. Prerequisites: MAT 243, CSC 210.

474 Modeling for Computer Simulation. (3) A; Lovell
Mathematical description of general dynamic systems (discrete event, discrete time, and continuous) in forms suitable for computer implementation. Prerequisites: CSC 355; MAT 242, 274.

475 Simulation Theory and Languages. (3) A; Lovell
Statistical background for simulation. Model construc-

tion and validation, analysis of results. Languages which support simulation. Prerequisites: CSC 474, ECE 383 or MAT 326.

483 Fortran Programming for Graduate Research. (3) S; Lewis, Lovell
Introductory course for graduate research computing. Subroutines, program libraries, mathematical and statistical applications, batch and time-sharing environments, data files, plotting. Two lectures, 2 hours laboratory.

512 Database Systems Design. (3) A; Hansche, Lewis
In-depth study of the theory of database systems. Prerequisite: CSC 410.

515 Information Storage and Retrieval. (3) N; Hansche, Lewis
Concepts of information storage and retrieval: theory, applications, and case studies. Prerequisite: CSC 410.

520 Computer Architecture II. (3) A; Huey
Theoretical structure of computers and computations, SIMD and MIMD systems, performance tradeoffs, memory hierarchies, interconnection networks. Prerequisite: CSC 420.

521 Microprocessor Applications. (4) S; Pheanis, Woodfill
Microprocessor technology and its application to the design of practical digital systems. Hardware, programming, and interfacing of microprocessor-based systems. Lecture and laboratory. Prerequisite: CSC 421.

522 Microprogramming. (3) S'82; Huey, Pheanis
Theory, practice, and application of microprogramming. Prerequisite: CSC 420 or 421.

523 Distributed Processing and Networks. (3) F'82; Pheanis, Woodfill
Theory and practice of distributed processing using inter-bused, shared resource, and networked mini- and microcomputer systems. Prerequisite: CSC 422.

525 Digital Testing and Reliability. (3) A; Huey
Fault modeling, test generation and simulation for combinational and sequential circuits; memory testing, self-checking logic, fault-tolerant logic, reliability analysis. Prerequisite: CSC 320. (Also listed as EEE 515.)

530 Operating Systems Theory. (3) F; Collofello
Formal methods for control of concurrent processes, process scheduling, memory and auxiliary storage management. Network operating systems. Operating system design. Prerequisite: CSC 430.

532 Security in Computing Systems. (3) S'83; Collofello, Lewis
In-depth development of the concepts of computer security; impact on computer hardware and software, and on user. Prerequisite: CSC 430.

535 Performance Evaluation. (3) S; Collofello
Topics in computer system measurement and evaluation: hardware/software monitors, workload characterization, program behavior, adaptive scheduling, simulation models, measurement interpretation. Prerequisite: CSC 430.

540 Compiler Construction II. (3) S; Hansche
Formal parsing strategies, optimization techniques, code generation, extensibility and transportability considerations, recent developments. Prerequisite: CSC 440.

542 Translator Writing Systems. (3) N; Hansche
Compiler writing tools, definition of syntax and semantics, compiler construction using translator writing systems. Prerequisite: CSC 440.

545 Programming Language Design. (3) N; Hansche
Language constructs, extensibility and abstractions, run-time support. Language design process. Prerequisite: CSC 440.

550 Combinatorial Algorithms and Intractability. (3) A; Ford
Combinatorial algorithms, nondeterministic algorithms, classes P and NP, NP-hard and NP-complete problems, intractability. Design techniques for fast combinatorial algorithms. Prerequisite: CSC 450.

552 Sorting Algorithms. (3) N; Ford, Pheanis
In-depth analysis of internal and external sorting algorithms, including selection, insertion, transposition, distribution, and merge sorts. Practical considerations. Prerequisites: CSC 410, 450.

554 Advanced Switching Theory. (3) S; Huey
Lattices, boolean algebras, post algebras, boolean differential calculus, multivalued logic, fuzzy logic, finite state machines. Prerequisite: EEE 427 or CSC 355. (Also listed as EEE 527.)

555 Automata Theory. (3)' N; Ford
Finite state machines, pushdown automata, linear bounded automata, turing machines, register machines, rams, rasps; relationships to computability, formal languages. Prerequisite: CSC 355 or MAT 400.

560 Software Project Management and Development II. (3) S; Collofello, Woodfield
Software quality measures. Software reliability and maintainability theory. Software configuration management. Analysis of requirement and specification techniques and design methodologies. Prerequisite: CSC 460.

565 Software Reliability. (3) A; Collofello, Woodfield
Software reliability models and measures, program testing theory, fault tolerant software, program verification, reliable software design and development, regression testing. Prerequisite: CSC 460.

571 Artificial Intelligence. (3) N; Hansche
Definitions of intelligence; computer problem solving, game playing, pattern recognition, theorem proving, semantic information processing; evolutionary systems; heuristic programming. Prerequisite: graduate standing.

572 Pattern Recognition. (3) N; Huey
Pattern classification by distance functions and likelihood functions, deterministic and statistical approaches to trainable pattern classifiers, syntactic pattern recognition. Prerequisite: MAT 326 or ECE 383. (Also listed as EEE 553).

Special Courses: CSC 294, 484, 492, 493, 494, 498, 499, 590, 591, 592, 598, 599, 790, 791, 792, 799. (See pages 32-33.)

Division of Construction

Vernon L. Hastings, M.S.I.E., Director

PROFESSORS:
HASTINGS (COB 268), MICHELS, PETERMAN

ASSOCIATE PROFESSORS:
BURTON, SELLECK, WARD, WOODING

Purpose

The primary purpose of the Division of Construction is to provide students the opportunity to obtain a quality education in construction and qualify them directly for positions of leadership and responsibility in the construction industry.

Every effort is made to provide a well integrated program which will not only give the student proficiency for a professional construction career, but will also develop ideals, judgment, character and the breadth of view necessary for a constructor as well as appropriate cultural attitudes. The Division is a member of the Associated Schools of Construction, an organization dedicated to the development and advancement of construction education. The Construction program is accredited by the American Council for Construction Education (ACCE).

General Information

Admission. Students who wish to be admitted to full freshman standing in the construction program should present certain secondary school units in addition to the minimum University entrance requirements. A total of 3½ units is required in mathematics, including advanced algebra, geometry and trigonometry. The laboratory sciences chosen must include at least one unit in physics.

Any student enrolling in the Division of Construction (transfer, beginning, or continuing student) not having English as a first language must demonstrate English proficiency by passing the TOEFL with a minimum score of 500.

Students who have omissions or deficiencies in subject matter preparation shall be required to complete additional university credit course work which will not be applied toward a construction degree. Courses usually taken to satisfy omissions or deficiencies include one or more of the following: MAT 115 College Algebra and Trigonometry, MAT 117 College Algebra, MAT 118 Plane Trigonometry and PHY 101 Introduction to Physics.

Transfer Students. The freshman and sophomore programs of study are designed to facilitate transfer for junior and community college students or A.A. graduates. Prospective Arizona community college transfer students should consult their advisor and refer to the "Engineering" section of the annual *Arizona Higher Education Course Equivalency Guide* for a listing of the acceptable courses transferable to the ASU construction program.

No grades lower than C will be accepted as transfer credit to meet the graduation requirements for a construction degree. Students transferring into the Division of Construction must have a cumulative grade point average for all transfer work of at least 2.25 based on the 4.0 scale. Vocational and craft oriented courses taught at community colleges will not be accepted for credit toward a bachelor's degree.

Further information may be obtained from the: Division of Construction, College of Engineering and Applied Sciences, Arizona State University, Tempe, Arizona 85287.

Student Societies. The Division has a chapter of Sigma Lambda Chi, a national society that recognizes high academic achievement in accepted construction programs. The Division is also host to a student chapter of the Associated General Contractors of America (AGC).

Academic Progress and Retention

All students registered in the Division of Construction shall make satisfactory progress towards the degree for retention in the program. The division may require additional or remedial work for those students who demonstrate a trend of academic difficulty. Students shall complete the following basic requirements prior to registering for advanced courses.

All first semester first-year courses must be completed by the time the student has accumulated forty-eight (48) semester hours of program requirements.

All second semester, first-year courses must be completed by the time the student has completed sixty-four (64) semester hours of program requirements. Transfer students will be given one semester to meet this requirement.

Any student not making satisfactory prog-

ress will be permitted to register for only those hours required to correct the deficiency/deficiencies.

Retention. A student is expected to make satisfactory progress toward completion of degree requirements in order to continue enrollment in the Division of Construction. Any one of the following conditions will be considered unsatisfactory progress and will result in the student being placed on provisional (probationary) status:

1. A deficiency of 15 grade points.
2. A semester or summer session with a grade point average less than 1.50.
3. Two successive semesters, summer sessions, or combinations of these with grade point averages below 2.00.
4. Grades of D, E, W or I in more than half the credit hours appearing on the official enrollment record for any semester.

Disqualification can occur after one semester of probationary status. After two successive semesters on probation, a student who fails to meet the retention standards will be disqualified.

Requirements for Graduation. In order to qualify for graduation from the Division of Construction a student must have a grade point average of at least 2.00 for all mathematics, science, engineering and construction courses.

Scholarships. Apart from those given by the University generally, a number of scholarships from the construction industry are awarded to students registered in the construction program. They are awarded on the basis of academic achievement and participation in activities of the construction program.

The Construction Program

Students seeking a Bachelor of Science degree in construction must satisfactorily complete a curriculum of not less than 130 semester hours. Construction careers are so broadly diversified that no single curriculum will fit the student for universal entry into all fields. As an example, engineering contractors usually place more emphasis on technical and engineering science skills than do residential contractors/developers, who usually prefer a greater depth of knowledge in management and urban science. To ensure a balanced understanding of the technical, professional and philosophical standards which distinguish modern-day constructors, advisory groups representing leading associations of contractors and builders provide counsel in curriculum development. Construction has a common core of engineering science, management and behavioral courses on which students may build defined areas of emphasis to suit individual backgrounds, aptitudes and objectives. These areas of emphasis are not absolute but generally match major divisions of the construction industry.

Areas of Emphasis

General Building Construction

Heavy Construction

Specialty Construction

The lower division courses are the same for all areas. Each area is arranged to accent requisite technical skills and develop management, leadership and competitive qualities in the student. Prescribed are a combination of General Studies, technical courses basic to engineering and construction, and a broad range of applied management subjects fundamental to the business of contracting. Students must be educated to survive heavy demands for explicit technical performance during their early career years, and they also must understand the functions of their employers and the industries they serve. The students should acquire the motivation for continuing their education which, when combined with experience, will qualify them for top positions of leadership and authority in the construction industry.

Students in all areas of emphasis shall be required to complete a construction core of science-based engineering, construction and management courses. Since the credit hours vary for some alternative courses in the core, any differences in credits for the required courses will be made up in the selected fields of specialization to achieve a minimum of 130 credit hours.

General Studies Requirements (45 Sem. Hrs.)

Humanities and Fine Arts (8 Sem. Hrs.)

Architecture (DES) Course Required	2
Electives	6

Behavioral and Social Sciences (9 Sem. Hrs.)

ECN 201	/202 Principles of Economics	6
ADS 305	Business Law	3

Science and Mathematics (22 Sem. Hrs.)

MAT270	Calculus with Analytic Geometry I	4

PHY 111/ General Physics
113 (Mechanics and Heat) 4

PHY 112/ General Physics
114 (Electricity, Light, Magnetism) 4

QBA 221 Business Statistics 3

CIS 302 Electronic Data Processing 3

Science/Lab Elective 4

English Requirement (6 Sem. Hrs.)

ENG 101 /102 First Year English 6
or
ENG 104 Advanced First Year English 3

(Must pass exemption examination - see place-
ment examinations for proficiency, page 27.)

Construction Core Requirements (68 Sem. Hrs.)

ACC 101 Elementary Accounting 3

ECE 104 Engineering Graphics 2

CON 221 Statics Mechanics 3

CON 243 Construction Materials and
Specifications 2

CON 244 Construction Graphics 1

CON 252 Construction Equipment 2

ELT 202 /203 Applied Electrical Science
and Laboratory 4

CEE 341 Surveying 3

CEE 310 Construction Materials Testing 2

CEE 380 Hydraulics and Hydrology 3

ELT 380 Electrical Systems 3

CON 323 Strength of Materials 3

CON 331 Construction Safety and Risk
Management 2

CON 345 Mechanical Systems 3

CON 366 Construction Methods 3

CON 374 Systems Management for
Construction 2

CON 383 Construction Estimating 3

CON 389 Construction Cost Accounting
and Control 3

CON 395 Construction Planning and
Scheduling 3

CON 424 Structural Design 3

CON 453 Construction Labor Management . 3

CON 463 Foundations and Concrete
Structures 3

CON 496 Construction Contract
Administration 3

CEE 450 Soil Mechanics in
Construction 3

ECE 400 Engineering Communications 3

Advisor-approved alternates/transfer credits
for courses listed above may vary from the
total required semester hours indicated. Such
variances shall not reduce the minimum of
130 semester hours required for the degree.

Construction Areas of Emphasis

The course work for the first two years is the
same for all three areas of emphasis. The spe-
cific lower division requirements are shown
below:

First Semester _Semester Hours_

ENG 101 First Yr. English 3
PHY 111 /113 Gen. Physics 4
MAT 270 Calculus 4
ECE 104 Engrg. Graphics 2
Humanities Elective 3
16

Second Semester

ENG 102 First Yr. English 3
DES 100 Intro to Arch. I 2
PHY 112 /114 Gen. Physics 4
ACC 101 Elem. Accounting 3
Science Elective 4
Total 16

Third Semester

ECN 201 Principles Economics 3
CON 221 Statics 3
CON 243 Intro. Const. Mat. 2
CON 244 Constr. Graphics 1
ELT 202 /203 Electronics 4
Humanities Elective 3
Total 16

Fourth Semester

ECN 202 Principles Economics 3
QBA 221 Statistical Analysis 3
CIS 302 Electronic Data Proc 3
CON 323 Strength of Materials 3
CEE 341 Surveying 3
CON 252 Constr. Equipment 2
Total 16

One field is to be selected by the student.

General Building Construction. The general
building emphasis provides a foundation for
students who wish to follow careers as manag-
ers or owners of firms engaged in the
construction of residential, commercial and
institutional structures. While conventional
building is still a major factor in this field,
modern educational focus is on building sys-

tems required for the mass development and production of large scale projects. General construction is treated as a complete process from conception through delivery of completed facilities to users.

General Building Emphasis
Requirements (17 Sem. Hrs.)

REA 251 Real Estate Principles 3

CON 384 Advanced Building Estimating 3

CON 472 Land Development Feasibility 2

Approved electives 9

Heavy Construction. The heavy construction emphasis prepares students for careers with constructors and contracting organizations, which are constructing large civil, mechanical electrical systems. Typical projects are highways, railroads, airports, power plants, rapid transit systems, process plants, harbor and waterfront facilities, pipelines, dams, tunnels, bridges, canals, sewerage and water works, mass earthwork, and other heavy public works.

Heavy Construction Emphasis
Requirements (17 Sem. Hrs.)

CEE 344 Route Surveying 3

CON 486 Heavy Construction Estimating 3

CON 482 Cost Engineering 2

Approved electives 9

Specialty Construction. Specialty construction usually involves specialized construction trades or crafts. The areas involved include mechanical construction, electrical construction, air conditioning construction, etc. This specialization is also intended to provide an option for those students interested in such areas as utility contracting and land development or other specialty areas. Upon application by the student and in consultation with an advisor a specific program of courses to be added to the General Studies and the core sequence may be developed subject to courses offered within the University and the approval of the Division director.

Specialty Construction
Requirements (17 Sem. Hrs.)

CON 455 Construction Office Methods 3

CON 468 Conceptual and Electrical
              Estimating 3

CON 482 Cost Engineering 2

Approved electives 9

CONSTRUCTION

CON 221 Static Mechanics. (3) F, S
Force systems acting on structural members. Forces, moments, equilibrium, centroids, trusses, beams, cables, frames, machines, friction, section properties, masses. Both US and SI units of measurement. Prerequisites: MAT 270, PHY 111/113.

243 Introduction to Construction Materials and Specifications. (2) F, S
Construction materials and components. Emphasizing material descriptions, usages and incorporation into the structure. Field trips. Prerequisite: ECE 104 or equivalent.

244 Construction Graphics. (1) F, S
Sketching and architectural drafting of building materials and systems. Field trips. Three hours laboratory. Prerequisite: ECE 104 or equivalent.

252 Construction Equipment. (2) F, S
Characteristics, capabilities, limitations and employment of general building and heavy construction equipment. Fleet operations, maintenance programs. Field trips.

323 Strength of Materials. (3) F, S
Analyses of strength and rigidity of structural members in resisting applied forces. Stress, strain, shear, moment, deflections, combined stresses, connections, moment distribution. Both US and SI units of measurement. Field trips. Prerequisite: CON 221 or equivalent.

331 Construction Safety and Risk Management (2) F, S
Protective equipment and devices, inspection procedures and record keeping. OSHA requirements for construction. Hazard analysis and liability assignment. Economics of accident protection. Field trips.

345 Mechanical Systems. (3) F, S
Heating and climatic systems for buildings. Sanitary and water piping layout and simple design. Field trips. Four hours lecture and laboratory. Prerequisites: CON 243, EEE 273.

366 Construction Methods. (3) F, S
Analysis of construction projects for the determination of the most appropriate and economic methods. Job organization, pre-planning and site layout. Field trips. Prerequisites: CON 243, 252, or approval of instructor. Four hours lecture and laboratory.

374 Systems Management for Construction. (2) F, S
Organization and management theory applied to the construction process. Conceptual foundations. Industry environment, processes and management. Leadership functions. Prerequisite: junior standing or approval of instructor.

383 Construction Estimating. (3) F, S
Theories and systems of building estimating. Quantity survey techniques, standard formats, classification and analysis of work, unit cost determinations, simulated bids. Computer applications. Field trips. Four hours lecture and laboratory. Prerequisites: CIS 302 or equivalent; CON 243; construction majors only or approval of instructor.

384 Advanced Building Estimating. (3) F, S
Methods analysis and cost estimating for construction of general building projects. Continuation of CON 383. Field trips. Four hours lecture and laboratory.

389 Construction Cost Accounting and Control. (3) F, S
Nature of construction cost. Investment models, depreciation and tax theory, variable equipment costs. Cash

flow theory, profitability and analysis. Computer applications. Funding sources and arrangements. Builder's insurance. Prerequisites: a knowledge of Fortran; CIS 302 or equivalent, ACC 101, CON 383.

395 Construction Planning and Scheduling. (3) F, S
Various network methods of project scheduling, such as AOA, AON, CPM, PERT and PDM. Using manual and computer systems. Other graphic methods including bar-charting, line-of-balance, and VPM, resource allocation and time/cost analysis. Prerequisites: computer programming; CON 244, 366, 383.

401 Construction Firm Management and Control. (3) F
Application of construction management principles by the small or specialty contractor. Directed experience in the analysis and evaluation of small contractor problems. Prerequisites: CON 374, 383, 389, 395.

424 Structural Design. (3) F, S
Economic use of steel, reinforced concrete, and wood in building and engineered structures. Design of beams, columns, and connections. Elastic and ultimate strength design. Student design projects. Field trips. Prerequisite: CON 323.

453 Construction Labor Management. (3) F, S
Labor history, union structure, and collective bargaining in the building and construction trades. Work customs and project organization. Applicable laws and government regulations. Area productivity differentials. Labor goals, economic power, jurisdictional disputes, grievance procedures. Four hours lecture and laboratory. Prerequisites: ECN 202, CON 374.

455 Construction Office Methods. (3) S
Administrative systems and procedures for the construction company office including methods improvement and work simplification, office layout, business forms and design, office manuals. Prerequisite: CON 389.

462 Project Planning and Control. (3) S
CPM, PERT and line of balance scheduling. Resource allocation. Control of time and cost. Prerequisite: CON 411.

463 Foundations and Concrete Structures. (3) F, S
Subsurface construction theory and practice for foundations of buildings and engineered facilities. Concrete form design for foundations and structural frames. Underpinning, piling, dry and wet excavating, dewatering, cofferdams, caissons. Field trips. Prerequisites: CON 323, 424, CEE 450.

468 Conceptual and Electrical Estimating. (3) F
System of estimating construction costs before design has been initiated. Cost estimating for large projects. Analysis and organization of electrical estimate. Prerequisite: CON 383.

472 Land Development Feasibility. (2) S
Economic location theory. Analysis of the profitability of land developments. Prerequisites: CON 383, 389. Field trips.

474 Power and Process Plant Construction. (2-3) S
Review of selected industrial processes. Design isometric drawings, and estimating costs for pipe, electrical, pressure vessels, and instrumentation. Project management of major industrial projects. Two-three hours lecture. Field trips. Prerequisites: CON 244, 345, 389, or approval of the instructor.

482 Cost Engineering. (2) S
The time-value of money. Comparison of alternatives, depreciation methods and impact on taxes, replacement and break-even analysis. Construction financing and analysis. Prerequisite: CON 389.

486 Heavy Construction Estimating. (3) F, S
Methods analysis and cost estimation for construction of highways, bridges, tunnels, dams and other engineering works. Prerequisites: CON 383, CEE 344, or approval of instructor. Field trips.

495 Construction Planning and Scheduling II. (2) F, S
Applications of scheduling techniques. Project planning, monitoring and control. Schedule updates and revisions. Detail scheduling methods. Long range scheduling for the organization. Graphic communication techniques. Prerequisites: CON 389, 395.

496 Construction Contract Administration. (3) F, S
Case studies. Ethical practice, social responsibility, licensing, codes and public regulation of contracting. Quality control requirements. Claims, payments and changes. Bonding, insurance, idemnification procedures. Technical and fiscal failure. Formulation of management contracts, prime contracts, subcontracts, joint venture and consortium agreements. Arbitration, litigation and specification analysis. Term papers. Prerequisite: senior standing. Pre-or co-requisite: ECE 400.

531 Economics of the Construction Industries. (3) F; Burton
The economic environment of construction with emphasis on unique aspects; critical review of economic literature dealing with the construction industries. Prerequisites: ECN 201, 202 and CON 496 or approval of instructor.

551 Facilities Operation and Maintenance. (3) S; Wooding
Analysis of maintenance work. Structure of the maintenance work and organization. Contract maintenance and force account economics. Maintenance control and supervision of operations. Field trips.

577 Construction Systems Engineering. (3) F; Burton
Systems theory as applied to the construction process. Alternates for structuring information flows and the control of projects. Prerequisite: CON 462 or equivalent.

Special Courses. 294, 484, 494, 498, 499. (See pages 32-33.)

School of Engineering

C. R. Haden, Ph.D., Director

Purpose

A large percentage of all engineering degree holders are found in leadership positions in a wide variety of institutional settings. Although an education in engineering is generally considered to be one of the best of technical educations, it also provides an opportunity for the development of many additional activities, aptitudes and interests, including moral, ethical, and professional concepts. In this era of rapid technological change, an engineering education will serve our society well as a truly

liberal education. Society's needs in the decades ahead call for engineering contributions on a scale not previously experienced. The well-being of our civilization as we know it may well depend upon how effectively this resource is developed.

Students studying engineering at Arizona State University are expected to acquire a thorough understanding of the fundamentals of mathematics and the sciences and their applications to the various engineering fields. The program is designed to develop a balance between science and engineering and an understanding of the economic and social consequences of engineering activity. The goals include the promotion of the general welfare of the engineering profession.

The courses offered are designed to meet the needs of the following students: (1) those who wish to obtain a degree in engineering and who plan careers in which science, mathematics, and analytical methods are of special value; (2) those who wish to do graduate work in engineering; (3) those who wish one or two years of training in mathematics, applied science, and engineering in preparation for a technical career; (4) those who desire pre-engineering for the purpose of deciding which program to undertake or those who desire to transfer to another college or university; (5) those who wish to take certain electives in engineering while pursuing another program in the University.

General Information
Admission

(1) Beginning College Students. Students who are beginning their initial college work in the School of Engineering should present certain secondary school units in addition to the minimum University requirements. A total of 3½ units is required in mathematics. Included must be: college algebra, geometry and trigonometry. The laboratory sciences chosen must include at least one unit in physics and one unit in chemistry. Biology is recommended.

Students who have omissions or deficiencies in subject matter preparation may be required to complete additional university credit course work which may not be applied toward an engineering degree. One or more of the courses—MAT 115 College Algebra and Trigonometry, PHY 101 Introduction to Physics, ENG 101 First Year English*, CHM 113 General Chemistry—are taken to satisfy omissions or deficiencies.

(2) Students Transferring to the School of Engineering. No grades lower than C will be accepted as transfer credit to meet the graduation requirements for an engineering degree. Students transferring into the School of Engineering must have a cumulative grade point average for all transfer work of at least 2.25 based on the 4.0 scale.

Any student enrolling in the School of Engineering (transfer, beginning, or continuing student) not having English as a first language must demonstrate English proficiency by passing the TOEFL with a minimum score of 500.

General Studies	Engineering Core	Field of Specialization	BSE Degree
47 sem. hrs.	32 sem. hrs.	(including Area of Emphasis) 51 sem. hrs.	130 sem. hrs.

*See statement on Placement Examinations for Proficiency—English, page 27.

Retention. A student is expected to make satisfactory progress toward completion of degree requirements in order to continue enrollment in the School of Engineering. Any one of the following conditions will be considered unsatisfactory progress and will result in the student being placed on provisional (probationary) status:

1. A deficiency of 15 grade points.
2. A semester or summer session with grade point average less than 1.50.
3. Two successive semesters, summer sessions, or combinations of these with grade point averages below 2.00.
4. Grades of D, E, W or I in more than half the credit hours appearing on the official enrollment record for any semester.

Disqualification can occur after one semester of probationary status. After two successive semesters on probation, a student who fails to meet the retention standards will be disqualified.

Requirements for Graduation. In order to qualify for graduation from the School of Engineering a student must have a grade point average of at least 2.00 for the 51 semester hours of required courses in the major field.

Programs of Study. The composition of the Bachelor of Science (B.S.) and Bachelor of Science in Engineering (B.S.E.) degrees is made up of three parts: University General Studies, an Engineering Core, and a Field of Specialization. This combination is illustrated in the accompanying chart.

The General Studies satisfy a University requirement and include basic studies in the humanities and fine arts, the social and behavioral sciences, the engineering and physical sciences, and mathematics (see page 36). These courses comprise approximately 35% of the degree program.

The Engineering Core is a specific and organized body of knowledge that will serve as a foundation to engineering and for further specialized studies in a particular engineering field of specialization. These courses comprise approximately 25% of the degree program.

The fields of specialization available are of two types: (1) those associated with a particular department within the School of Engineering (for example, electrical and computer engineering, civil engineering, etc.), and (2) those offered as Special and Interdisciplinary Studies (for example, manufacturing engineering, nuclear sciences, premedical, etc.). In general, the departmental curricula are extensions beyond the Engineering Core and cover a wide variety of subject areas within each field. In each case several courses are set aside for the student's use as technical electives to support an area of emphasis.

For convenience, the departments are designated as CEE (Civil Engineering), CHE (Chemical and Bio Engineering), EEE (Electrical and Computer Engineering), ESE (Aerospace Engineering and Engineering Science), IEE (Industrial and Management Systems Engineering), and MEE (Mechanical and Energy Systems Engineering).

The areas offered under the Special and Interdisciplinary Engineering Studies are designed for those students whose educational objectives require more intensity of concentration on a particular subject or more curricular flexibility among engineering disciplines than is possible in the traditional departmental fields. Again, several courses are made available to the student within each field of specialization to support an area of emphasis. Field of specialization courses comprise approximately 40% of the degree program.

The first two years of study are concerned primarily with the General Studies and the Engineering Core, with more time being spent with General Studies. The final two years of study are concerned with the Engineering Core and the field of specialization, with the major part of the time being spent with the field of specialization. This arrangement can be illustrated by the chart below:

First Year	Second Year	Third Year	Fourth Year
GENERAL STUDIES			
ENGINEERING CORE			
		FIELD OF SPECIALIZATION	
			AREA OF EMPHASIS

The sequential arrangement of all course work for the B.S. and B.S.E. degrees into the three categories above is especially helpful to the beginning student who is undecided concerning a specific career choice from within the various fields of specialization. It is possible, for example, to delay a final selection of the field of specialization until the third year. However, if a specific career choice has been made earlier, the semester by semester selection of courses will vary from one field to another. An example of a typical freshman engineering schedule is shown below.

Typical Freshman Year

Fall Semester <div align="right">*Semester Hours*</div>

CHM   114[1] or CHM 116 General Chemistry .. 4
MAT   290[2] Calculus I 5
ECE   102   Introduction to Engineering 2
ECE   104   Engineering Graphics and Design   2
Social Sciences (or ENG 101) 3
    Total 16

Spring Semester

ECE   122   Computer Programming 2
    or CSC 182 Elementary Computer
    Programming (2)

MAT   291   Calculus II 5
PHY   115[3] University Physics 4
PHY   117   Univ. Physics Lab 1
Humanities or Fine Arts 2
ENG   102[4] or ENG 104 English 3
    Total 17

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[1] Chemical Engineering students will take CHM 113.
[2] Some students may desire a math review and take MAT 115 Algebra and Trigonometry; others may desire a less intense calculus sequence and take MAT 270.
[3] Students who have not completed one unit of physics in high school should complete PHY 111 and 113 in the preceding semester.
[4] Students not eligible for ENG 104 should complete ENG 101 in the preceding semester.

Well-prepared students usually can complete the program of study leading to an undergraduate degree in engineering in four years, or fewer than four by attending Summer Sessions. Many students, however, may find it advantageous or necessary to devote more than four years to the undergraduate program by pursuing, in any semester, fewer studies than are regularly prescribed. Where omissions or deficiencies exist, i.e., in chemistry, English, physics, or mathematics, the student must complete more than the minimum of 130 semester hours. Therefore, in cases of inadequate secondary preparation, poor health, or financial necessity requiring much time for outside work, the undergraduate program should be extended to five years or longer.

Professional Accreditation

All the undergraduate engineering fields of specialization—chemical, civil, electrical, industrial, mechanical, and the special and interdisciplinary engineering studies in engineering—are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET). Master of Science in Engineering programs are accredited by ABET in the fields of electrical, civil, industrial, and mechanical engineering, and in engineering science.

Degree Requirements

The degree programs in engineering at Arizona State University are intended to develop habits of quantitative thought having equal utility for both the practice of engineering and other professional fields. It is the intent of the faculty that all students be prepared in:

(1) *Competency in oral and written communication* in the English language which is considered to be essential for the engineering graduate. Although the requirement of specific course work may serve as a foundation for such competency, the development of communication skills should be demonstrated by student work in engineering courses. As a minimum and in addition to the 130 semester hour course requirements, all students must satisfy the University English proficiency requirements (see page 27).

(2) *General Studies* to ensure that the engineer will acquire a satisfactory level of basic knowledge in the humanities and fine arts, social and behavioral sciences, and sciences and mathematics. These subjects are so selected as to give the engineer an increased awareness of social responsibilities, to provide an understanding of related factors in the decision-making process, and to provide a foundation for the study of engineering.

(3) *Fundamental studies* in engineering and related subjects that will further develop the foundation for engineering and to provide the base for specialized studies in a particular engineering discipline.

(4) *Field of specialization studies* that provide a depth of understanding for a more definitive body of knowledge appropriate to a particular aspect of societal concern. These studies include technical elective course work in an area of emphasis that may be selected by the student.

The specific course requirements for the three parts of the B.S. and B.S.E. degrees are listed below.

B.S. and B.S.E. Degree Requirements

Semester Hours

University English Proficiency
Requirement .... (See page 27)

General Studies

ECN 201 Principles of Economics 3

Humanities and Fine Arts Courses .... 6 to 10*

Behavioral and Social Sciences Courses .... 7 to 3*

CHM 114 or CHM 116 General Chemistry .. 4

PHY 115 University Physics 4

PHY 116 University Physics 4

PHY 117 University Physics Laboratory 1

PHY 118 University Physics Laboratory 1

MAT 290 Calculus I 5

MAT 291 Calculus II 5

ECE 380 Ordinary Differential Equations ... 3

(or MAT 274 Elementary Differential Equations)

Approved Mathematics Content Electives 4

Total General Studies 47

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* Combined total is 13 semester hours.
Note: The mathematics sequence MAT 270, 271, 272 may be substituted for the 10 semester-hour mathematics requirement. However, the extra 2 semester hours may not be used to satisfy graduation requirements.

A total of 16 semester hours of the General Studies must be in behavioral and social sciences (including ECN 201), and humanities and fine arts, with a minimum of 6 hours in each of these areas being required. It is recommended that at least 6 of the 16 semester hours total be 300- or 400-level courses, and that the students select two courses from the same subject area. Selections must be made from the following lists.

Humanities and Fine Arts. Selected courses in: Architecture (APH and EDH courses only); Art (ARH courses only); Communication (COM 241 only); Dance (DAH courses only); English (literature courses only); Foreign Languages (literature courses only);

Philosophy and Humanities; Music (MHL and MTC courses only); Religious Studies; Theatre (THE courses only).

Social and Behavioral Sciences. Selected courses in: Anthropology (ASB courses only); Economics; Geography, Cultural (GCU courses only); History; Political Science; Psychology (PGS courses only); Sociology; Society, Values and Technology (Engineering).

Engineering Core

The courses included in the Engineering Core are taught in such a manner that they serve as basic background material (1) for all engineering students who will be taking subsequent work in the same and related subject areas, and (2) for those students who may not desire to pursue additional studies in a particular subject area. Thus, subjects within the Engineering Core are taught with an integrity and quality appropriately relevant to the particular discipline, but always with an attitude and concern for both engineering in general and for the particular field(s) of specialization. The courses required are listed below:

Engineering Core

Semester Hours

ECE 102 Introduction to Engineering 2

ECE 104 Engineering Graphics and Design 2

ECE 122 Computer Programming 2

or CSC 182 Elementary Fortran Programming

ECE 210 Engineering Mechanics I: Statics . 3

ECE 304 Electrical Networks and System Analogies 4

ECE 312 Engineering Mechanics II: Dynamics 3

ECE 313 Introduction to Deformable Solids 3

ECE 334 Electronic Devices and Instrumentation 4

ECE 340 Thermodynamics 3

or CHM 441 General Physical Chemistry

ECE 350 Structure and Properties of Material 3

or ECE 351 Engineering Materials
or ECE 352 Semiconductors and Devices
or CHM 442 General Physical Chemistry

ECE 400 Engineering Communications ..... <u>3</u>
          Total Engineering Core 32

Field of Specialization

Fields of specialization and areas of emphasis are offered by the seven engineering departments: Aerospace Engineering and Engineering Science, Chemical and Bio Engineering, Civil Engineering, Electrical and Computer Engineering, Industrial and Management Systems Engineering, Mechanical and Energy Systems Engineering, and Special and Interdisciplinary Engineering. About one-fourth of the field of specialization credits are reserved for the student's use as an area of emphasis. These credits are traditionally referred to as "technical electives." Requirements for each of the fields of specialization offered are described on the following pages.

Field of Specialization (including area of emphasis) .... 51 semester hours
Total Degree
Requirements* .... 130 semester hours

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*These requirements are in addition to the University English proficiency requirements.

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Department of Aerospace Engineering and Engineering Science

PROFESSORS:
WALLACE (EC G-120B), AVERY, BICKFORD, CARPENTER, CHEN, LOGAN, NELSON, SHAW, STANLEY, L.P. THOMPSON, WAGNER
ASSOCIATE PROFESSORS:
HENDRICKSON, RANKIN, S.J. RUSSELL
ENGINEERING COMMUNICATIONS ASSOCIATE PROFESSORS:
LAWLER, STADMILLER

Aerospace Engineering. The primary concern of aerospace engineers is the design and development of a wide variety of aircraft and space vehicles. They also have the responsibility for the research and development necessary for future designs. The current challenges to the aerospace engineer include the design of a new generation of high efficiency transport aircraft, the development of a second generation of space transports and the design of large space systems. In addition to the design of

vehicles, the aerospace engineer is involved in the further development of the many spin-offs of the aerospace industry. These include contributions to communications, air and water pollution monitoring, management of the earth's land and resources, and the understanding and the control of weather. Future contributions are anticipated in the area of zero gravity manufacturing of high purity materials and medicines, and the design of solar power satellites.

The aerospace engineering curriculum is founded upon the broad fundamentals of mathematics and the engineering sciences, with the additional specialized education in flight mechanics, aerospace structures, aerodynamics, and propulsion providing the foundation necessary for aerospace design.

This program, leading to the Bachelor of Science in Engineering degree, provides for early career opportunities in industry or government. Well-qualified students are also urged to consider graduate work leading to the Master of Science in Engineering and Doctor of Philosophy degrees.

Aerospace Engineering Core

Students in the undergraduate aerospace engineering emphasis are required to complete the Aerospace Engineering Core in addition to the Engineering Core. They may develop greater depth in areas of interest through a proper selection of approved electives.

The following courses from the Engineering Core are required for aerospace engineering students:

			Semester Hours
ECE	340	Thermodynamics	3
ECE	350	Structure and Properties of Materials	3
MAT	242	Elementary Linear Algebra	2
ECE	386	Partial Differential Equations for Engineers	2

The following courses are required to fulfill the requirements in aerospace engineering:

ESE	315	Mechanics Laboratory	2
ESE	413	Intermediate Dynamics	3
ESE	415	Vibration Analysis	3
ESE	422	Mechanics of Materials	3
ESE	426	Aerospace Structures	3
ESE	450	Mechanical Properties of Solids	3
ESE	480	Aerospace Systems Design	3
MEE	365	Dynamics Systems and Control	4

MEE 371 Fluid Mechanics 3

MEE 372 Fluid Mechanics 4

MEE 450 Aerodynamics 3

MEE 453 Propulsion 3

Area of emphasis (technical electives) 14

The technical electives are selected with the approval of the student's advisor.

Aerospace Engineering Areas of Emphasis

Technical electives may be selected from one or more of the following areas:

Aerodynamics: ESE 430, 474, 475; MEE 382, 452, 471, 488.

Computer Science: CSC 305, 383; EEE 321, 322, 421, 422.

Engineering Mathematics: ASE 486, 582, 586; CSC 383; ECE 383, 384; ESE 546.

Flight and Space Dynamics: ESE 474, 475, 492, 513; MEE 465.

Propulsion: MEE 382, 455, 456.

Stress Analysis: ESE 355, 492, 523, 528, 529, 542, 555; MEE 441, 442; EEE 439.

Structural Dynamics: ESE 410, 492, 511, 515, 528, 542, 555; EEE 439.

With the approval of the advisor, courses other than those shown above may also be chosen as technical electives.

Aerospace Engineering Program of Study Typical Four-Year Sequence
Freshman Year

First Semester | Semester Hours

ECE 102 Intro. to Engineering 2

MAT 290 Calculus I 5

ECE 104 Engrg. Graphics/Design 2

CHM 114 General Chemistry 4

ENG 101 First Year English* .... _3_

16

Second Semester

ECE 122 Computer Programming 2

MAT 291 Calculus II 5

PHY 115 University Physics 4

PHY 117 Univ. Physics Lab 1

Humanities or Social Sciences 2

ENG 102 First Year English .... _3_

17

Sophomore Year
First Semester

ECE 210 Engrg. Mech. I/Statics 3

PHY 116 University Physics 4

PHY 118 Univ. Physics Lab 1

MAT 274 Elem. Diff. Eqns. 3

MAT 242 Elem. Linear Algebra 2

ECN 201 Principles Economics .... _3_

16

Second Semester

ECE 313 Intro/Deformable Sol 3

ECE 312 Engrg. Mech. II/Dynam. 3

ECE 340 Thermodynamics 3

ECE 386 Part. Diff. Eqns. Engrg. 2

ESE 315 Mechanics Laboratory 2

Humanities or Social Sciences .... _5_

18

Junior Year
First Semester

ECE 304 Elec. Ntwk/Sys. Analog 4

ESE 422 Mech. of Materials 3

MEE 371 Fluid Mechanics 3

ECE 350 Struc./Prop. Matls. 3

Technical Electives 3

Humanities or Social Sciences 2

18

Second Semester

ECE 334 Electr. Device/Instru. 4

MEE 372 Fluid Mechanics 4

ESE 426 Aerospace Mechanics 3

ESE 413 Intermed. Dynamics 3

ESE 450 Mech. Prop. of Solids .... _3_

17

Senior Year
First Semester

ECE 400 Engrg. Communications 3

Technical Electives 5

ESE 415 Vibration Analysis 3

MEE 450 Aerodynamics 3

Propulsion .... _3_

17

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* or Humanities/or Social Sciences if exempt from ENG 101.

Second Semester

MEE	365	Dyn, Sys, & Control	4
		Technical Electives	6
ESE	480	Aero. Sys. Design	3
		Humanities or Social Sciences	4
			17

Engineering Science. The engineering science curriculum emphasizes the fundamentals of those scientific and mathematical disciplines which have application in solving important technological problems of society. The program includes courses associated with such fields as engineering mechanics, vibration and noise control, dynamic meteorology and materials science.

This fundamental education provides the engineer with the flexibility and understanding required to cope with the rapidly occurring changes in technology and the needs of society.

Engineering Science Core

The undergraduate curriculum in engineering science is based upon the fundamental foundation provided by the Engineering Core. In addition to the Engineering Core, each student is to complete the requirements in the Engineering Science Core. Through the approved electives, the student may obtain greater depth in areas of special interest.

The following courses from the Engineering Core are required for engineering science students:

ECE	340	Thermodynamics	3
ECE	350	Structure and Properties of Materials	3
MAT	242	Elementary Linear Algebra	2
ECE	386	Partial Differential Equations Engineering	2

The following courses are required to fulfill the requirements in engineering science:

ESE	315	Mechanics Laboratory	2
ESE	355	Introduction to Metallurgy	3
ESE	410	Acoustics and Noise Control	2
ESE	413	Intermediate Dynamics	3
ESE	415	Vibration Analysis	3
ESE	422	Mechanics of Materials	3
ESE	430	Introduction to Continuum Mechanics	3
ESE	455	Physical Metallurgy	4

ESE	492	Project in Design and Development	3
MEE	371	Fluid Mechanics	3
PHY	361	Modern Physics	3
		Area of Emphasis (technical electives)	16

The technical electives are selected with the approval of the student's advisor.

Engineering Science Areas of Emphasis

Technical electives may be selected from one or more of the following areas:

Biomechanics: CHE 411; EEE 434; ESE 526.

Computer Science: CSC 305, 383; EEE 321, 322, 421, 422.

Dynamic Meteorology: ESE 475; GPH 412, 414; MEE 372, 488.

Engineering Mathematics: ASE 486; 582, 586; CSC 383; ECE 383, 384; ESE 546.

Engineering Mechanics: ASE 486,; EEE 439; ESE 426, 523, 529, 555; MEE 372, 488.

Manufacturing Engineering: ESE 401, 450; IEE 300, 374, 431, 463; MEE 332.

Materials Science and Metallurgy: ESE 450, 451, 453, 555.

Vibration and Acoustics: ESE 511, 512, 513, 515; CEE 536, 537; EEE 439.

With the approval of the advisor, courses other than those shown above may also be chosen as technical electives.

Engineering Science Program of Study Typical Four-Year Sequence
Freshman Year
First Semester

			Semester Hours
ECE	102	Intro. to Engineering	2
MAT	290	Calculus I	5
ECE	104	Engrg. Graphics/Design	2
CHM	114	General Chemistry	4
ENG	101	First Year English*	3
			16

Second Semester

ECE	122	Computer Programming	2
MAT	291	Calculus II	5
PHY	115	University Physics	4
PHY	117	University Physics Lab	1
		Humanities or Social Sciences	2
ENG	102	First Year English	3
			17

or Humanities/Social Sciences if exempt from ENG 101.

Sophomore Year

First Semester

ECE	210	Engrg. Mech. I/Statics	3
PHY	116	University Physics	4
PHY	118	Univ. Physics Lab	1
MAT	274	Elem. Diff. Eqns.	3
MAT	242	Elem. Linear Algebra	2
ECN	201	Principles Economics	3
			16

Second Semester

ECE	313	Intro/Deformable Sol.	3
ECE	312	Engrg. Mech. II/Dynam.	3
ECE	340	Thermodynamics	3
ECE	386	Part. Diff. Eqns. Engrg.	2
ESE	355	Intro. Metallurgy	3
ESE	315	Mechanics Laboratory	2
		Humanities or Social Sciences	2
			18

Junior Year

First Semester

ECE	304	Elec. Ntwk/Sys. Analog	4
ESE	422	Mech. of Materials	3
PHY	361	Modern Physics	3
ECE	350	Struc./Prop. Matrls.	3
ESE	413	Intermed. Dynamics	3
		Humanities or Social Sciences	2
			18

Second Semester

ECE	334	Electr. Device/Instru.	4
MEE	371	Fluid Mechanics	3
ESE	415	Vibration Analysis	3
ESE	410	Acoustics/Noise Cont.	3
		Technical Electives	3
		Humanities or Social Sciences	2
			17

Senior Year

First Semester

ESE	430	Intro to Cont. Mech.	3
ESE	455	Physical Metallurgy	4
ESE	474	Dynamic Meteorology	3
		Technical Electives	5
		Humanities or Social Sciences	2
			17

Second Semester

ECE	400	Engrg. Communications	3
		Technical Electives	8

ESE	492	Proj. in Des. & Devel.	3
		Humanities or Social Sciences	3
			17

Materials Science and Manufacturing Engineering. Students pursuing programs in either the materials science or·manufacturing engineering fields are advised by faculty members in Aerospace Engineering and Engineering Science. For descriptions of these two programs see the School of Engineering, Special Engineering Studies on pages 260-261.

Department of Chemical and Bio Engineering

PROFESSORS:
ZWIEBEL (COB B-210L), BERMAN, DORSON, KUESTER, SATER

ASSOCIATE PROFESSORS:
BECKMAN, BELLAMY, GUILBEAU, TORREST

PROFESSOR EMERITUS:
REISER

Chemical engineers are generally concerned with processes involving chemical change. Students aspiring to become chemical engineers must prepare to solve a wide variety of problems utilizing chemistry, physics, mathematics, and the engineering sciences. As professionals in industry they shall apply these fundamentals to creatively develop, economically design and productively operate processes and their constituent equipment.

In addition to the chemical industry, chemical engineers find challenging opportunities in the petroleum, energy, plastics, solid state, metals, space, food, drugs, and health care industries, where they practice in a wide variety of occupations like environmental control, energy and materials transformations, biomedical applications, fermentation, protein recovery, extractive metallurgy, and separations. A large percentage of the industrial positions are filled by graduates with bachelor's degrees. However, there are lucrative and creative opportunities in research and development for those who acquire post-graduate education.

While subspecializations have developed within the profession, the same broad body of knowledge is generally expected of all chemical engineers for maximum flexibility in industrial positions. The preparation for chemical engineering is accomplished by a blend of classroom instruction and laboratory experience. The courses for the undergraduate degree can be classified into the following categories (in semester hours):

General Studies 16
Humanities and Social Science courses, plus English proficiency

Science and Mathematics Fundamentals 35
CHM 113, CHM 116
PHY 115, PHY 116, PHY 117, PHY 118
MAT 290, MAT 291, MAT 274, MAT 242
ECE 382 or ECE 383

Advanced Chemistry 14
CHM 331, CHM 332, CHM 335
CHM 343, CHM 441, CHM 442

Engineering Core 26
ECE 102, ECE 104, ECE 122,
ECE 210, ECE 312, ECE 313,
ECE 304, ECE 334, ECE 400

Chemical Engineering Fundamentals 24
CHE 311, CHE 312, CHE 331, CHE 332,
CHE 333, CHE 342, CHE 364, CHE 442

Chemical Engineering Design 13
CHE 432, CHE 451, CHE 461,
CHE 462, CHE 492

Technical Elective 3
A selection from among CHE courses 487, 473, 411, 413, or appropriate technical courses in other departments with advisor's approval
Total for credit requirement for BSE   131

To fulfill accreditation requirements and to adequately prepare for the advanced chemistry courses, chemical engineering majors are required to take the CHM 113 and CHM 116 introductory chemistry sequence (CHM 117 and CHM 119 are acceptable substitutes). Other freshman chemistry courses are *not acceptable,* and transfer students who have taken another chemistry course may be required to enroll in CHM 113 and/or CHM 116.

The Chemical and Bio Engineering Department also offers graduate programs leading to the M.S.E., M.S. and Ph.D. degrees. These programs provide a blend of classroom instruction and research. A wide variety of topical and relevant research projects are available for thesis topics. Students interested

in these programs should contact the department for up-to-date descriptive literature.

Chemical Engineering Areas of Emphasis

Whenever more extensive specialization is desirable than is available through the elective, required courses may be replaced by a predesigned selection of courses. These substitutions must be petitioned to the department faculty through the faculty chair and must meet all academic standards.

The following is a listing of suggested electives for each of several possible areas of emphasis:

Biomedical: CHE 411, 413, 515, 517; AGB 435; IEE 425; EEE 465, 466.

Energy Conversion and Conservation: CHE 553, 556; MEE 583 456, 458, 487.

Environmental Control: CHE 553, 556, 562; CEE 361, 362, 561.

Plant Administration: CHE 553, 581; IEE 431; MGT 301, 300.

Simulation, Systems Control, and Design: CHE 487, 556, 562, 563, 581; IEE 463.

Chemical Engineering Program of Study
Typical Four-Year Sequence
First Year

First Semester *Semester Hours*

CHM	113	General Chemistry	4
MAT	290	Calculus 1	5
ENG	101	English	3
ECE	102	Intro. to Engineering	2
ECE	104	Engrg. Graphics/Design	2
CHE	496	Professional Seminar	0
			16

Second Semester

CHM	116	General Chemistry	4
MAT	291	Calculus II	5
ENG	102	English	3
PHY	115	University Physics	4
PHY	117	Univ. Physics Lab	1
CHE	496	Professional Seminar	0
			17

Second Year

First Semester

CHE	311	Materials/Energy Bal.	3
ECE	122	Computer Programming	2
CHM	331	Gen. Organic Chemistry	3
MAT	274	Elem. Diff. Eqns.	3
MAT	242	Elem. Linear Algebra	2

PHY	116	University Physics 4
PHY	118	Univ. Physics Lab 1
CHE	496	Professional Seminar 0
		18

Second Semester

CHE	312	Chem. Engrg. Princ. 3
ECE	210	Engrg. Mech. 1/Statics 3
CHM	332	Gen. Organic Chemistry 3
CHM	335	Gen. Org. Chem. Lab 1
ECE	304	Elec. Networks 4
		General Studies 3
		17

Third Year

First Semester

CHE	331	Transport Phenomena 3
CHM	441	Gen. Physical Chem. 3
CHM	343	Phys. Chem. Lab 1
ECE	383	Problty/Stats Engrg. 2
		or ECE 384 Numrcl. Analys Engrg.
ECE	312	Engrg. Mech. II/Dynam. 3
		General Studies 4
CHE	496	Professional Seminar 0
		16

Second Semester

CHE	332	Unit Operations 3
CHE	333	Appl. of Trans. Phen. w/Lab 3
CHE	342	Applied ChE Thermo. 3
CHE	364	Chem. Proc. Instrum. 3
CHM	442	Physical Chemistry 3
		General Studies 3
CHE	496	Professional Seminar 0
		18

Fourth Year

First Semester

CHE	432	Princ. of ChE Design 3
CHE	442	Chemical Reactor Design 3
CHE	451	Chem. Engrg. Laboratory 2
CHE	461	Process Control 3
ECE	313	Intro/Deformable Sol. 3
		General Studies 3
CHE	496	Professional Seminar 0
		17

Second Semester

CHE	462	Process Design 3
CHE	492	Chem. Engrg. Projects 2
ECE	334	Electr. Device/Instru. 4

ECE	400	Engrg. Communications 3
		Technical Elective 3
		General Studies 3
CHE	496	Professional Seminar 0
		18

Graduation Requirements: 131 semester hours plus English proficiency.

Department of Civil Engineering

PROFESSORS:
HILL (EC G-120D), BETZ, BLACKBURN, KLOCK, LUNDGREN, O'BANNON, PIAN, RUFF, TUMA

ASSOCIATE PROFESSORS:
BORGO, MATTHIAS, SINGHAL

ASSISTANT PROFESSORS:
DUFFY, HANSEN, HIGGINS

PROFESSOR EMERITUS:
WILSON

Civil engineers are responsible for the planning, design, construction, research and management of many transportation, structural, urban and environmental projects which form the basis of our modern civilization. These include buildings, bridges, highways, dams, canals, irrigation projects, water and waste treatment plants and various multipurpose systems. Education in this field is established on scientific fundamentals with extensive training and practice in one or more areas of emphasis.

Civil Engineering Core

The additional requirements for science, engineering sciences, and design specified in the engineering core are satisfied within the civil engineering core.

			Semester Hours
CEE	321	Structural Analysis 3
CEE	322	Steel Structures 3
CEE	323	Concrete Structures 3
CEE	341	Surveying 3
CEE	351	Soil Mechanics 4
CEE	361, 362	Environmental Engineering 6
CEE	372	Transportation Engineering 3
CEE	381	Hydraulic Engineering 4

CEE   496   Topics in Civil Engineering
                    Practice 3

Special Requirements. Except for Surveying, civil engineering core courses may not be taken without permission until:
(1) The engineering core (except electrical and communications courses) has been completed with an average grade of C or better;
(2) Each of MAT 290, MAT 291, ECE 380 or MAT 274, ECE 210, ECE 312, and ECE 313 (or their equivalent) have been completed with a minimum grade of C; and
(3) For international students, an official TOEFL score of 520 (in addition to the successful completion of the English Composition requirements) has been received.

If attempted for the third time (because of grades of W, I, D, and/or E), MAT 290, MAT 291, ECE 380 or MAT 274, ECE 210, ECE 312, and ECE 313 (or their equivalent) and all civil engineering core courses must be completed with a grade of B or better. All other courses attempted a third time must be completed with a grade of C or better. Failure to meet the requirements in this paragraph will result in automatic disqualification from civil engineering. No civil engineering student will be allowed to attempt a course more than three times.

Bachelor's Degree Program. Requirements for the bachelor's degree include the completion of the Civil Engineering Core courses and 16 credit hours of design and technical electives with an average grade of C or better. Course selections will be made by the student with the advisor's approval. For those students wishing to enter an area of emphasis, the technical electives should be selected from the elective area of particular interest. The graduate courses listed under the elective areas may, with appropriate approvals, be taken for undergraduate credit.

Civil Engineering Designated Design Electives (minimum of 2 required)   *Semester Hours*

CEE	423	Structural Design	3
CEE	452	Foundations	3
CEE	466	Sanitary Systems Design	3
CEE	475	Highway Geometric Design	3
CEE	481	Water Resources Engineering	3

Civil Engineering Elective Areas of Emphasis with Suggested Courses

Structural Engineering—Analysis and design of structures for buildings, bridges, space frames, structural mechanics: CEE 423, 521, 531, 532.

Geotechnic Engineering—Assessment of engineering properties and design utilizing soils and rocks as engineering materials. CEE 452, 552, 555, 556, 557.

Environmental Engineering—Water treatment. Industrial and domestic waste treatment and disposal. Public health engineering. Industrial hygiene. CEE 466, 461, 563, CHM 231, MIC 210, or MIC 201, 202.

Transportation Engineering—Analysis and design of transportation facilities. Transportation planning and economics. Transportation in the urban environment. CEE 475, 471, 572, 574, 575, 576.

Water Resources Engineering—Planning and design of facilities for collection, storage, and distribution of water. Water systems management. Estimating availability of water resources. CEE 481, 581, 582, 583.

Construction Engineering: CEE 344, 573, CON 383, 395, 496.

Civil Engineering Program of Study
Typical Four-Year Sequence
Freshman Year

First Semester

			Semester Hours
PHY	115	University Physics	4
and	117	Univ. Physics Lab	1
MAT	290	Calculus I	5
CHM	114	General Chemistry	4
or CHM	116	General Chemistry	
ECE	102	Intro. to Engineering	2
CEE	496[5]	Topics CE Practice	1
			17

Second Semester

PHY	116	University Physics	4
and	118	Univ. Physics Lab	1
MAT	291	Calculus II	5
ECE	122	Computer Programming	2
or CSC	182	Elem. Fortran Prog.	
		Humanities Elective[2]	2
		Social Science Elective[2]	3
			17

Sophomore Year

First Semester

ECE	380	Ord. Diff. Eqns. Engrs.	3
or MAT 274	Elem. Diff. Eqns.		
ECE	210	Engrg. Mech. I/Statics	3
ECE	104	Engrg. Graphics/Design	2
CEE	341[5]	Surveying	3
ECN	201[2]	Principles Economics	3
ENG	101[1]	First Year English	3
			17

Second Semester

ECE	304	Elec. Ntwk/Sys. Analog	4
		Math Elective[3]	2
ECE	313	Intro/Deformable Sol.	3
ECE	312	Engrg. Mech. II/Dynam.	3
ECE	340	Thermodynamics	3
ENG	102[1]	First Year English	3
			18

Junior Year

First Semester

ECE	334	Electr. Device/Instru.	4
		Math Elective[3]	2
MEE	371	Fluid Mechanics	3
ECE	351	Engrg. Materials	3
CEE	321[5]	Structure Analysis	3
		Humanities Elective[2]	3
			18

Second Semester

CEE	372[5]	Transportation Engrg.	3
CEE	381[5]	Hydraulic Engineering	4
CEE	351[5]	Soil Mechanics	4
CEE	322[5]	Steel Structures	3
CEE	361[5]	Environmental Engrg.	3
			17

Senior Year

First Semester

		Design Elective[4]	3
		Technical Elective[6]	4
CEE	362[5]	Environmental Engrg.	3
CEE	323[5]	Concrete Structures	3
CEE	496[5]	Topics CE Practice	1
		Social Science or	
		Humanities Elective[2]	3
			17

Second Semester

ECE	400	Engrg. Communications	3
		Design Elective[4]	3
		Technical Elective[6]	3
		Technical Elective[6]	3
CEE	496[5]	Topics CE Practice	1
		Social Science Elective[2]	2
			15

Pre-Architecture

Civil engineering provides a mechanism for qualified students to complete their requirements for admission to the College of Architecture while satisfying preliminary prerequisites for further study in structural engineering. Required courses are detailed as Option "B" under Pre-Professional Preparatory Studies in the College of Architecture, page 150. To complete this pre-architectural sequence in two years, students should have done well in algebra, trigonometry and physics in high school. A pre-calculus math course and chemistry may be desirable.

Joint Bachelor of Architecture/Master of Science (Engineering) Degree Program

Students who complete the pre-architecture sequence in civil engineering may satisfy prerequisites for an M.S., with a focus in structural engineering, by completing ECE 351 and CEE 321, 322 and 323 as technical electives during their three-year professional program in the College of Architecture. Upon receipt of their Bachelor of Architecture, such students can obtain their M.S. with 30 additional hours of approved course work if their academic qualifications satisfy graduate college requirements.

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[1] With sufficient ACT or SAT scores, ENG 104 substitutes for both ENG 101 and 102.

[2] ECN 201 is included in the required 6 hrs. of social science which makes up part of the 16 hrs. of social science and humanities (at last 6 of which must be humanities).

[3] Suitable math electives must have MAT 291, MAT 274 or ECE 380 as a prerequisite.

[4] Design electives must be chosen from CEE 423, 452, 466, 475 or 481.

[5] Civil Engineering Core Courses.

[6] Technical electives may be selected from, but are nor restriced to, any of the courses listed for the areas of emphasis.

Department of Electrical and Computer Engineering

The professional activities of electrical engineers directly affect the lives of most of the world's population every day. For example, electrical engineers are responsible for the design and development of complex signal processing systems, such as digital computers, radar, television, telephone switching systems and satellite links. But signal processing is just one area of the electrical engineering profession.

Electrical engineering is designing minuscule integrated circuits, or generating and transmitting vast quantities of electrical energy, or automatically controlling physical devices or processes, or designing patient monitoring systems for hospitals. The development of the microcomputer has expanded the opportunities for electrical engineers to work on diverse products since these devices are now used in automobiles, consumer and office products, entertainment systems, and a vast variety of test and measurement instruments and machine tools.

A student can obtain a B.S.E. degree in electrical engineering by choosing one of two options: the regular electrical engineering option or the computer engineering option. The recent advances in solid state electronics that have produced inexpensive digital computers have resulted in the need for electrical engineers who are well versed in digital computer systems. The computer engineering option in the electrical engineering program is directed toward those students who are certain that they want to work in the computer industry. However, most electrical engineers are involved with computers so that the regular option gives the student a background in computers as well as allowing for the broader background in electrical engineering that most

employers seek. The curriculum is structured so that, by the proper use of technical electives in the senior year, a student could take all the required courses in both options in fulfilling the B.S.E. degree requirements.

Academic Requirements

The curriculum in electrical and computer engineering builds upon the base provided by the engineering core. The curriculum can be divided into three sections: an electrical and computer engineering core, a group of required courses that depends on whether the regular or computer option is chosen, and the technical elective courses. Approved technical elective courses provide students with an opportunity to either broaden their background in electrical and computer engineering or to study, in greater depth, technical subjects in which they have special interests. The successful completion of the curriculum leaves the student prepared to enter industry or to further his or her education in graduate school.

The attention of the student is directed to the retention and graduation requirements of the University and the School of Engineering. In addition to these requirements, a student must earn a grade of C or better in the mathematics and physics courses listed in the first two years of the plan of study given below. The student must also have a grade point average of at least 2.00 for the following group of courses: ECE 304, 334, 352; all courses with an EEE prefix; and any other courses used as technical electives.

Electrical and Computer Engineering Core

The following courses are required for students in electrical and computer engineering to fulfill the requirements of the engineering core and the mathematics electives.

			Semester Hours
MAT	274	Elementary Differential Equations	3
MAT	242	Elementary Linear Algebra	2
MAT	362	Adv. Math for Engineers and Scientists	3
ECE	352	Semiconductors and Devices	3

In addition, the following courses are required to fulfill the electrical and computer engineering core:

			Semester Hours
EEE	301	Electrical Networks	3
EEE	303	Signals and Filters	3
EEE	321	Digital Computer Fundamentals I	4
EEE	322	Digital Computer Fundamentals II	4

| EEE | 340 | Electromagnetic Engineering I | 3 |
| EEE | 496 | Professional Seminar | 0 |

Electrical Engineering Option Core

The following courses are required by the regular electrical engineering option. *Semester Hours*

EEE	360	Electromechanics	3
EEE	436	Fundamentals of Solid State Devices	3
EEE	440	Electromagnetic Engineering II	4
EEE	455	Communication Systems	4
EEE	480	Feedback Systems	4

Computer Engineering Option Core

The following courses are required by the computer engineering option *Semester Hours*

EEE	422	Digital Computer Design I	3
EEE	423	Digital Computer Design II	4
EEE	424	Computer Structures I	3
EEE	425	Digital Systems Circuits	3
EEE	426	Digital Circuits Laboratory	1

Technical Electives in Electrical and Computer Engineering

The regular program in electrical and computer engineering has a minimum total of 15 semester hours of approved technical elective courses. The computer option has a total of 19 hours of approved technical electives. Technical electives may be selected from one or more of the following technical areas of emphasis:

Antennas and Microwaves: EEE 441, 443, 445, 448, 541, 543, 547.

Computer Applications: EEE 406, 411, 428, 459, 482, 511, 522, 583.

Computer Organization and Architecture: EEE 411, 514, 520, 523, 524, 526, 528, 559.

Controls: EEE 411, 427, 428, 433, 459, 470, 482, 550, 582.

Digital Logic and Circuits: EEE 427, 435, 436, 451, 515, 525, 527, 528

Electrical Communications: EEE 451, 459, 554, 559; ECE 383; ASE 485.

Electrical Networks: EEE 402, 405, 406, 428, 433, 445, 470, 504.

Lasers and Coherent Optics: EEE 434, 448, 548, 549.

Power System and Machinery: EEE 470, 471, 472, 473, 474, 475; MEE 411, 412, 413, 415, 417; (ECN 451 and GCU 364 recommended for social science elective).

Software Engineering: EEE 411, 482, 511, 514, 523; CSC 340, 430, 440.

Solid State Electronics: EEE 425, 426, 432, 433, 434, 435, 438, 525, 531, 533.

With the approval of the student's faculty advisor, technical electives may also be chosen from other courses in engineering, mathematics, the sciences, and business administration at or above the 300-level.

Program of Study. The first two years of course work are identical for students in either the regular or computer options. Slight differences occur in the junior year, and the senior year is considerably different for the two options.

Electrical Engineering Program of Study
Typical Four-Year Sequence
Freshman Year *Semester Hours*

First Semester

MAT	290	Calculus	5
CHM	114	or 116 Chemistry	4
ECE	102	Intro. to Engrg.	2
ECE	104	Engrg. Graphics	2
Eng	101	English	3
			16

Second Semester

MAT	291	Calculus II	5
PHY	115	Univ. Physics	4
PHY	117	Physics Lab	1
ECE	122	Computer Prog.	2
HU/SS		Elective	2
ENG	102	English	3
			17

Sophomore Year

First Semester

MAT	274	Differential Eq.	3
MAT	242	Linear Algebra	2
EEE	321	Dig. Comp. Fund. I	4
ECE	210	Statics	3
PHY	116	Univ. Physics	4
PHY	118	Physics Lab	1
			17

Second Semester

| MAT | 362 | Adv. Math for Engrs. | 3 |

ECE	304	Elec. Ntwks. & Analogies	4
EEE	322	Dig. Comp. Fund. II	4
ECE	312	Dynamics	3
ECN	201	Economics	3
			17

Regular Option, Electrical Engineering:
Junior Year
First Semester   *Semester Hours*

EEE	340	Electromagnetics I	3
ECE	334	Electronic Dev. & Inst.	4
EEE	301	Networks	3
ECE	340	Thermodynamics	3
HU/SS		Elective	3
			16

Second Semester

EEE	440	Electromagnetics II	4
EEE	360	Electromechanics	3
EEE	303	Signals & Filters	3
ECE	352	Semiconductors	3
HU/SS		Elective	4
			17

Senior Year
First Semester

EEE	480	Feedback Sys.	4
EEE	455	Comm. Sys.	4
EEE	436	Solid State Dev.	3
ECE	313	Deformable Solids	3
		Tech. Electives	4
			18

Second Semester

EEE	496	Prof. Seminar	0
		Tech Electives	11
		HU/SS Elective	4
ECE	400	Engrg. Commun.	3
			18

Computer Option, Electrical Engineering
Junior Year
First Semester

EEE	422	Computer Design I	3
ECE	334	Electronic Dev. & Inst.	4
EEE	301	Networks	3
ECE	340	Thermodynamics	3
		HU/SS Elective	3
			16

Second Semester

EEE	423	Computer Design II	4
EEE	340	Electromagnetics I	3
EEE	303	Signals & Filters	3
ECE	352	Semiconductors	3
		Tech. Electives	3
		HU/SS Elective	2
			18

Senior Year
First Semester

EEE	424	Computer Structures	3
EEE	425	Digital Ckts.	3
EEE	426	Digital Ckts. Lab	1
ECE	313	Deformable Solids	3
		Tech. Electives	4
		HU/SS Elective	3
			17

Second Semester

EEE	496	Prof. Seminar	0
		Tech. Electives	12
		HU/SS Elective	3
ECE	400	Engrg. Commun.	3
			18

Department of Industrial and Management Systems Engineering

PROFESSORS:
SMITH (EC G-140), BEDWORTH, YOUNG
ASSOCIATE PROFESSORS:
ANDERSON, BAILEY, DEAN, MOOR, ROLLIER
ASSISTANT PROFESSOR:
MACKULAK
PROFESSOR EMERITUS:
HOYT

Industrial engineering provides a multi-disciplinary approach for analyzing, understanding and resolving problems within organizations. Emphasis is on objective and analytical procedures that facilitate sound decision making for problem solution. Industrial engineering has applications in all areas of the economy (industrial, service, commercial and government). It is the branch of engineering concerned not only with things but with people, making industrial engineers a prime source of management talent. Typical organi-

zations employing industrial engineers include hospitals, government at all levels, transportation, construction, banks, processing, facilities design, manufacturing and warehousing.

Since modern industrial engineering approaches for designing effective operational systems are universally applicable to all forms of enterprise, students must gain competence in a number of areas of knowledge and be capable, through application of such knowledge, of understanding complex systems.

The purpose of the Industrial Engineering field of specialization, therefore, is to provide each student with an understanding of (1) how operational systems are designed, (2) how each component of a system contributes to overall system effectiveness, (3) the methodologies of systems analysis, (4) the probabilistic nature of events, (5) the human component in complex systems and (6) organization and management to facilitate planning and control.

Industrial Engineering. The following course is required as a part of the Engineering Core:

			Semester Hours
ECE	383	Probability and Statistics for Engineers	2

In addition, the following courses are required for the Industrial Engineering Field of Specialization:

ACC	498	Pro-Seminar: Cost Accounting for Engineers	3
ASE	485	Engineering Statistics	3
IEE	300	Economic Analysis for Engineers	2
IEE	362	Work Analysis and Design	3
IEE	372	Facilities Analysis and Design	3
IEE	374	Quality Control	3
IEE	431	Engineering Administration	3
IEE	461	Planning, Scheduling and Control of Resources	3
IEE	473	System Applications of Linear Programming	3
IEE	475	Fundamentals of Simulation	3
IEE	476	Introduction to Operations Research Models	3
IEE	492	Project in Design and Development	3
MEE	332	Production Processes	3
Area of Emphasis (technical electives)			13

Technical Electives in Industrial Engineering

In consultation with an advisor, technical electives may be selected from one or more of the following areas of emphasis. The graduate courses listed under these areas may, with appropriate approvals, be taken for undergraduate credit.

Production Systems: IEE 463, MET 301, MET 306, MGT 331, MGT 432, IEE 561, IEE 570.

Computer-aided Processes: IEE 463, CHE 461, CSC 383, ESE 401, MET 306, MET 403.

Quality Control/Reliability: IEE 330, IEE 474, AET 308, ASE 483, MEE 441, MEE 442, IEE 570.

Engineering Management: IEE 411, ADS 305, FIN 300, MGT 413, MGT 432, IEE 510, IEE 531.

Information Systems: IEE 330, IEE 422, CSC 304, CSC 410, CSC 412, IEE 577.

With the approval of the student's advisor, technical electives may also be chosen from other courses in engineering, mathematics, the sciences, and business administration at or above the 300-level.

Industrial Engineering Program of Study
Typical Four-Year Sequence
Freshman Year

First Semester

			Semester Hours
ECE	102	Intro. to Engineering	2
ECE	104	Engrg. Graphics/Design	2
ENG	101[1]	First Year English	3
MAT	290	Calculus I	5
PHY	115	University Physics	4
PHY	117	Univ. Physics Lab	1
			17

Second Semester

CHM	114[2]	General Chemistry	4
ENG	102[1]	First Year English	3
MAT	291	Calculus II	5
PHY	116	University Physics	4
PHY	118	Univ. Physics Lab	1
			17

Sophomore Year

First Semester

ECE	122	Computer Programming	2
ECE	210	Engrg. Mech. 1/Statics	3
ECN	201[3]	Principles Economics	3
MAT	242	Elem. Linear Algebra	2
MAT	274	Elem. Diff. Equations	3
General Studies Elective[3]			3
			16

Second Semester

ECE	312	Engrg. Mech. II/Dynam	3
ECE	383	Prob. & Stat./Engrs.	2
IEE	300	Econ. Analysis/Engrs.	2
MEE	332	Production Processes	3
General Studies Electives[3]			7
			17

Junior Year

First Semester

ACC	498	PS: Cost Acctg./Engrs.	3
ECE	304	Elec. Ntwk./Sys. Analog	4
ECE	313	Intro./Deformable Sol.	3
IEE	362	Ind. Engrg. Analysis	3
IEE	374	Quality Control	3
			16

Second Semester

ASE	485	Engrg. Statistics	3
ECE	350	Struc./Proprts. Matls.	3
IEE	372	Fac. Anal. & Design	3
General Studies Elective[3]			3
Technical Electives[4]			6
			18

Senior Year

First Semester

ECE	340	Thermodynamics	3
IEE	431	Engrg. Administration	3
IEE	461	Plan. Sched. & Con. Res.	3
IEE	473	Sys. Appl. of Lin. Prog.	3
IEE	475	Fund. of Simulation	3
Technical Elective[4]			3
			18

Second Semester

ECE	334	Electr. Device/Instru.	4
ECE	400	Engrg. Communication	3
IEE	476	Intro. Oper. Res. Models	3
IEE	492	Proj. in Design & Dev.	3
Technical Elective[4]			4
			17

Graduation Requirements: 136 semester hours minimum (without English exemption). Scholastic index of 2.0 or better (C average)

[1] Students with ACT English test score of 25 (SAT 650) or better take ENG 104. Score of 23 or 24 (SAT 600 to 650) qualifies for ENG 101 exemption test. Others take ENG 101 without graduation credit, followed by ENG 102 unless exempted by test (possible with an A in ENG 101).

[2] No high school chemistry, take CHM 113 and CHM 116.

[3] General Studies courses should be selected from the list of humanities and social science courses approved for School of Engineering and must include ECN 201.

[4] Technical electives should be selected from an area of emphasis.

Department of Mechanical and Energy Systems Engineering

PROFESSORS:
METZGER (EC G-133), ALLEN, BACKUS, BEAKLEY, COOPERRIDER, DAVIDSON, DITSWORTH, EVANS, FLORSCHUETZ, JACOBSON, JANKOWSKI, LOGAN, PRICE, RICE, SHAW, WOOD

ASSOCIATE PROFESSORS:
AUTORE, JORGL, McKLVEEN

ASSISTANT PROFESSORS:
HIRLEMAN, LIMBERT, McNEILL, NEITZEL

Mechanical engineering is one of the most broadly applicable fields of engineering. Therefore, a major strength of a mechanical engineering degree is the flexibility it provides in future employment opportunities for the graduate. For example, mechanical engineering is usually the principal engineering discipline in the aerospace, automotive, and nuclear power industries, to name but a few.

Of the established fields of engineering, mechanical is the field most closely allied to energy, its production (i.e., conversion of one form to another), transportation and end use. In this context, it is natural to find energy systems engineering housed in the same department with mechanical engineering at ASU.

Both the mechanical engineering and the energy systems engineering curricula can serve as entry points to immediate professional employment or to graduate study. The emphasis in both fields is on development of fundamental skills which will have long-lasting utility in our rapidly changing technical society. Employers' desire for this emphasis is a strong point in favor of these choices of curricula over technology programs or special programs which emphasize primarily current applications or specific industries.

Both options in the department build on the broad exposure in mathematics, physics and the engineering sciences offered by the General Studies requirements and by the engineering core. Both also build on a common department core with technical electives

that allow specialization in a number of areas. Analytical capability is fostered in advanced engineering courses while ample laboratory experiments demonstrate the application of analyses and principles to practical systems.

Mechanical Engineering Option. More than a century of educational and professional development provides an established foundation for mechanical engineering graduates seeking employment opportunities now and in the future. Employers recognize that mechanical engineering students are trained in the areas of fluid mechanics (flows of gases and liquids such as in pipe lines or over objects), the conversion of energy (such as in solar devices, gas turbine engines and nuclear reactors), the transmission of energy (in thermal systems via heat exchangers or in mechanical systems via gear boxes and shafts), in creative design (in configuring of systems and machine parts to meet functional and failure prevention requirements and in novel approaches to problem solving), and in experimental testing (such as appropriate measuring techniques and control of meaningful tests).

Mechanical engineers are found throughout modern society in an extremely wide variety of capacities. They are employed in technical positions by government, industry and consulting firms to seek new knowledge through research, to do creative design and to build and control the modern devices and systems needed by society. They are also sought for non-technical fields such as sales and management because of their broad understanding of technical problems and their methodical approach to problem solving.

At the undergraduate level, students may elect to specialize in a variety of areas of emphasis: aerospace; biomechanical; computer methods; control and dynamic systems; design, engineering mechanics manufacturing; stress analysis, failure prevention, and materials; and thermosciences. A general area of emphasis is also available and can be used to generate a pre-approved sequence that is of particular interest to the student.

Energy Systems Engineering Option. Awareness of the world's mounting and chronic energy problems has been increasing ever since the world oil crises in 1973. In an effort to solve these problems and to lessen their impact on economies and lifestyles, both government and industry have increased their commitments to production, conservation and research. This in turn has stimulated employment of engineers and scientists trained in fields that relate to this problem area.

It is the purpose of this option to build on the traditional mechanical engineering areas of fluid flow, thermodynamics, heat transfer, design and controls with student-selected courses in the following areas of emphasis: alternative sources and conversion; conventional sources and conversion; electrical power and distribution; environmental; and nuclear. A general area of emphasis is also available to allow a student to generate a pre-approved sequence of interest.

Minimum Scholastic Requirements. Both option areas require that students attain at least a C (2.00) average in the combined engineering, department and specialty cores in order to be eligible for graduation. Also, the department may require additional or remedial work for those students who have demonstrated a trend of academic difficulty.

Department Core

Among the options listed on page 258 as part of the engineering core requirements, mechanical and energy systems engineering students are required to select the following:

			Semester Hours
CHM	114	General Chemistry for Engineers .	4
		or CHM 116 General Chemistry and Lab	
ECE	340	Thermodynamics	3
ECE	350	Structure and Properties of Materials	3

Also, ECE 384 Numerical Analysis and ECE 386 Partial Differential Equations must be used to fulfill the "approved mathematics content electives" in the General Studies requirements. In addition, the following courses are required to fulfill the requirements of the department core:

			Semester Hours
CSC	383	Applied Fortran Programming	3
or		EEE 321 Digital Computer Fundamentals	(4)
or		IEE 463 Computer-Aided Processes .	(3)
ESE	415	Vibrations	3
or		ESE 422 Mechanics of Materials	(3)
IEE	300	Economic Analysis for Engineers .	2
MEE	365	Dynamic Systems and Control	4
MEE	371	Fluid Mechanics	3
MEE	372	Fluid Mechanics	4

MEE   382   Thermodynamics 3
MEE   441   Principles of Design 3
MEE   445   Engineering Design 3
MEE   488   Heat Transfer 3
MEE   491   Experimental Mechanical
                   Engineering 3
MEE   492   Mechanical Engineering Projects . 2
PHY   361   Modern Physics 3

Areas of Emphasis

In both option areas, programs arc completed
with 11 or 12 hours of course work (depending
on the computer elective in the department
core) chosen from the lists below in the stu-
dent's area of emphasis. A 2 or 3 semester
hour course in mathematics, computer pro-
gramming or the natural environment (BIO
320 or CEE 361) may also be used (300-level
or above). In both options, a student may,
with prior approval of the department Under-
graduate Committee, select a general area or
a set of courses that would support a career
objective not covered by the following catego-
ries.

Mechanical Engineering Areas of Emphasis

Aerospace. MEE 446, 450, 452, 453, 455,
456, 471, 487; ESE 410, 413, 415, 422, 480.

Biomechanical. MEE 321, 412; CHE 411,
571 (recommended); EEE 301, 439.

Computer Methods. CSC 383; MEE 471;
ASE 483, 485, 486, 487; CHE 581; ECE 383;
IEE 475; MAT 464, 465.

Control and Dynamic Systems. MEE 465;
ECE 382 (or MAT 213), 383; EEE 321, 322,
360, 439, 483; ESE 413, 415; IEE 463; MAT
461.

Design. MEE 321, 332, 442, 458, 465, 487;
ECE 351, 383; EEE 439; ESE 401, 413, 415,
422.

Engineering Mechanics. MEE 321, 442,
471; MAT 465, 466; ECE 382 (or MAT 213);
ESE 410, 413, 415, 422, 426, 430.

Manufacturing. MEE 321, 332, 442, 465;
ESE 355, 422, 450, 453, 455; IEE 374, 411,
431, 461, 463.

*Stress Analysis, Failure Prevention and
Materials.* MEE 321, 489; ECE 383; EEE
439; ESE 355, 422, 426, 450, 451, 453, 455.

Thermosciences. MEE 383, 386, 411, 446,
450, 452, 453, 455, 456, 471, 487, 489.

Energy Systems Engineering Areas of Emphasis

Alternative Sources and Conversion. MEE
386, 411, 446, 458, 487, 489; ECE 352; EEE
360, 436, 438, 439; GLG 301.

Conventional Sources and Conversion. ECE
383; MEE 411, 455, 456, 465; EEE 439; ESE
415, 422.

Electrical Power and Distribution. MEE
411, 415, 442, 455, 465, 487; EEE 301, 360,
470, 471, 473, 474; ESE 415, 422.

Environmental. MEE 386, 412, 465; BIO
320, 330; CEE 361, 362, 461; GLG 302.

Nuclear. MEE 411, 412, 413, 415, 417,
442, 446, 465, 487; EEE 439; ESE 415, 422;
GLG 321.

Mechanical and Energy Systems Engineering Program of Study
A Typical Four-Year Sequence
Freshman Year

First Semester   *Semester Hours*

MAT   290   Calculus I 5
CHM   114   General Chemistry 4
                   or
CHM   116   General Chemistry .... (4)
ECE   102   Intro. to Engineering 2
ENG   101   First Year English 3
HUM or SS[1] Elective 3
                                                                        17

Second Semester
MAT   291   Calculus II 5
PHY   115   Univ. Physics 5
         and 117
ECE   104   Engrg. Graphics/Design 2
ECE   122   Computer Programming 2
                   or
CSC   182   Elem. Fortran Prog. .... (2)
ENG   102   First-Year English 3
                                                                        17

Sophomore Year
First Semester
MAT   274   Elem. Diff. Eqns. 3
                   or
ECE   380   Ord. Diff. Eqns. Engrs. .... (3)
PHY   116   University Physics 5
         and 118
ECE   210   Engrg. Mech. I/Statics 3

ECE   384   Numrcl. Analys. Engr. 2

HUM or SS[1] Elective 4

                                        17

Second Semester

IEE   300   Econ. Analysis Engr. 2

ECE   304   Elec. Ntwk/Sys. Analog 4

ECE   312   Engrg. Mech. II/Dynam. 3

ECE   313   Intro./Deformable Sol. 3

ECE   340   Thermodynamics 3

ECE   386   Part. Diff. Eqns. 2

                                          17

Junior Year

First Semester

ECE   334   Electr. Device/Instru. 4

ECE   350   Stru./Proprts. Matls. 3

MEE   371   Fluid Mechanics 3

MEE   382   Thermodynamics 3

PHY   361   Modern Physics 3

                                        16

Second Semester

Computer Elective[2] .... 3 (or 4)

MEE   372   Fluid Mech. 4

MEE   441   Prin. of Des. I 3

MEE   488   Heat Transfer 3

MEE   365   Dyn. Sys. & Control 4

                                 17 (or 18)

Senior Year

First Semester

ECE   400   Engrg. Communications 3

ESE   415   Vibrations 3

                 or

ESE   422   Mech. of Matls. .... (3)

MEE   491   Exp. Mech. Engr. 3

Tech El[3] .... 3 (or 2)

Tech El[3] 3

HUM or SS[1] 3

                                 18 (or 17)

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[1] See the requirements for behavioral and social sciences (SS) and humanities and fine arts (HUM) in the General Studies section under the School of Engineering.

[2] Choose one of CSE 383 (3), EEE 321 (4), IEE 463 (3).

[3] Technical electives are to be selected from the course groupings under the Areas of Emphasis section above.

Second Semester

MEE   445   Engr. Design 3

MEE   492   Mech. Engr. Proj. 2

Tech El[3] 3

Tech El[3] 3

HUM or SS[1] Elective 6

                                        17

Programs in Special and Interdisciplinary Engineering Studies

The programs of Special Engineering Studies and of Interdisciplinary Engineering Studies accommodate students whose educational objectives require more intensity of concentration on a particular subject or more curricular flexibility within an engineering discipline than the traditional departmental fields generally permit. These fields of specialization are School of Engineering programs. Unlike the departmental field areas, however, there is not a separate faculty. The faculty teaching and advising in these programs are from the School of Engineering.

For many students, engineering studies form the basis of preparation for professional engineering work where proficiency in the application of science and the physical and social technologies are brought to bear on problems of large scope. The necessary breadth that these students seek often is not obtainable by branching from existing engineering fields. Rather, especially designed programs of course work that merge the required principles and approaches drawn from all fields of engineering and other pertinent disciplines are desired. As an answer to this need, two types of course arrangements are available: (1) the Bachelor of Science in Engineering degree special programs; and (2) interdisciplinary programs that lead to the degree Bachelor of Science.

The B.S.E. Special Programs are designed primarily for students intending to pursue engineering careers at a professional level in industry or graduate studies. The B.S. Interdisciplinary Programs accommodate those students who desire the integrity of an engineering education but plan to enter professions other than engineering, or particularly to serve

society in socially relevant activities. Both are developed beyond the General Studies and the engineering core.

The curricula leading to both the Bachelor of Science in Engineering (B.S.E.) and the Bachelor of Science (B.S.) have been accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET) under the categories Engineering Science and Engineering.

Special Engineering Studies—B.S.E.

Bioengineering. Bioengineering bridges the engineering, physical, and life sciences. Engineers, physicists and mathematicians routinely join with the biologist and physician in developing techniques, equipment and materials. The multidisciplinary approach to solving problems in medical treatment and research has evolved from exchanges of information between specialists of the concerned areas. Advanced study beyond the bachelor's degree is acutely needed in bioengineering, requiring a depth of knowledge from at least two diverse disciplines. This program emphasis is especially designed for entry into this type of work.

The following courses are required as a part of the engineering core:

			Semester Hours
CHM	116	General Chemistry	4
CHM	441	General Physical Chemistry	3
CHM	442	General Physical Chemistry	3
ECE	383	Probability and Statistics	2

In addition, the following courses are required:

AGB	435	Animal Physiology	4
CHE	331	Transport Phenomena	3
		or MEE 371 Fluid Mechanics	
CHE	364	Chemical Process Instrumentation	3
CHE	411	Biomedical Engineering	3
CHE	413	Physiological Instrumentation	3
CHE	492	Chemical Engineering Projects	2
CHM	113	General Chemistry	4
CHM	331	General Organic Chemistry	3
CHM	332	General Organic Chemistry	3
CHM	335	General Organic Chemistry Lab	1
CHM	361	Principles of Biochemistry	3
EEE	465	Clinical Engineering I	3
EEE	466	Clinical Engineering II	3

Technical Electives
(including one course each of engineering sciences and engineering design type content) 13

Computer System Engineering. This program is administered by the Department of Computer Science (see page 229).

Manufacturing Engineering. Manufacturing engineering is concerned with the applications of the principles of science to increase productivity in industry. This involves the design of products and of manufacturing facilities so that consumer goods may be made with the least labor content, minimum material content, and the lowest investment of capital. This involves a thorough knowledge of the principal manufacturing processes and how these may be organized to produce a required end result. An important aspect of manufacturing engineering is the evaluation of several possible functional designs from the point of view of manufacturability. Construction materials play an important role in any manufacturing process and it is important that a manufacturing engineer have a thorough knowledge of materials properties and the application of the principles of materials science to practical situations. Another important aspect of manufacturing engineering is engineering economics. This becomes evident when it is realized that the success of most manufactured products is evaluated in terms of the following considerations: (1) ability to do the intended job; (2) initial cost; (3) useful life.

The following courses are required as a part of the engineering core:

			Semester Hours
ECE	350	Structure and Properties of Materials	3
ECE	383	Probability and Statistics for Engineers	2

In addition, the following courses are required:

ESE	401	Manufacturing Engineering	3
ESE	415	Vibration Analysis	3
ESE	422	Mechanics of Materials	3
ESE	450	Mechanical Properties of Solids	3
ESE	455	Physical Metallurgy	3
IEE	300	Economic Analysis for Engineers	2
IEE	374	Quality Control	3
IEE	431	Engineering Administration	3
IEE	463	Computer-Aided Processes	3
MEE	332	Production Processes	3

MEE	371	Fluid Mechanics	3
MEE	441	Principles of Design I	3
MET	306	N/C Manual Programming	3
Technical Electives			13

Materials Science. Materials science is concerned with a fundamental study of materials utilized by engineers in order to acquire knowledge and understanding of their behavior in the various environments experienced by engineered systems. Conventional techniques such as mechanical testing and optical metallography as well as modern methods such as X-ray diffraction and Auger spectroscopy are utilized in this study. The knowledge gained is applied to the solution of materials problems which may consist of selecting the best existing material for a certain application, or to develop a new material to meet some new demand of our advancing technology, or perhaps to combine existing materials and processes to build a new electronic device that can perform in a new or more efficient way.

Materials are truly the working media of our society and as such they play a crucial role in the way we live. The impact of materials on the technological ascent of man is reflected in the names Stone, Bronze and Iron Ages attached to stages of development of our civilization. Today materials scientists are heavily involved in industries such as aerospace, solid state electronics, electric power generation, transportation, environmental engineering and utilization of our natural resources, to name a few. This program prepares students for employment in a variety of industries, or for entry into an advanced degree program.

The following course is required as a part of the engineering core:

Semester Hours

ECE	350	Structure and Properties of Materials	3

In addition, the following courses are required:

ECE	352	Semiconductors and Devices	3
CHE	364	Chemical Processes Instrumentation	3
CHM	441	General Physical Chemistry	3
ESE	355	Metallurgy	3
ESE	450	Mechanical Properties of Solids	3
ESE	451	X-Ray and Electron Diffraction	3
ESE	453	Corrosion and Corrosion Control	3
ESE	455	Physical Metallurgy	4

ESE	492	Project in Design and Development	3
MEE	371	Fluid Mechanics	3
PHY	361	Modern Physics	3
Technical Electives (including one course of engineering design type content)			17

Nuclear Sciences. The nuclear sciences curriculum encourages an individualized program based on the student's own career interests and objectives. The program provides a strong foundation in basic engineering and nuclear concepts. Electives are generally taken during the junior and senior years and must be approved by a designated faculty advisor. The electives should focus on a technical or environmental area associated with the (1) discovery, development or utilization of energy resources, or (2) materials or products which use, release or may be affected by radiation.

Individual elective programs may also be aligned with a traditional discipline such as chemical, civil, electrical or mechanical engineering. They may be tailored toward specific energy resources such as those associated with fission, fusion, solar, geothermal, fossil fuels or synthetic fuels such as oil shale. They may be structured for specific high-demand areas such as radiation health physics, corrosion and radiation effects on materials, computer-aided operation and accident analysis at power generation facilities, or designing better man-machine interfaces. Finally, there are opportunities to pursue selected areas such as waste disposal, radiation effects on electronics in space, nuclear applications in forensics, low-level radiation measurements of our natural radiation environment, or anomalies from trace amounts of natural radioactivity in computer microprocessing circuits.

Motivated students who have demonstrated scholastic excellence will be encouraged to participate in summer research programs at national laboratories or with an appropriate industry. In addition, students may elect an independent study or senior research project. The exercise provides an opportunity to assemble and apply the newly acquired engineering knowledge and laboratory skills to an in-depth investigation of a real world problem.

The following course is required as a part of the engineering core:

Semester Hours

ECE	350	Structure and Properties of Materials	3

or ECE 352 Semiconductors and Devices

In addition, the following courses are required:

CHE	331	Transport Phenomena	3
CHE	333	Applications of Transport Phenomena	3
ESE	422	Mechanics of Materials	3
MEE	365	Dynamics Systems and Controls ... or EEE 480 Feedback Systems	4
MEE	411	Nuclear Engineering	3
MEE	412	Health Physics Principles and Radiation Measurements	3
MEE	413	Reactor Safety Analysis	3
MEE	415	Nuclear System Design	3
MEE	417	Nuclear Engineering Lab	3
PHY	361	Modern Physics	3
Technical Electives			20

System Engineering. The increasing involvement of engineers in vital issues of the public sector has emphasized the need for breadth in technical perspective. In addition the complexity of technology demands the depth of technical insight which is characteristic of traditional engineering disciplines. Coping with environmental issues, resource management, public policy formulation and decision criteria in the public arena requires this perspective and insight. The systems for transportation, urban development, pollution control and law enforcement are examples of bridges between public concerns and engineering activities. A solid foundation in science and technology with an engineering orientation is essential to the development and implementation of workable design concepts compatible with the needs of society. The system engineering program is designed to provide this foundation in three parts, as follows: the basic elements of system theory and its application are introduced from the point of view of the traditional engineering disciplines—chemical, civil, electrical, mechanical and industrial; the technical electives are sufficient to provide a substantial introduction to specialization in one of these fields; and General Studies requirements include courses specifically oriented to the relationships among technology, society, human values and public policy.

The following courses are required as a part of the General Studies requirement: *Semester Hours*

HUP	402	Technology, Society and Human Values	3
STE	403	Technology and Public Policy	3

The following courses are required as a part of the engineering core:

ECE	382	Linear Algebra for Engineers .... or MAT 242 Elementary Linear Algebra	2
ECE	383	Probability and Statistics for Engineers	2

In addition, the following courses are required:

CEE	361	Environmental Engineering	3
CHE	311	Materials and Energy Balance	3
CHE	331	Transport Phenomena	3
CHE	461	Process Control	3
EEE	301	Electrical Networks	3
EEE	303	Signals and Filters	3
EEE	321	Digital Computer Fundamentals I	4
EEE	322	Digital Computer Fundamentals II	4
EEE	455	Communication Systems I	4
IEE	473	System Applications of Linear Programming	3
IEE	476	Introduction to Operations Research Models	3
MEE	365	Control System Principles	4
Technical Electives			11

Urban Systems Engineering. Frequently civilizations are measured by their cities. For the past 100 years America has been moving toward urbanization, and forecasts indicate that this trend will likely continue for the next two decades. The problems of urbanization extend over a wide range of physical, social and economic conditions. These problems are also affected by scale, thus an urban area with a concentration of 1,000,000 people is not always functionally the same as another area with a population of 100,000. The problems of urban areas are highly interrelated and interdisciplinary. This program emphasis leads into such areas as urban engineering, transportation planning, environmental engineering, city planning, urban management and decision making, or perhaps serving the electorate directly.

The following courses are required as a part of the General Studies requirement:

Semester Hours

PGS	100	Introduction to Psychology	3
SOC	301	Principles of Sociology	3

The following courses are required as a part of the engineering core:

ECE 382 Linear Algebra for Engineers 2
or MAT 242 Elementary Linear Algebra

ECE 383 Probability and Statistics for
Engineers 2

In addition, the following courses are required:

ASE 485 Engineering Statistics 3

CEE 371 Urban Problems 3

CEE 372 Transportation Engineering 3

CEE 461 Environment and Society 3

CEE 471 Planning and Design of
Urban Systems 3

CEE 492 Project in Design and Development 3
or approved design elective)

IEE 300 Economic Analysis for Engineers . 2

IEE 431 Engineering Administration 3

IEE 473 System Applications of Linear
Programming 3

IEE 476 Introduction to Operation
Research Models 3

MEE 371 Fluid Mechanics 3

PUP 475 Interdisciplinary Urban Planning . 3

Technical Electives (including one course of
engineering design type content) 16

Interdisciplinary Engineering Studies—B.S.

Business and Pre-Law. This program accommodates especially those engineering students whose primary intent is to earn a law degree or a graduate degree in business administration. The success with which engineers have risen to positions of leadership in business and government is well established. It is predicted that with the rapid increase in technological advance on every hand, opportunities for engineers to enter business and legal careers will be enhanced to an even greater degree in the future. Students who complete this program may complete requirements for the degree Master of Business Administration in one calendar year.

The following course is required as a part of the General Studies requirement: *Semester Hours*

ECN 202 Principles of Economics 3

The following course is required as a part of the engineering core:

ECE 382 Linear Algebra for Engineers 2
or MAT 242 Elementary Linear Algebra

In addition, the following courses are required:

ACC 101 Elementary Accounting 3

ACC 102 Elementary Accounting 3

ADS 305 Business Law 3

CSC 304 Introduction to Cobol 3

ASE 485 Engineering Statistics 3

FIN 300 Fundamentals of Finance 3

IEE 300 Economic Analysis for Engineers . 2

IEE 362 Work Analysis and Design 3
or IEE 422 Information Acquisition

IEE 461 Planning, Scheduling and Control
of Resources 3

IEE 473 Systems Applications of Linear
Programming 3

IEE 492 Project in Design and
Development 3

MGT 301 Principles of Management 3

MKT 300 Principles of Marketing 3

Engineering Technical Electives (including one
course each of engineering sciences and
engineering design type content) 13

Geological Engineering. This program emphasis incorporates the joint application of engineering and geological principles to the planning, analysis and design of engineering projects directly related to the earth, its materials, structures and forces. The goal of the program is to investigate the physical properties of the shallow portions of the earth's crust which influence the design and construction of engineering structures such as foundations, excavations, dams, highways and sites for waste disposal. Additionally, the geological factors associated with land use planning and with the occurrence of petroleum and mineral deposits are encompassed within the program.

The following course is required as a part of the engineering core: *Semester Hours*

ECE 351 Engineering Materials 3

In addition, the following courses are required: *Semester Hours*

CEE 351 Soil Mechanics 4

CEE 452 Foundations 3

CEE 492 Project in Design
and Development 3

(or approved design elective)

CEE 552 Geological Engineering 3

GLG 101 Physical Geology 4

GLG 310 Structural Geology 3

GLG 321 Mineralogy 4

GLG 418 Geophysics 3

GLG 423 Optical and X-Ray Techniques 2
GLG 424 Petrology-Petrography 4
MEE 371 Fluid Mechanics 3
Engineering Technical Electives
   (including one course each of engineering sciences and engineering design type content)
   (An approved summer engineering-geology field course is also highly recommended) 15

Pre-Medical. In the past decade the interrelation between engineering and medicine has become vigorous and exciting. Our rapidly expanding technology dictates that engineering will continue to become increasingly involved in all branches of medicine. As this develops, so will the need for physicians trained in the engineering sciences--medical men and women with a knowledge of computer technology, operations research, electronics and cybernetics. This program emphasis would be of special interest to students desiring entry into a medical college and whose medical interests lie in research, aerospace and undersea medicine, artificial organs, prostheses, or biophysics. Since both engineering and medicine have as their goal the well-being of man, this program could be compatible with any field of medical endeavor.

The following courses are required as a part of the engineering core:

			Semester Hours
CHM	116	General Chemistry	4
CHM	441	General Physical Chemistry	3
CHM	442	General Physical Chemistry	3
ECE	383	Probability and Statistics	2

In addition, the following courses are required:

BIO	101	Biological Principles and Processes	4
BIO	102	Biological Principles and Processes	4
CHE	311	Material and Energy Balances	3
CHE	331	Transport Phenomena	3
		or MEE 371 Fluid Mechanics	
CHE	364	Chemical Process Instrumentation	3
CHE	411	Biomedical Engineering	3
CHE	413	Physiological Instrumentation	3
CHE	492	Chemical Engineering Projects	2
CHM	113	General Chemistry	4
CHM	331	General Organic Chemistry	3
CHM	332	General Organic Chemistry	3
CHM	335	General Organic Chemistry Laboratory	1

CHM 336 General Organic Chemistry Laboratory 1
EEE 465 Clinical Engineering 1 3
Approved Pre-Medical Elective 3
Engineering Technical Electives
   (including one course each of engineering sciences and engineering design type content) 8

Analysis and Systems

ASE 200 Engineering Drawing. (2) F
Further study of orthographic projection, auxiliary views, section views, dimensioning, and standard engineering drawing conventions. Drafting skills and precision dimensioning techniques for production drawings of typical engineering parts. Prerequisite: ECE 104 or GRC 111. Six hours lecture-laboratory.

300 Communication Processes. (3) N
Synthesis of basic communication processes with emphasis upon listening, speaking, reading, and writing. Prerequisites: ENG 101 or approval of instructor.

301 Words and Human Behavior. (3) N
Techniques for recognizing and avoiding those habitual responses to familiar words that generate much everyday hostility, anxiety, confusion and frustration.

304 Atomic and Nuclear Principles. (2) F, S
Atomic and nuclear principles with applications to engineering. Prerequisite: PHY 116.

335 Legal Aspects of Engineering and Construction. (2) N
Influence of contract, property and tort law on engineering and construction activities. Influence of governmental regulations (OSHA).

406 System Methodology. (3) F; Welch
Introduction to general systems theory with application to both natural and man made systems. Prerequisite: MAT 210 or equivalent.

410 Medical Practice Seminar. (2) S; Dorson
Lecture and recitation on methods used in diagnosis and treatment of diseases and disorders emphasizing reliance on technical information in each medical specialty. Prerequisite: approval of instructor.

441 Introduction to Cybernetics. (3) S; S. Russell
Historical survey and mathematical fundamentals of cybernetic engineering. Applications in technology, industry, biology, and society.

450 Entrepreneurial Engineering. (3) F; Staff
Innovation, strategy development, planning; market opportunity identification, fiscal responsibility, and operations start-up for new engineering ventures. Prerequisite: Junior standing.

460 Engineering Managerial Decision Processes. (3) S; Staff
The project engineer's relationship to management; design interface, engineering economy, and decision processes. Prerequisite: Junior standing.

480 Medical Data Analysis. (3) N; Dorson
Applications of statistical and probabilistic models for the study and analysis of biological and clinical problems including experience with biomedical program packages. Prerequisite: MAT 291 or MAT 210.

483 Probability for Engineers. (3) S; Rollier, Dean
First course in applied stochastic processes. Special emphasis on applying theory developed for Markov and renewal processes to queueing, reliability, time series and social and behavioral problems. Prerequisite: ECE 383.

485 Engineering Statistics. (3) F, S; Anderson, Dean, Rollier
Statistical methods applied to engineering problems. Regression and correlation analyses, quality control and tolerance charts, distribution of extremes, and introduction to experimental design and analysis of variance. Prerequisite: ECE 383.

486 Methods of Engineering Analysis. (3) F,S; Bickford
Modeling and analysis of engineering problems. Discrete and continuous models for equilibrium, evolution and propagation problems. Prerequisite: ECE 380 and 382, or equivalent.

487 Applied Mathematical Analysis. (3) F; Berman
Treatment and interpretation of engineering data, mathematical models of engineering problems, linear algebra and introduction to optimization techniques, and computation techniques for solving nonlinear equations. Prerequisite: ECE 380 or MAT 274.

492 Project in Design and Development. (2,3) F, S, SS
Individual project in creative design and synthesis. Prerequisite: Senior standing.

510 Rotating Internship. (1) N; Dorson
Exposure by scheduled rotating assignments to major hospital and health delivery departments including medical, administrative, and support functions.

511 Clinical Practicum. (3) N; Dorson
Extended supervised engineering service in health delivery systems with assignment of individual project culminating in technical report defense.

541 Cybernetics. (3) F; S. Russell, Lewis
Analysis of adaptive, learning, and self-organizing systems. Applications to problems of current interest.

582 Linear Algebra in Engineering. (3) S; S. Russell, Bickford
Development and solution of systems of linear algebraic equations. Applications from mechanical, structural and electrical fields of engineering. Prerequisite: ECE 382 or equivalent.

583 Process Analysis by Statistical Methods. (3) F; Kuester
Descriptive statistics, linear and nonlinear regression analysis, experimental design, and experimental optimum seeking techniques.

586 Partial Differential Equations in Engineering. (3) F; Bickford, S. Russell
Development and solution of partial differential equations in engineering. Applications in solid mechanics, vibrations, heat transfer. Prerequisites: ECE 380, 382 and 386, or equivalents.

Special Courses: ASE 484, 494, 498, 499. (See pages 32-33.)

Aerospace Engineering and Engineering Sciences

ESE 315 Mechanics Laboratory. (2) S
Experiments and demonstrations related to mechanical systems. Digital methods of data analysis. One hour lecture, 2 hours laboratory. Corequisite: ECE 312, 313.

355 Introduction to Metallurgy. (3) S
Elements of the structure of metals and alloys, measurement of mechanical properties, and optical metallography. Field trips. Lecture and laboratory. Prerequisite: CHM 114 or equivalent.

401 Manufacturing Engineering. (3) F; Shaw
Analysis and optimization of manufacturing processes. Prerequisite: MEE 332.

410 Acoustics and Noise Control. (2) S; Wallace
Acoustic analysis and design. Acoustic fatigue of aerospace structures. Aircraft, traffic and industrial noise control. Environmental noise standards. Architectural acoustics. Prerequisite: PHY 116 or equivalent.

413 Intermediate Dynamics. (3) S; Avery
Rotating reference frames, Lagrange's and Euler's equations, gyroscopic motion, aerospace vehicle flight mechanics. Prerequisite: ECE 312.

415 Vibration Analysis. (3) F, S; Staff
Free vibration and forced response of single and multiple degree of freedom systems, normal modes, random vibrations. Lecture and laboratory. Prerequisite: ECE 313.

422 Mechanics of Materials. (3) F, S
Failure theories, torsion of noncircular members, finite element methods, plates, curved beams, unsymmetrical bending, shear flow, shear center, energy methods. Prerequisite: ECE 313. Lecture and laboratory.

426 Aerospace Structures. (3) S; Avery
Load analysis; thin-walled members including skin-stringer structure; rings, frames; determinate and indeterminate structures; sandwich construction; numerical methods. Prerequisite: ESE 422.

430 Introduction to Continuum Mechanics. (3) F; Rankin
Application of the principles of continuum mechanics to such fields as flow in porous media, meteorology, biomechanics, electromagnetic continua, magneto-fluid mechanics. Prerequisites: ECE 313, MEE 371.

450 Mechanical Properties of Solids. (3) S; Hendrickson
Effects of environmental and microstructural variables on mechanical properties; plastic deformation, fatigue, creep, brittle fracture, internal friction. Prerequisite: ECE 350.

451 X-Ray and Electron Diffraction. (3) S; Hendrickson
Fundamentals of X-ray diffraction, transmission electron microscopy and scanning electron microscopy. Techniques for studying surfaces, internal microstructures, and fluorescence. Lecture and demonstrations.

453 Corrosion and Corrosion Control. (3) F; Hendrickson
Introduction to corrosion mechanisms and methods of preventing corrosion. Topics: electrochemistry, polarization, corrosion rates, oxidation, coatings, cathodic protection. Prerequisite: ECE 350.

455 Physical Metallurgy. (4) F; Hendrickson, Stanley
Crystal structure and defects. Phase diagrams, metallography, solidification and casting, deformation and annealing. Prerequisite: ECE 350. Three lectures, 3 hours laboratory.

474 Dynamic Meteorology I. (3) F; Rankin
Basic equations of atmospheric motions, scale analysis, atmospheric waves, planetary boundary layer equations, barotropic and baroclinic models. Prerequisites: ECE 380 or MAT 274, MEE 371 or GPH 310, 311, or approval of instructor.

475 Dynamic Meteorology II. (3) S; Rankin
Turbulence, dynamic forecasting, numerical methods, objective analysis, special topics. Prerequisite: ESE 474.

480 Aerospace Systems Design. (3) S
Prerequisites: ESE 413, 426, MEE 450, 453.

492 Project in Design and Development. (3) F, S
Projects in creative design and synthesis.

511 Acoustics. (3) F '81; Wallace
Principles underlying the generation, transmission and reception of acoustic waves. Applications to noise control, electroacoustic transducers and architectural acoustics.

512 Acoustics Laboratory. (2) F'82; Wallace
Experiments and measurements associated with architectural acoustics and noise control. Lecture and laboratory.

513 Advanced Dynamics. (3) F; Nelson
Dynamics of mechanical systems, variational principles, Lagrange's and Hamilton's equations, applications to vehicle motion, gyroscopes, and space mechanics. Nonlinear systems.

515 Vibrations: Discrete Systems. (3) S; Nelson
Free vibration and forced response of discrete elastic systems. Finite elements. Analytical and computer methods of solution. Random vibrations. Prerequisite: ESE 415.

516 Vibrations: Continuous Systems. (3) F; Bickford, Nelson
Free vibration and forced response of continuous elastic systems. Variational methods. Exact and approximate methods of solution. Wave propagation. Prerequisite: ESE 415.

518 Dynamics of Rotor-Bearing Systems. (3) S'82; Nelson
Critical speed and response analysis of rigid and flexible rotor systems. Bearing influence and representation. Stability analysis. Methods of balancing.

522 Variational Principles of Mechanics. (3) S'83; Bickford
Virtual work, stationary and complementary potential energies. Hamilton's principle. Application of these and direct methods to vibrations, elasticity and stability.

523 Theory of Plates and Shells. (3) S; Avery, Chen
Bending of plates. Plates on elastic foundation. Large deflection of plates. Membrane theory of shells. Shells of revolution. Approximate methods.

524 Theory of Elasticity. (3) F; Bickford, Chen, Rankin
Analysis of stress and strain in three dimensions. General theorems. Plane elastostatic problems. Bending and torsion, thermoelasticity, axi-symmetrical problems. Applications. Prerequisite: ECE 386.

526 Biomechanics. (3) S; Chen, Russell
Mechanics of the human body. Mechanical and physical properties of tissues. Application to fields of interest including joint replacement, sports medicine.

528 Fracture Mechanics. (3) F'81; Chen, Stanley
Basic concepts of solid mechanics applied to the problem of fracture. Microstructural effects in fracture initiations and propagation. Experimental methods.

529 Theory of Elastic Stability. (3) S'82; Bickford, Chen
General concepts; stability of discrete and continuous systems. Torsional and lateral buckling of thin plates and shells. Dynamic instability. Prerequisite: ECE 386 or MAT 460.

530 Continuum Mechanics. (3) F'82; Rankin
Methods of continuum mechanics with applications to current research.

542 Computation Methods in Engineering Science. (3) F'82; Rankin
Utilization of documented computer programs. Application in analysis, design and computer graphics.

544 Engineering Structures and Systems. (3) F; Shaw
Principles of dimensional analysis and similitude with application to a wide variety of problems from several fields of engineering.

546 Finite Element Methods in Engineering Science. (3) F; Bickford
Discretization, interpolation, elemental matrices, assembly, computer implementation. Application to solid and fluid mechanics, heat transfer, time dependent problems. Prerequisite: ASE 582.

550 Theory of Crystalline Solids. (3) F; Hendrickson, Stanley
Anisotropic properties of crystals; tensor treatment of elastic, magnetic, electric, and thermal properties; crystallography of Martensitic transformations.

551 Effects of Radiation on Materials. (3) S; Stanley
Defect production and annealing. Irradiation enhanced diffusion. Irradiation embrittlement and swelling. Prerequisite: ESE 450 or equivalent.

553 Physical Metallurgy. (3) S; Hendrickson, Stanley
Advanced research techniques in physical metallurgy, ternary and quarternary phase diagrams, thermal analysis, magnetic analysis, metallography, fracture analysis. Two lectures, 3 hours laboratory.

554 Metallurgical Thermodynamics and Kinetics. (3) S'83; Hendrickson, Stanley
Thermodynamics of alloy systems, diffusion in solids, kinetics of precipitation and phase transformations in solids. Prerequisites: ECE 340, 350.

555 Analysis of Material Failures. (3) F; Hendrickson
Indentification of types of failures. Analytical techniques. Fractography, SEM, nondestructive inspection, metallography. Mechanical and electronic components. Prerequisite: ECE 350 or equivalent.

574 Dynamic Meteorology. (3) S'83; Rankin
Applications of fluid mechanics to atmospheric motions, diffusion processes and pollution modeling.

Special Courses: ESE 484, 494, 498, 499, 500, 590, 591, 592, 594, 598, 599, 792, 799. (See pages 32-33).

Chemical and Bio Engineering

CHE 311 Material and Energy Balances. (3) F, S
Principles of physics and chemistry applied to the formulation of material and energy balances. Prerequisites: CHM 116; MAT 291 or MAT 271.

312 Chemical Engineering Principles. (3) S
Extension of material and energy balance calculations to complex steady state systems. Introduction of thermodynamic principles and transient system calculations. Prerequisite: CHE 311.

331 Transport Phenomena. (3) F,S
Heat, mass, and momentum transfer. Prerequisites: MAT 274 and PHY 116; corequisite: CHE 311. Lecture and recitation.

332 Chemical Engineering Operations. (3) F, S
Process operations including absorption, drying, crystallization, filtration, materials handling and preparation. Prerequisite: CHE 331; corequisite: CHE 312.

333 Applications of Transport Phenomena. (3) S
The application of the fundamental principles to heat transfer and the flow of Newtonian and non-Newtonian fluids in both single and two phase systems. Prerequisite: CHE 331. Lecture and laboratory.

342 Applied Chemical Thermodynamics. (3) F, S
Energy relations and equilibrium conversions based on chemical potentials and phase equilibria. Corequisite: CHE 312.

364 Chemical Process Instrumentation. (3) S
Theory and applications of analytical and control instrumentation used in the chemical process industries. Prerequisite: CHM 116. Lecture, demonstrations and laboratory.

411 Biomedical Engineering. (3) F; Dorson
Review of diagnostic and prosthetic methods using engineering methodology. Introduction to transport, metabolic and autoregulatory processes in the human body. Prerequisite: approval of instructor.

413 Physiological Instrumentation. (3) S; Guilbeau
Problems, concepts and techniques of biomedical instrumentation in static and dynamic environments. Prerequisite: ZOL 360 or BAS 460 or equivalent. Lecture and laboratory.

432 Principles of Chemical Engineering Design. (3) F; Staff
Design philosophy, theory and methods for the design of process units and plants including optimization and economic analysis. Prerequisites: CHE 332 and 342.

442 Chemical Reactor Design. (3) F, S; Staff
Application of kinetics to chemical reactor design. Prerequisites: CHE 342, 331.

451 Chemical Engineering Laboratory. (2) F
Operation, control and design of experimental and industrial process equipment; independent research projects. prerequisites: CHE 332 and 333. Six hours laboratory.

461 Process Control. (3) F; Staff
Process dynamics, instrumentation and feedback applied to automatic process control. Prerequisite: ECE 304. Two lectures, 3 hours laboratory.

462 Process Design. (3) S; Staff
Application of economic principles to optimize equipment selection and design; development and design of process systems. Prerequisites: CHE 332, 342 and 442.

473 Industrial Chemistry. (3) S, Staff
Reaction systems as encountered in large scale operations. Typical examples from inorganic, organic, polymer, biochemical, fermentation, and electrochemical industries. Prerequisites: CHM 318 or 332 and CHM 442.

487 Applied Mathematics in Chemical Engineering. (3) S, Staff
Mathematical formulation of complex chemical engineering problems. Analytical and numerical solution of the resulting linear or non-linear, ordinary and partial differential equations. Prerequisites: MAT 274, CHE 332 and 342.

492 Chemical Engineering Projects. (2) S; Staff
Individual projects in chemical engineering operations and design. Prerequisite: Approval of instructor. Six hours laboratory.

496 Professional Seminar. (0) F, S; Staff
Professional and ethical aspects with a discussion of employment opportunities and responsibilities. Lectures and field trips.

515 Physiological Transport Processes. (3) N; Guilbeau
Analysis of heat, mass, momentum and electrical energy transfer in mammals, derivation of both microscopic and macroscopic models based on current research.

517 Prosthetic and Diagnostic Engineering. (3) N; Dorson
Criteria for mechanical replacement or assistance of organ functions; diagnostic methods, equipment and usage; existing methodology and future requirements, including detailed designs.

525 Electrochemical Engineering. (3) N; Staff
Principles of electrochemical reactions applied to chemical production, electroplating, electrodialysis, and fuel cells.

533 Transport Processes. (3) F; Berman, Torrest
Unified treatment of momentum, heat and mass transfer from molecular theory and continuum points of view. Continuum equations of microscopic and macroscopic systems, multicomponent and multiphase systems.

534 Turbulent Mixing. (3) N; Berman
Turbulence and mixing in multicomponent systems with/without chemical reactions. Computational models applied to chemical processes. Prerequisite: CHE 533.

536 Convective Mass Transfer. (3) N; Berman, Zwiebel
Turbulent flow for multicomponent systems including chemical reactions with applications in separations and air pollution. Prerequisite: CHE 533 or MEE 571.

543 Thermodynamics of Chemical Systems. (3) F; Dorson
Classical and statistical thermodynamics of non-ideal physicochemical systems and processes; prediction of optimum operating conditions.

544 Chemical Reactor Engineering. (3) S; Kuester, Zwiebel
Reaction rates, thermodynamics, and transport principles applied to the design and operation of chemical reactors. Prerequisite: CHE 543.
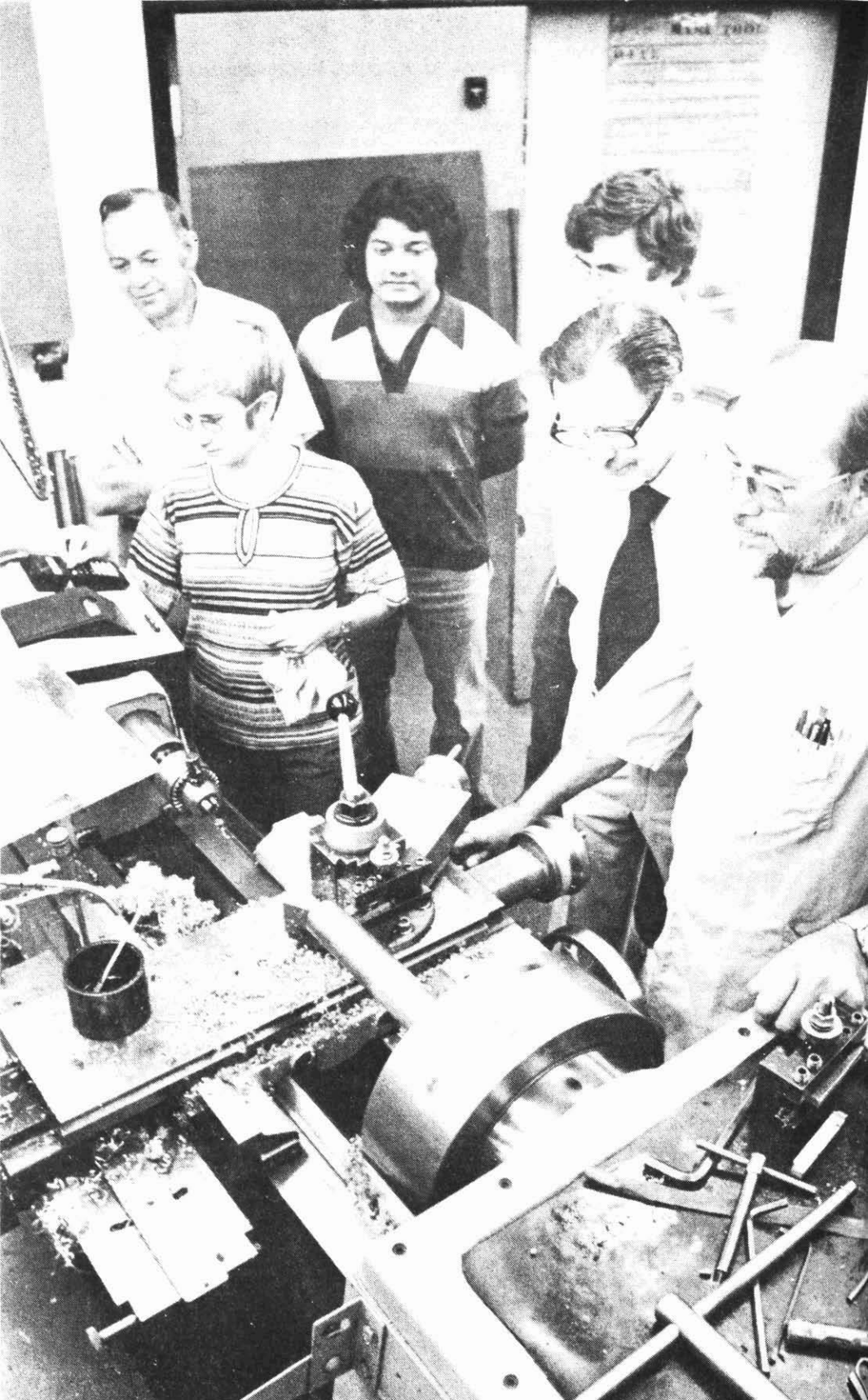
553 Energy-Pollution Strategies. (3) N; Torrest
Interaction of energy conservations, residuals management and economic policy in the chemical process industry.

556 Separation Processes. (3) N; Zwiebel
Topics in binary/multicomponent separation, rate governed and equilibration processes, mass transfer criteria, energy requirements, separating agents and devices, staged operatons.

562 Chemical Systems Engineering. (3) N; Sater
Process dynamics, systems analysis, computer applications, process control.

563 Chemical Engineering Design. (3) N; Staff
Computational methods; the design of chemical plants and processes.

581 Process Optimization Techniques. (3) S; Kuester
Method for optimizing engineering processes. Experimental design and analysis; linear and nonlinear regression methods; classical, search, and dynamic programming algorithms. Prerequisite: Approval of instructor.

587 Advanced Applied Mathematical Analysis in Chemical Engineering. (3) F; Beckman
Formulation and solution of complex mathematical relationships resulting from the description of physical problems in mass, energy, and momentum transfer, and chemical kinetics. Prerequisite: CHE 487 or approval of instructor.

Special Courses: CHE 484, 494, 498, 499, 584, 590, 591, 592, 593, 594, 598, 599, 792, 799. (See pages 32-33.)

Civil Engineering

CEE 310 Testing of Materials for Construction. (2-3) F, S
Structural and behavioral characteristics, engineering properties, measurements and application of construction materials. Not open to engineering students. Prerequisite: CON 323 or equivalent. Lecture and laboratory.

321 Structural Analysis. (3) F, S
Statically determinate and indeterminate structures by classical and matrix methods: trusses, beams, and frames. Prerequisite: same as CEE 322 except ECE 351 and MEE 371. Two lectures, 2 hours recitation.

322 Steel Structures. (3) F, S
Behavior of structural components and systems. Design of steel members and connections. Partial design of a steel building system. Prerequisite: CEE 321 and completion of the Engineering Core (except electrical and communications courses) with an average grade of C or better, plus at least a C in MAT 290 and 291, ECE 210, 312, 313, and 380 or MAT 274 (or equivalent), and an official TOEFL score of at least 520 if an international student. Two lectures, 2 hours recitation.

323 Concrete Structures. (3) F, S
Behavior of concrete structures. Design of reinforced and prestressed concrete members including footings. Partial design of concrete building system. Prerequisite: Same as CEE 322. Two lectures, 2 hours recitation.

341 Surveying. (3) F, S
Theory and field work in construction and land surveys. Prerequisite: MAT 118. Two lectures, 3 hours laboratory.

342 Surveying Calculation Techniques. (3) F
Office calculations including traverses, adjustment of traverse, curve calculations—horizontal, vertical, spirals, coordinates, and azimuth determination by solar observations.

344 Route Surveying. (3) F, S
Simple, compound and transition curves; reconnaissance, preliminary and location surveys. Calculation of earthwork. Solar observations for azimuth. Prerequisite: CEE 341. Two lectures, 3 hours laboratory.

345 Surveying of Public Lands. (3) S
History and methods of surveying public lands of the United States. Problems in resurveys of public lands.

351 Soil Mechanics. (4) F, S
Index properties and engineering characteristics of soils. Compaction, shear, compressibility, and permeability. Prerequisite: Same as CEE 322. Three lectures, 3 hours laboratory.

361 Environmental Engineering. (3) F, S
Natural environment, water resources, hydrologic cycle, chemistry of natural waters, quality requirements and water treatment, water distribution systems. Prerequisite: Same as CEE 322. Corequisite: CEE 381.

362 Environmental Engineering. (3) F, S
Natural environment, the carbon cycle and biochemistry of wastes, principles of waste treatment, drainage systems. Prerequisite: Same as CEE 322. Corequisite: CEE 381.

371 Urban Problems. (3) F
Problems of the modern urban environment. Concepts of comprehensive planning. History of urban development, transportation, public service, zoning, land division, urban renewal, neighborhood planning. See PUP 301, page 166.

372 Transportation Engineering. (3) F, S
Elementary forms of transportation: highway, rail, water, air. Similarities and differences in construction operation, planning and administration. Prerequisite: Same as CEE 322.

380 Hydraulics and Hydrology. (3) F, S
Water supply and distribution, precipitation and runoff, wells. Flow in pressure conduits and open channels. Hydraulic machinery. Not open to engineering students. Prerequisite: CON 221. Two lectures, 3 hours laboratory.

381 Hydraulic Engineering. (4) F, S
Application of fluid mechanics to water engineering. Pressure conduit and free surface flow, unsteady flow, and turbo-machinery. Introduction to hydrology. Prerequisite: Same as CEE 322. Three lectures, 3 hours laboratory.

423 Structural Design. (3) F, S; Pian, Lundgren
Analysis and design of structural systems. Prerequisite: CEE 323. Two lectures, 3 hours laboratory.

450 Soil Mechanics in Construction. (3-4) F, S
Soil mechanics as applied to the construction field: foundations, highways, retaining walls and slope stability. Relationship between soil characteristics and geologic formations. Not open to engineering students. Prerequisite: CON 323. Lecture and laboratory.

452 Foundations. (3) F, S; Duffy
Applications of soil mechanics to slope stability, highways, earth dams, foundations, and stress distribution in soil media. Prerequisite: CEE 351

461 Environment and Society. (3) F
Physical, chemical and biological components of the natural environment. Impact of man, origins and types

of pollution. Environmental factors affecting society. Open to juniors, seniors and graduate students.

466 Sanitary Systems Design. (3) F; Klock, Higgins
Capacity, planning and design of water supply, domestic and storm drainage, and solid waste systems. Prerequisite: CEE 361 or 362.

471 Planning and Design of Urban Systems. (3) F; Blackburn, Matthias.
For students in city planning, urban systems, civil engineering and related areas working as interdisciplinary planning and design teams. Effect of economic base, employment and population on urban land use requirements. Location and required capacity of urban systems to serve urban land uses. Prerequisite: senior standing. Two lectures, 3 hours laboratory.

475 Highway Geometric Design. (3) S; Matthias, Blackburn
Design of the visible elements of the roadway. Fundamental design controls with application to rural roads, at-grade intersections, freeways and interchanges. Prerequisite: CEE 372. Two lectures, 2 hours recitation.

481 Water Resources Engineering. (3) S; Ruff
Formulation of hydraulic engineering systems concepts pertaining to irrigation, hydroelectric power, flood control, municipal and industrial water supply, navigation, recreation, fish and wildlife conservation. Prerequisite: CEE 381.

496 Topics in Civil Engineering Practice. (1-4) F, S
Technical, economic, political, legal and social aspects of civil engineering practice as related to the formulation, planning, design and management of engineering projects.

521 Stress Analysis. (3) F; Hill, Singhal
Advanced topics in the analytical determination of stress and strain.

524 Advanced Steel Structures. (3) F; Pian, Lundgren
Strength properties of steel and their effects on structural behavior. Elastic design of steel structures. Plastic analysis and design of beams, frames and bents. Plastic deflections. Plastic design requirements. Multi-story buildings.

526 Finite Element Methods in Civil Engineering. (1-3) S; Hill, Lundgren, Singhal
Finite element formulation for solutions of structural, geotechnic, and hydraulic problems. Prerequisite: CEE 532.

527 Advanced Concrete Structures. (3) S; Pian, Lundgren
Elastic, ultimate strength and yield line theory. Deflection, torsion, shrinkage and plastic flow. Prestressed concrete; special systems.

528 Stability of Structures. (3) F; Lundgren, Singhal
Elastic and inelastic buckling of rolled and cold-formed columns and beams. Stability of plates, rigid frames and trusses.

529 Complex Structures. (1-3) S; Tuma
Classical and numerical investigations of linear and nonlinear structures composed of flat and curved surfaces, and linear or curvilinear elements.

531 Theory of Structures. (3) F; Tuma, Pian, Lundgren, Singhal
General theorems relating to elastic systems; deflection of trusses and beams; statically indeterminate trusses, beams, rings, arches, and frames by consistent deformation, least work and elastic center; horizontally curved members in bending and torsion.

532 Matrix Methods in Structural Analysis. (3) S; Lundgren, Singhal
Matrix methods applied to structural engineering and

structural mechanics. Stiffness and flexibility methods; introduction to finite elements, differences. Corequisite: Computer programming.

536 Dynamics of Structures. (3) S; Hill, Lundgren, Singhal
Structures and structural members subjected to dynamic loadings; response spectra theory emphasizing earthquake applications; investigations of the response of multi-degree of freedom structures; matrix methods of analysis. Two lectures, 2 hours recitation.

537 Topics in Structural Engineering. (1-3) F, S; Lundgren, Pian, Singhal, Tuma
Advanced topics including wind engineering, earthquake engineering, probabilistic concepts, optimization and behavior of structural systems.

552 Geological Engineering. (3) S; Duffy, O'Bannon, Hansen
Geological investigations for engineering purposes, case histories, major aspects of geologic structure, weathering, river mechanics, glacial deposits, eolian deposits, airphoto interpretation for engineering site locations.

553 Theoretical Soil Mechanics. (3) F; Duffy, O'Bannon, Hansen
Engineering properties of soils, application of theory of elasticity to soil media, failure theories, theories of consolidation and shear strength of granular materials. Prerequisite: CEE 351. Two lectures, 3 hours laboratory.

554 Theoretical Soil Mechanics. (3) S; Duffy, O'Bannon, Hansen
Shear strength of cohesive materials, clay mineralogy and soil structure, theories of bearing capacity, slope stability, soil dynamics. Prerequisite: CEE 351. Two lectures, 3 hours laboratory.

555 Applied Soil Mechanics. (3) S; Duffy, O'Bannon, Hansen
Application of theoretical soil mechanics to engineering problems. Subsoil investigations, sampling techniques, field measurements, underpinning, dewatering systems, chemical and mechanical stabilization techniques. Prerequisite: CEE 553. Two lectures, 2 hours recitation.

556 Seepage and Earth Dams. (3) F; O'Bannon, Duffy, Hansen
Transient and steady state flow of water through soil media, confined and unconfined flow, pore water pressures, and application of theories to the design of earth dams. Prerequisite: CEE 351.

557 Topics in Soil Mechanics and Foundations. (1-4) F, S; Hansen, Duffy, O'Bannon
Topics include foundations, retaining walls, excavations, bulkheads, cofferdams, rock mechanics, numerical techniques and earthquake engineering. Lectures and laboratory.

561 Physical-Chemical Treatment of Water and Waste. (3-4) F; Klock
Theory and design of physical and chemical processes for the treatment of water and waste waters. Prerequisite: CEE 361 or equivalent.

562 Environmental Biochemistry and Waste Treatment. (3-4) S; Klock
Theory and design of biological waste treatment systems. Pollution and environmental assimilation of wastes. Prerequisite: CEE 362 or equivalent.

563 Environmental Chemistry Laboratory. (3) S; Klock
Analysis of water, domestic and industrial wastes, laboratory procedures for pollution evaluation and the control of water and waste treatment processes. Prerequisite: CEE 361 or 362. One lecture, 5 hours laboratory.

564 Industrial Hygiene. (2-4) F
Survey methods, legal and physiological aspects of occupational health hazards. Methods of measurement and analysis and physiological actions of such contaminants as toxic gases, mineral dusts, metals and their compounds, and industrial solvents.

566 Sanitary Engineering Processes Laboratory. (3) F; Klock
Study of unit processes involved in water and waste treatment. One lecture, 6 hours laboratory.

567 Atmospheric Pollution. (1-3) S
Atmospheric composition and dynamics, origins and chemistry of contamination, biological significance, analytical measurement, engineering control methods and air pollution legislation.

568 Epidemiology and Public Health Engineering. (1-3) S
Biology and transmission of diseases, epidemics, sanitation and public health administration.

572 Design of Highway and Airport Pavements. (3) S; Blackburn, Matthias
Design practices, materials, and testing of flexible and rigid pavements. Prerequisites: CEE 351, 372.

573 Engineering Interpretation of Land Forms. (3) S; Matthias, Blackburn
North America by geographic regions and the engineering problems and characteristics of each area.

574, 575 Traffic Engineering. (3,3) F, S; Matthias, Blackburn
Operator and vehicle characteristics, street capacity, signals, signs and markings, etc. All phases of traffic engineering as applied to urban areas.

576 Airport Engineering. (3) F; Blackburn, Matthias
Planning and design of airport facilities, financing, air traffic control, aircraft characteristics, demand, site selection, runway configuration and terminal areas. Prerequisite: CEE 372.

577 Urban Transportation Planning. (3) S '82; Betz, Blackburn
Application of land use parameters traffic generation theory, traffic distribution and assignment models, transit analysis and economic factors to the solution of the urban transportation problem.

578 Highway Engineering, Planning and Economics. (3) S '83; Betz, Blackburn
Highway transportation including design, operation, planning, environmental impact, economic feasibility and financing. Highways as a regional system.

579, 581 Hydrology. (2-3) F, S; Ruff
Theory and the application of hydrologic principles to the solution of typical water resources systems planning and engineering design problems. Prerequisite: CEE 381.

582 Open Channel Flow. (2) S; Ruff
Introduction to hydrodynamics of open channel flow. Emphasis on applications. Prerequisite: CEE 381.

583 Water Resources Systems Planning. (3) F; Ruff
Introduction to the theory of quantitative planning methodologies for large scale systems. Case studies.

586 Water Resources Systems. (2) F; Ruff
Application of quantitative planning methodologies to the engineering aspects of water resource systems. Case studies. Corequisite: CEE 583.

587 Water Resources Systems. (2-3) F; Ruff
Application of quantitative planning methodologies to the social, legal, political and economic aspects of water resources systems. Case studies. Corequisite: CEE 583.

589 Water Resources Systems Management. (3) S; Ruff
Systematic approach to the management of water resources systems. Synthesis of the technical and nontechnical system components. Case studies of large scale developments. Prerequisites: CEE 583, 586 and 587.

Special Courses: CEE 484, 494, 498, 499, 580, 584, 590, 591, 592, 594, 598, 599, 792, 799. (See pages 32-33.)

Students enrolled in CEE 580, 584, 590, 592, 599, 792 and 799 are required to attend graduate student seminars at time shown in class schedule. Each semester, every graduate student enrolled for more than 6 credit hours is to enroll for at least 1 credit hour of CEE 592, 599, 792 or 799. Each civil engineering graduate student holding an appointment as a Teaching or Research Assistant or Associate is to enroll for 1 credit hour of CEE 580; such credit does not apply toward graduation.

Electrical and Computer Engineering

EEE 273 Electrical Construction Fundamentals. (4) F, S
Circuits and machinery. Power transmission and distribution, with emphasis on secondary distribution systems. Measurements and instrumentation. (Not for degree credit for EEE majors.) Prerequisites: PHY 112, 114; MAT 290 or 261. Three lectures, 3 hours laboratory.

301 Electrical Networks. (3) F, S, SS
Analysis of linear and nonlinear networks. Analytical and numerical methods. Corequisite: ECE 334.

303 Signals and Filters. (3) F, S, SS
Filtering and spectral analysis in continuous and discrete systems. Prerequisite: EEE 301.

321 Digital Computer Fundamentals I. (4) F, S, SS
Combinational and sequential logic network design. Data representations and arithmetic unit operations. Introduction to microcomputer programming and operation. Prerequisite: ECE 122 or CSC 182. Three hours lecture, 3 hours laboratory.

322 Digital Computer Fundamentals II. (4) F, S
Continuation of EEE 321. Microcomputer system organization and operation, I/O device operation, I/O programming and interfacing. Memory systems, Microcomputer applications. Prerequisite: EEE 321. Three hours lecture, 3 hours laboratory.

340 Electromagnetic Engineering I. (3) F, S, SS
Static and time varying vector fields. Dielectric and magnetic materials. Maxwell's equations. Uniform plane waves. Energy. Radiation. Prerequisites: PHY 116; MAT 362.

360 Electromechanics. (3) F, S
The ac and dc operations of magnetic circuits, permanent magnets, transformers, incremental motion electromechanical systems, dc machines, induction machines, synchronous machines, control of electrical machines. Prerequisite: ECE 304.

402 Network Analysis. (3) N; Patterson, Thompson
Advanced topics in linear network analysis. Multiports, scattering parameters and topological methods. Prerequisite: EEE 303 or equivalent.

405 Filter Design. (3) N; Patterson, Thompson
Principles of active and passive filter design. Time and frequency domain approximations. Prerequisite: EEE 303 or equivalent.

406 Computer-Aided Design. (3) N; Zimmer
Applications of modern CAD programs, such as SPICE 2; includes independent project. Prerequisite: EEE 303 or equivalent.

411 Engineering Software Design. (3) N; O'Grady, Snider
Design of computer programs for engineering systems using higher-level languages. Program design concepts. Interfacing the program with peripheral devices. Prerequisite: EEE 322. Lecture and laboratory.

422 Digital Computer Design I. (3) F, S; Staff
Logical design and internal operation of processing and control units of a computer. Data representations. Relation to memory and I/O units. Prerequisite: EEE 322 or CSC 421. (Also listed as CSC 422).

423 Digital Computer Design II. (4) F, S; Staff
Computer organization emphasizing interface to memory and I/O. Interrupt structures, bussing, I/O, memory technology and hierarchy. Hardware/software interface. Prerequisite: EEE 422 or CSC 422. Three hours lecture, 3 hours laboratory. (Also listed as CSC 423).

424 Computer Structures I. (3) F, S; Staff
Evolution of main-line architectures. Instruction sets, addressing modes, and control structures. Characterization of computer architectures. Performance evaluation. Prerequisite: EEE 423.

425 Digital Systems Circuits. (3) F, S; Staff
Saturating and non-saturating logic families: TTL, ECL, IIL, NMOS, PMOS, CMOS. Selected LSI components including memories and bit slices. Prerequisites: ECE 334, EEE 322. Corequisite: EEE 426 or equivalent.

426 Digital Circuits Laboratory. (1) F, S; Staff
Experiments dealing with the characteristics of various logic families and incorporation of digital components into circuits for digital systems applications. Corequisite: EEE 425.

427 Digital Switching Theory. (3) S; Robbins
Combinational logic, functional decomposition, NAND (NOR) circuit analysis and synthesis, logic arrays, iterative networks, fault diagnosis, sequential circuit representation, memory devices. Prerequisite: EEE 322. Three hours lecture.

428 Analog and Hybrid Computers. (3) N; Higgins
Design and application of hybrid analog-digital computer systems and components. Prerequisites: ECE 334, EEE 322. 2.5 hours lecture, 1.5 hours laboratory.

432 Solid State Circuits. (4) N; Zimmer
Analog and digital integrated circuits with emphasis on MTL bipolar LSI technology, high-density MOS processes, and the ADFL and DFET technologies. Prerequisite: ECE 334. Three hours lecture, 3 hours laboratory.

433 Analog Circuit Design. (4) S; Blackledge
Design of electronic circuits including amplifiers, mixers, waveform generators and active filters. Prerequisite: EEE 301 or equivalent. Three lectures, 3 hours laboratory.

434 Quantum Mechanics for Engineers. (3) N; Kaufman, Sirkis
Probability, Schroedinger equation, eigenfunctions, harmonic oscillator, periodic potential, superposition, angular momentum, scattering, tunneling, perturbation theory. Prerequisite: EEE 340.

435 Microelectronics. (3) S; DeMassa
Practice of solid state device fabrication techniques including thin film and integrated circuit fabrication principles. Prerequisite: EEE 436 or equivalent. Two lectures, 3 hours laboratory.

436 Fundamentals of Solid State Devices. (3) F, S; Staff
Metal-semiconductor contacts, P-N junctions, light interacting devices, schottky diodes, bipolar and field effect transistors, planar and thin film integrated circuit (I-C) devices. Prerequisite: ECE 352.

438 Solar Cells. (3) F; Sirkis, Wang
Photovoltaic devices including homojunctions and heterojunctions. Photogeneration of carriers, spectral response, electrical characteristics, efficiency. Prerequisite: EEE 436.

439 Measurement Systems Engineering. (3) N; Staff
System design concepts applied to static and dynamic measurements. Carrying, processing, shaping and converting energy and information. Prerequisites: ECE 312, 334. Lectures, demonstrations, laboratory, and recitation.

440 Electromagnetic Engineering II. (4) F, S; Staff
Guided waves, systems, lines and components. Prerequisites: ECE 122 or CSC 182; EEE 340. Three lectures, 3 hours laboratory.

441 Advanced Engineerin Electromagnetics. (3) N; Kaufman, Sirkis
Static and time-varying fields. Polarization. Magnetization. High frequency impedance. Propagation and reflection of plane waves. Guided waves. Slow waves. Anisotropic media. Resonators. Coupling. Radiation. Prerequisite: EEE 340.

443 Antennas. (3) N; Tice
Engineering principles, arrays, measurements, numerical computations. Prerequisite: EEE 440.

445 Microwaves. (4) N; Kaufman, Sirkis, Tice
Components, systems and measurements. Prerequisite: EEE 440. Three lectures, 3 hours laboratory.

448 Fiber Optics. (4) F; Palais
Components and systems for fiber optical communications. Prerequisites: EEE 340, ECE 334. Three hours lecture, 3 hours laboratory.

451 Error-Correcting Codes. (3) N; Steinmann
Application of modern algebra to the analysis and synthesis of random error-detecting and error-correcting block codes. Prerequisite: EEE 322.

455 Communication Systems. (4) F, S; Staff
Signal analysis. Linear, exponential, and pulse modulation. Comparative analysis of circuits and systems. Prerequisite: EEE 303. Three lectures, 3 hours laboratory.

459 Data Communication Systems. (3) N; Kelly
System characteristics. Communications media. Communication codes. Data validity checking. Line protocols, terminals, system configurations. Examples. Prerequisites: EEE 303, 322.

465 Clinical Engineering I. (3) N; Thompson
Responsibilities of the clinical engineer. Design of patient safety programs. Applicable codes and regulations administered by FDA, HEW, OSHA and other agencies. Prerequisites: ECE 334; CHE 364 or EEE 321; ECE 122 or CSC 182.

466 Clinical Engineering II. (3) N; Thompson
Continuation of EEE 465. Safety, research, and regulatory procedures with patient involvement. Prerequisite: EEE 465.

470 Power System Fundamentals. (3) F, S; Anderson, Thompson
Basic power system analytical concepts, three-phase systems, phasors, impedance, steady-state network analysis, normalization, transmission lines, transformers, synchronous machines, power flow. Prerequisite: EEE 301 or equivalent.

471 Power System Analysis. (3) S; Anderson, Thompson
Introduction to symmetrical components, faulted system analysis, protection and stability. Prerequisite: EEE 470 or equivalent.

472 Electric Power Distribution. (3) S; Anderson, Thompson
Distribution components, design criteria, protective systems, networks, voltage control. Prerequisite: EEE 470 or equivalent.

473 Electrical Machinery. (3) F; Thompson, Russell
Fundamentals of transformers and rotating machines; dc, induction, and synchronous machines. Prerequisite: EEE 360 or equivalent.

474 Electric Machines Laboratory. (1) F; Staff
Laboratory experiments with electric machines. Corequisite: EEE 473 or equivalent. Three hours laboratory.

475 Power Systems Control. (3) S; Anderson, Russell
Analytical concepts of economic dispatch of electric generation, system frequency control, control center functions, real-time control concepts. Prerequisite: EEE 470, 480 or equivalent.

480 Feedback Systems. (4) F, S; Staff
Analysis and design of linear feedback systems. Frequency response and root locus techniques, series compensation and state variable feedback. Prerequisite: EEE 303. Three lectures, 3 hours laboratory.

482 Digital Simulation of Continuous Systems. (3) N; Higgins
System representation, continuous system simulation languages, operational and numerical methods. Corequisite: EEE 480.

496 Professional Seminar. (0) F, S; Staff
Topics of interest to graduating electrical engineers. Prerequisite: senior standing. One hour lecture.

504 Filter Synthesis. (3) N; Patterson, Thompson
Synthesis of active and passive filters. Methods of approximation in the time and frequency domains. Sensitivity and optimization. Prerequisite: EEE 405 or equivalent.

505 Digital Processing of Signals. (3) N; Steinmann, Snider
Frequency-domain description of digital filtering. Discrete spectrum analysis by z-transform, and discrete Fourier transform with quantization effects. Prerequisite: EEE 550.

511 Hardware/Software Integration. (3) N; O'Grady
The engineering design process applied to the integration of hardware and software in systems design. Applications, including real-time systems. Prerequisites: EEE 411, 424. Lecture and laboratory.

513 High-Level-Language Machines. (3) N; Higgins
Advantages and disadvantages of high-level-language machines. Language suitability. Microprogramming and interpretive execution. I/O operations. Examples. Prerequisites: EEE 511, 523, 524.

514 Hardware Design Languages. (3) N; Staff
Introduction to hardware design language (HDL). HDL description of integrated circuit components and systems. HDL description of computer organizations. Prerequisite: EEE 424.

515 Digital Testing and Reliability. (3) N; Robbins
Fault modeling, test generation and simulation for combinational and sequential circuits; memory testing, self-checking logic, fault-tolerant logic, reliability analysis. Prerequisite: CSC 320 or EEE 321. (Also listed as CSC 525).

516 Digital Design Automation. (3) N; Staff
Typical computer-aided design system. Simulation techniques. Test generator. Microprogrammed control design aids. Specification sheet analysis. Applications. Prerequisites: EEE 514, 525.

520 Minicomputers I. (4) F; Blackledge
Organization of minicomputers, with "hands on" emphasis of one particular design. Prerequisite: EEE 423 or equivalent. Three hours lecture, 3 hours laboratory.

521 Minicomputers II. (4) S; Blackledge
Organization of minicomputer operating system with emphasis on the Unix operating system on the laboratory computer. Prerequisite: EEE 520. Three hours lecture, 3 hours laboratory.

522 System Design Using Microprocessors. (4) N; Blackledge
Hardware, software, and interface considerations in the design of microprocessor applications. Prerequisite: EEE 423 or equivalent. Three hours lecture, 3 hours laboratory.

523 Microprogramming. (3) N; Staff
Control unit functions, instruction sets and microcode implementation, interpretation and emulation, LSI hardware, case studies. Prerequisite: EEE 423 or equivalent.

524 Computer Structures II. (3) N; Staff
Main-line computer architectures; multiprogramming, time-sharing, multiprocessing, hardware/software trade-offs, memory hierarchies, input/output structures, communications. Prerequisite: EEE 424.

525 Digital Circuit Design. (3) F; Akers
Analysis and design of Very Large Scale Integrated Circuits (VLSI). Physics of small devices, fabrication, regular structures, and system timing. Prerequisite: EEE 425.

526 Parallel Processing. (3) N; O'Grady
Real and apparent concurrency. Hardware organization of multiprocessors, multiple computer systems, scientific attached processors and other parallel systems. Prerequisite: EEE 424.

527 Advanced Switching Theory. (3) F; Robbins
Lattice approach to Boolean algebra, post algebras, Boolean differential calculus, multivalued logic, fuzzy logic, finite state machines. Prerequisite: EEE 427.

528 Bit Slice Processor Design. (4) A; Blackledge
Hardware and software design of a bit-slice computer with
writable control store. Prerequisite: EEE 423 or equivalent.
Three hours lecture, 3 hours laboratory.

531 Semiconductor Device Theory I. (3) F; Akers, De-
Massa
Junction diodes, junction and field-effect transistors; in-
homogeneous impurity profiles, high injection effects,
basic fabrication techniques, surface effects, analysis of
MOS field-effect transistors. Prerequisite: EEE 436 or
equivalent.

532 Semiconductor Device Theory II. (3) S; Akers, De-
Massa
Semiconductor device phenomena including tunneling,
light emission and absorption, negative resistance effects,
metal-semiconductor, metal-insulator and multiple junc-
tions. Prerequisite: EEE 531.

533 Integrated Circuit Design. (3) F; Staff
Integrated circuit fabrication, device modeling, active and
passive parasitics. Comparison of integrated and discrete
circuits. Characterization and design of integrated logic
and small-signal circuits. Prerequisite: EEE 436 or equiva-
lent.

541 Advanced Electromagnetic Fields. (3) N; Staff
Analytical techniques applied to electromagnetic field
problems. Prerequisite: EEE 440 or equivalent.

543 Antennas. (3) N; Tice
Analysis and synthesis of selected radiating structures and
systems. Prerequisite: EEE 443 or equivalent.

547 Microwave Solid State Electronics. (3) N; Kaufman
Use of ferrite, semiconductor and piezoelectric materials in
microwave systems. Prerequisites: ECE 352 and EEE 445,
or equivalent.

548 Optical Engineering. (3) N; Palais
Diffraction, lenses, optical processing, holography, elec-
tro-optics, acousto-optics, pulsed and high power lasers.
Prerequisite: EEE 448.

549 Laser Engineering. (3) S; Palais
Theory and design of lasers. Prerequisite: EEE 448.

550 Transform Theory and Applications. (3) F, S; Rus-
sell, Patterson
Applications of complex variables to Fourier, Laplace, and
z-transforms. Oriented to applications in control, network,
communication, and linear system theory. Prerequisite:
EEE 303.

551 Information and Coding Theory. (3) N; Steinmann
Fundamental theorems of information theory for sources
and channels; convolutional and burst codes. Prerequi-
sites: EEE 451, 554.

552 Coherent Communications. (3) N; Kelly
Systems analysis and design of telecommunication sys-
tems using phase-locked loops. Prerequisite: EEE 555.

553 Pattern Recognition. (3) N; Kelly
Pattern classification by distance functions and likelihood
functions, deterministic and statistical approaches to train-
able pattern classifiers, syntactic pattern recognition.
Prerequisite: EEE 554. Same as CSC 572.

554 Random Signal Theory. (3) F, S; Staff
Application of statistical techniques to the representation
and analysis of electrical signals and to communication
systems analysis. Prerequisite: EEE 303.

555 Electrical Communications. (3) S; Staff
Processing of signals in the presence of noise. Random
signals, correlation, frequency spectra, estimation, filter-
ing, noise, prediction, transients. Prerequisite: EEE 554.

556 Detection and Estimation Theory. (3) N; Staff
Combination of the classical techniques of statistical infer-
ence and the random process characterization of
communication, radar and other modern data processing
systems. Prerequisites: EEE 455, 550, 554.

557 Digital Communications. (3) N; Staff
Signal quantizing, multiplexing, PCM and Delta modula-
tion. Satellite communications. Modulation and coding
including QPSK, channel effects and bit error rates. Pre-
requisites: EEE 455, 555.

558 Modulation Theory. (3) N; Staff
Linear and nonlinear modulation, optimum processors, in-
cluding the development of performance bounds.
Prerequisites: EEE 455, 554.

559 Computer Communication Networks. (3) N; Kelly
Introduction to computer networks. Hardware elements.
Data link protocols. Packet and message switching soft-
ware elements. Network control. Examples. Prerequisites:
EEE 459, 424.

566 Advanced Medical Instrumentation. (3) N; Staff
Design and analysis of sophisticated components and sys-
tems for laboratory analysis, research, medical care, and
monitoring. Prerequisites: BSEE or equivalent.

580 Digital Control Systems. (3) S; Higgins
Analysis and design of digital and sampled data control
systems including: sampling theory, z-transforms, the
state transition method, stability, design and synthesis.
Prerequisites: EEE 550, 582.

581 Random Processes in Control Systems. (3) N; Hig-
gins
Statistical filtering, estimation, and control with emphasis
on the Kalman filter and its applications and computa-
tional problems. Prerequisites: EEE 550, 554, 582.

582 Linear System Theory. (3) F, S; Staff
State variables, controllability and observability, state
feedback and observers, multivariable systems. Prerequi-
site: EEE 480.

583 Real-Time Systems. (3) N; Higgins
Design of computer systems for real-time applications in
signal processing, graphics, control, and simulation. Pre-
requisite: EEE 423 or equivalent, EEE 428 or 433.

586 Nonlinear Control Systems. (3) N; Higgins
Stability theory including phase-plane, describing function,
Liapunov's method and frequency domain criteria for con-
tinuous and discrete, nonlinear and time-varying systems.
Prerequisite: EEE 582.

587 Optimal Control Systems. (3) N; Higgins
Application of calculus of variations, Pontryagin's princi-
ple, and dynamic programming to control problems.
Computational techniques for solving optimal control
problems. Prerequisite: EEE 582.

Special Courses: EEE 484, 494, 498, 499, 590, 591, 592,
594, 598, 599, 792, 799. (See pages 32-33.)

Engineering Core

ECE 102 Introduction to Engineering. (2) F, S
Orientation, dimensions, and units, presentation of problems; graphical representation and analysis of data, error analysis and engineering estimations, typical problems in engineering disciplines, foundations of the design process and design projects. Lecture and recitation.

104 Engineering Graphics and Design. (2) F, S
Sketching, spatial visualization, descriptive geometry, and modern engineering drawing practices for design application. Six hours lecture-laboratory.

122 Computer Programming. (2) F, S, SS
Definition, formulation and flow charting, leading to the solution of complex problems by digital computer, using Fortran. Computer solution is required for projects. Corequisite: MAT 115. (Also listed as CSC 182).

210 Engineering Mechanics I: Statics. (3) F, S, SS
Force systems, resultants, equilibrium, distributed forces, area moments, fluid statics, internal stresses, friction, energy criterion for equilibrium and stability. Prerequisite: PHY 115, 117; corequisite: ECE 380 or MAT 274. Lecture and recitation.

304 Electrical Network and System Analogies. (4) F, S, SS
Introduction to electrical networks and to a unified treatment of lumped parameter models of physical systems. Prerequisites: ECE 122 or CSC 182; ECE 380 or MAT 274; PHY 116, 118. Lecture and recitation.

312 Engineering Mechanics II: Dynamics. (3) F, S, SS
Kinematics and kinetics of particles, translating and rotating coordinate systems, rigid body kinematics, dynamics of systems of particles and rigid bodies, energy and momentum principles, vibration and time response, dynamics of non-rigid systems. Prerequisities: ECE 210; ECE 380 or MAT 274. Lecture and recitation.

313 Introduction to Deformable Solids. (3) F, S, SS
Analysis requirements: equilibrium, geometric compatibility, force-deformation relations; concepts of stress and strain, transformation equations, measurement of strain, stress-strain-temperature relations. Applications in various engineering disciplines. Prerequisites: ECE 210; ECE 380 or MAT 274. Lecture and recitation.

334 Electronic Devices and Instrumentation. (4) F, S, SS
Review of electrical network theory, semiconductor devices and integrated circuits. Electronic device and circuit applications, instruments and instrumentation systems. Prerequisite: ECE 304. Lecture, recitation and laboratory.

340 Thermodynamics. (3) F, S, SS
Work, heat and energy transformations, relationships between properties; laws, concepts and modes of analysis common to all applications of thermodynamics in engineering. Corequisite: ECE 380 or MAT 274. Lecture and recitation.

350 Structure and Properties of Materials. (3) F, S, SS
Basic concepts of material structure and its relation to properties. Application to engineering problems. Corequisite: ECE 340. Lecture and recitation.

351 Engineering Materials. (3) F, S
Structure and behavior of civil engineering materials. Laboratory investigations and test criteria. Prerequisite: ECE 313. Two lectures, 3 hours laboratory.

352 Semiconductors and Devices. (3) F, S
Crystalline nature of solids, classical and quantum mechanical description of solids, excess carriers in semiconductors, junctions, transistors and integrated circuits. Prerequisites: ECE 334; ECE 380 or MAT 274.

380 Ordinary Differential Equations for Engineers. (3) F, S
First order equations, second and higher order linear equations, series solutions, Laplace transforms, numerical solutions, boundary value problems. Prerequisites: ECE 122 or CSC 182; MAT 291. Lecture and recitation.

382 Linear Algebra for Engineers. (2) F, S, SS
Matrices and systems of linear equations, determinants, vector spaces, and eigenvalue problems. Prerequisite: MAT 291.

383 Probability and Statistics for Engineers. (2) F, S, SS
Topics include discrete and continuous distributions, random variables, sampling and descriptive statistics as well as tests of hypotheses and estimates. Prerequisite: MAT 291.

384 Numerical Analysis for Engineers. (2) F, S
Numerical solution of algebraic and transcendental equations, and systems of linear equations. Numerical integration. Curve fitting. Error bounds and error propagation. Emphasis on use of digital computer. Prerequisites: ECE 122 or CSC 182, MAT 291.

386 Partial Differential Equations for Engineers. (2) F, S
Boundary value problems, separation of variables, Fourier series as applied to initial-boundary value problems. Prerequisite: ECE 380 or MAT 274.

400 Engineering Communications. (3) F, S, SS
Composition for technical papers, reports, and scientific articles suitable for publication. Oral and written presentation. Prerequisite: ENG 102 or 104; senior standing.

Industrial and Management Systems Engineering

IEE 300 Economic Analysis for Engineers. (2) F, S
Economic evaluation of alternatives for engineering decisions emphasizing the time value of money.

330 Introduction to Data Base Design. (2) S
Data structures and techniques with special attention to DBTG standards. Design, implementation, control and case studies of data management systems. Prerequisite: ECE 122 or CSC 182.

362 Work Analysis and Design. (3) F, S
Analysis and design of man-machine systems; emphasis on work planning, methods, measurement, job evaluation. Applications in diversified fields. Two lectures, 2 hours laboratory. Corequisite: MEE 332 or approval of instructor.

372 Facilities Analysis and Design. (3) F, S
Analysis and design of man-machine systems; emphasis on facilities location, facilities design, material handling, automation. Applications in diversified fields. Two lectures, 2 hours laboratory. Prerequisite: IEE 300. Corequisite: MEE 332 or approval of instructor.

374 Quality Control. (3) F
In-depth analysis of control chart techniques. Organization and managerial aspects of quality assurance. Attribute and variable acceptance sampling plans. Prerequisite: ECE 383.

411 Engineering Economy. (3) S; Moor
Cash flow model, pricing, economic production charts, economic balance analysis, profitability models. Prerequisite: IEE 300.

422 Information Systems Design. (3) S; Bailey, Moor, Smith
The design of information systems, emphasizing human information processing and methods of information gathering.

425 Human Resources Engineering. (3) F; Moor, Young
Study of people at work; designing for human performance effectiveness and productivity. Considerations of human physiological and psychological factors. Prerequisite: IEE 362.

431 Engineering Administration. (3) F, SS; Bailey, Hoyt, Moor
Engineering organization and administration; introduction to decision making, quantitative and qualitative approaches to management and engineering administration.

461 Planning, Scheduling and Control of Resources. (3) F, S; Bailey, Bedworth, Mackulak
Industrial engineering techniques for the planning, analysis, control and evaluation of operating systems. Time series forecasting, network planning, scheduling and control. Prerequisite: ECE 383. Corequisite: IEE 362 or 372.

463 Computer-Aided Processes. (3) F; Bedworth, Mackulak, Young
Equipment and programming requirements of computer systems which interact with external physical processes. Computer Aided Manufacturing (CAM) application. Two lectures, 3 hours laboratory. Prerequisite: ECE 122 or CSC 182.

473 System Applications of Linear Programming. (3) F; Dean, Smith
Linear programming in a systems context. Emphasis on design aspects of linear programming models for a variety of problems involving transportation, allocation and total industrial systems. Prerequisite: ECE 382.

474 Reliability Assessment Techniques. (3) S, Anderson, Dean, Rollier
Distributions encountered in reliability assessment. Reliability testing and analysis. Availability and maintainability analysis. Prerequisite: IEE 374.

475 Introduction to Simulation. (3) F; Mackulak, Young
Digital simulation and its use in the analysis and design of discrete systems. Transaction and discrete event orientations are used. Prerequisites: ECE 122 or CSC 182; ECE 383.

476 Introduction to Operations Research Models. (3) S; Dean, Rollier, Smith
Operations research methodology for industrial systems. Development of models and techniques for solving decision problems such as queueing, inventory, and replacement. Prerequisite: ECE 383.

492 Project in Design and Development. (3) F, S, SS
Individual project in creative design and synthesis.

500 Systems Research Methods. (3) S; Bailey, Mackulak, Moor
Scientific and systems methods as applied to master's and doctoral degree research

510 Measurement of Productivity. (3) F; Hoyt
The engineering economic audit and its use with applications to break-even analysis, variable budget control cost analysis, and product pricing. Prerequisite: ECE 383.

511 Analysis of Decision Processes. (3) F; Rollier, Smith, Young
Methods of making economic decisions; statistical decision theory; effects of risk, uncertainty, and strategy on managerial economic decisions. Prerequisite: ECE 383.

520 Topics in Human Engineering. (3) S; Moor, Young
Human physiological and psychological factors in the design of work environments and in employment of people in man-machine systems. Two lectures, 2 hours laboratory. Prerequisite: IEE 362.

531 Topics in Engineering Administration. (3) S; Bailey, Hoyt, Moor
Consideration given to philosophical, psychological, political and social implications of administrative decisions.

533 Scheduling and Network Analysis Models. (3) F; Bailey, Smith
Application of sequencing algorithms, deterministic and stochastic network analysis and flow algorithms. Topics include CPM, PERT, GERT, GERTS, and QGERTS. Prerequisite: IEE 461.

560 Data Base Concepts for Industrial Management Systems. (3) S; Bailey, Smith
Application of data base concepts to industrial systems problems. Topics include data structures and data base management software. Prerequisite: CSC 304.

561 Production Control Information Systems. (3) F; Bailey, Bedworth, Mackulak
Development of system designs for production control. Topics include material requirement planning, scheduling, sequencing, and inventory control. On-line design concepts are covered. Prerequisite: IEE 461.

563 Distributed Computer Aided Manufacturing. (3) N; Bailey, Bedworth, Mackulak, Smith
Theory and design of network, computer-aided manufacturing systems. Concepts of host-driven microprocessors to collect data and control processes. Prerequisites: IEE 463, 476.

567 System Simulation. (3) S; Mackulak, Young
Use of simulation in the analysis and design of systems involving continuous and discrete processes; simulation languages; statistical aspects of simulation. Prerequisite: IEE 475.

569 Nonparametric Statistical Inference. (3) S; Anderson, Rollier
Application of statistical inference procedures, based on ranks, to engineering problems. Efficient alternatives to classical statistical inference constrained by normality assumptions. Prerequisite: ASE 485.

570 Advanced Quality Control. (3) F '82; Dean, Rollier
Statistical design of sampling plans and procedures for attributes and variables data; operating characteristic curves; federal specifications and standards of quality. Prerequisite: IEE 374.

572 Engineering Statistics. (3) F; Anderson, Dean, Rollier
Analysis of variance and experimental design. Topics include general design methodology, incomplete blocks, confounding, fractional replication, response surface methodology. Prerequisite: ASE 485.

574 Applied Deterministic Operations Research Models. (3) S '82; Staff
Formulation, solution, analysis and application of deter-

ministic models in operations research, including those of linear programming, integer programming, and non-linear programming. Prerequisite: IEE 473.

575 Applied Stochastic Operations Research Models. (3) S'83; Staff
Application of stochastic models including inventory theory, queueing theory, Markov processes, stochastic programming, and renewal theory. Prerequisite: IEE 476.

576 Applications of Operations Research. (3) F; Staff
Case studies of application of linear and non-linear models and general types of search techniques. Prerequisites: IEE 473, 476.

577 Information Systems Methodology. (3) F; Bailey, Moor, Smith
Systems approach to the analysis, design and implementation of management systems. Emphasis is on generalized techniques. Concern given to questions of user perceptions and systems effectiveness.

578 Advanced Decision Theory. (3) S'82; Smith
Advanced decision theory techniques for industrial systems. Topics include conjugate families of distributions, value theory, decisions with multiple objectives and goal programming. Prerequisite: IEE 511.

579 Time Series Analysis and Forecasting. (3) F; Bedworth, Rollier
Forecasting time series by the Box-Jenkins and exponential smoothing techniques; existing digital computer programs are utilized to augment the theory. Prerequisite: ASE 485.

Special Courses: IEE 484, 494, 498, 499, 590, 591, 592, 598, 599, 784, 790, 792, 799. (See pages 32-33.)

Mechanical and Energy Systems Engineering

MEE 321 Kinematics and Force Analysis in Machinery. (3) F
Positions, velocities, and accelerations of machine parts; cams, gears, flexible connectors, rolling contact; introduction to mechanisms; force analysis in linkages; balancing. Prerequisite: ECE 312.

332 Production Processes. (3) F, S
Production techniques and equipment. Casting and molding, pressure forming, material removal, joining and assembly processes, automation and material handling. Prerequisite: ECE 104 or GRC 111.

365 Dynamic Systems and Control. (4) F, S
Modeling and representations of dynamic physical systems: transfer functions, block diagrams, state equations. Transient response. Principles of feedback control and linear system analysis including root locus and frequency response. Introductory analog computer laboratory. Prerequisites: ECE 304 and 312.

371 Fluid Mechanics. (3) F, S
Introductory concepts of fluid motions; fluid statics; control volume forms of basic principles; introduction to local principles. Prerequisites: ECE 312 and 340.

372 Fluid Mechanics. (4) F, S
Application of basic principles of fluid mechanics to problems in viscous and compressible flow. Laboratory experimentation and demonstrations. Prerequisites: ECE 122, 386, MEE 371.

382 Thermodynamics. (3) F, S
Applied thermodynamics; gas mixtures, power cycles and reactive systems. Laboratory experimentation and demonstrations. Prerequisite: ECE 340.

383 Internal Combustion Engines. (3) S
Performance characteristics, combustion, carburetion, cooling, and control of internal combustion engines. Prerequisite: MET 381 or MEE 382 or approval of instructor.

386 Air Conditioning and Refrigeration. (3) F
Refrigeration cycles, refrigerant properties, heating, cooling loads; psychrometry; purification; temperature and humidity control. Prerequisite: MEE 381 or 382 or approval of instructor.

411 Nuclear Engineering. (3) F; Backus, McKlveen
Principles of neutron chain reacting systems with emphasis on nuclear reactors and nuclear powered systems. One and two group diffusion theory with introduction to computer methods. Corequisite: PHY 361, or consent of instructor.

412 Health Physics Principles and Radiation Measurements. (3) S; McKlveen
Source, characteristics, dosimetry, shielding and measurement techniques for natural and man-made radiation. Philosophy of radiation protection. Emphasis on instrumentation and environmental monitoring. Two lectures, 3 hours laboratory.

413 Reactor Safety Analysis. (3) S; McKlveen
Power reactor safety and licensing methodologies. Reactor transient and accident analysis. Use of industry codes to assess fission product build up, emergency core cooling behavior, reactivity and thermodynamic transient behavior, offsite releases and dose calculations. Prerequisite: MEE 411.

415 Nuclear System Design. (3) S, Backus, McKlveen
Engineering design of reactor and nuclear steam supply systems with emphasis on core heat removal. Prerequisites: MEE 411 and MEE 371 or CHE 331.

417 Nuclear Engineering Experiments. (3) F; McKlveen
Theory and applied concepts in reactor design, instrumentation and shielding. Experimental measurements of nuclear parameters using subcritical and critical reactors and fusion neutron generator. Fast and thermal activation analysis. Primary coolant analysis. Mossbauer spectrometry. Two lectures, 3 hours laboratory. Corequisite: MEE 411.

441 Principles of Design I. (3) F, S
Design procedures; use of fundamentals to model and to analyze design problems; material failure modes and other design criteria; applications to selected components. Prerequisites: ECE 313 and 350.

442 Principles of Design II. (3) S
Continuation of MEE 441. Application of engineering principles and techniques to the design of mechanical systems and components. Modeling and design with mechanical, electrical, hydraulic and pneumatic components. Prerequisite: MEE 441.

445 Engineering Design. (3) F, S
Group projects to design engineering components and systems. Course work problem definition, ideation, modeling and analysis, decision making and communication activities. Prerequisite: MEE 441 and at least 3 of the following courses ESE 415, 422, MEE 382, 365, 372, 488. Six hours laboratory.

446 Thermal System Design. (3) A; Evans, Florschuetz, McNeill, Metzger, Rice
Continuation of thermodynamics and heat transfer with emphasis on design of systems such as nuclear reactors, turbine engines, power plants. Prerequisites: MEE 382 and 488.

450 Aerodynamics. (3) F; Logan
Aerodynamic characteristics of airfoils; finite wings; airfoils, wings and bodies in high speed flow; boundary layer control; stability and aircraft performance. Corequisite: MEE 372.

452 Gas Dynamics. (3) N; Logan, Price
Compressible flow at subsonic and supersonic speeds; normal and oblique shocks; duct flow; numerical techniques. Prerequisite: MEE 382; corequisite: MEE 372.

453 Propulsion. (3) F; Evans, Logan, Price
Performance analysis of propulsion systems including turbojet, fanjet and turboprop engines, solid and liquid-fueled rockets, and ion-propulsion devices. Prerequisite: ECE 340.

455 Turbomachinery. (3) S; Logan, Price
Design and performance of turbomachines including steam and gas turbines, hydraulic turbines, centrifugal pumps, compressors, fans and blowers. Corequisites: MEE 372 and 382.

456 Combustion. (3) N; Hirleman, Price
Thermodynamics and chemical kinetics of combustion. Structure, propagation, and stability of flames. Pollutant formation. Prerequisite: MEE 382.

458 Solar Energy. (3) N; Backus, Evans, Wood
Solar radiation and instrumentation, design and testing of collectors, performance analyses of systems, thermal storage, photovoltaics, materials and economic analysis. Prerequisites: MEE 382 and 488.

465 Control System Design. (3) S; Limbert
Tools and methods of control system design and compensation: simulation, response optimization, frequency domain techniques, state variable feedback, sensitivity analysis. Introduction to nonlinear and discrete time systems. Prerequisites: MEE 365 or equivalent.

471 Numerical Fluid Mechanics. (3) S; Jankowski
Numerical solutions for selected problems in fluid mechanics. Prerequisite: MEE 372.

487 Direct Energy Conversion. (3) F; Backus, Jacobson
Unconventional methods of energy conversion; fuel cells, thermoelectrics, thermionics, photovoltaics, and magnetohydrodynamics. Prerequisites: ECE 340, 350.

488 Heat Transfer. (3) F, S
Steady and unsteady heat conduction including numerical solutions; thermal boundary layer concepts and applications to free and forced convection. Thermal radiation concepts. Laboratory experimentation and demonstrations. Corequisite: MEE 372.

489 Statistical Thermodynamics. (3) N; Ditsworth, Jacobson
Statistical approach to thermodynamic concepts, laws and methods of analysis. Generalized p-v-T data. Special systems. Prerequisite: ECE 340.

491 Experimental Mechanical Engineering. (3) F, S
Experimental and analytical studies of phenomena and performance of fluid flow, heat transfer, thermodynamics, refrigeration and mechanical power systems. Prerequisites: MEE 382, ECE 334; corequisite: MEE 488. One lecture, 6 hours laboratory.

492 Mechanical Engineering Projects. (2) F, S
Small group projects in fundamental or applied aspects of mechanical engineering; emphasis on experimental solutions to complex problems. Prerequisites: MEE 441, 491. Six hours laboratory.

498 Pro-Seminar. (1-3) N
Special topics for advanced students. Application of the engineering disciplines to design and analysis of modern technical devices and systems. Prerequisite: approval of instructor.

512 Reactor Theory. (3) N; McKlveen
Neutron moderation; Fermi Age theory; multigroup diffusion theory and applications; reflected reactors. Prerequisite: MEE 411.

514 Reactor Design. (3) N; McKlveen
Heterogeneous reactor systems, perturbation theory, fuel burn-up, introduction to transport theory; kinetics, controls and feedback methodology. Prerequisite: MEE 512.

544 Mechanical Design and Failure Prevention. (3) F; Davidson
Modes of mechanical failure; application of principles of elasticity and plasticity in multiaxial state of stress to design synthesis; failure theories; fatigue; creep; impact. Prerequisite: MEE 445 or equivalent.

548 Mechanism Synthesis and Analysis. (3) S; Davidson
Algebraic and graphical methods for exact and approximate synthesis of cam, gear, and linkage mechanisms; design optimization; methods of planar motion analysis; characteristics of plane motion; spatial kinematics.

553 Propulsion Systems. (3) N; Logan
Principles of gas dynamics with application to propulsion-system components. Air-breathing and chemical rocket engines.

555 Turbomachinery. (3) N; Logan
Design and performance of turbomachines including turbines, compressors, pumps, fans and blowers.

556 Combustion. (3) N; Hirleman, Price
Kinetic theory, chemical kinetics and reaction rate theories. Ignition theories; droplet, coal and fluidized bed combustion. Laser diagnostics in combustion. Prerequisite: MEE 456 or approval of instructor.

560 Advanced System Modeling, Dynamics, and Control. (3) F; Limbert
Lumped-parameter modeling of physical systems using bond graphs, with examples; state variable representations and dynamic response; introduction to modern control. Prerequisite: MEE 365 or equivalent, or approval of instructor.

561 Modern Control Theory and Applications. (3) N; Limbert
Advanced techniques for the control of physical systems and processes. Optimal control: Pontryagin formulation, numerical methods, linear regulator. Accommodation of disturbances; deterministic observers. Introduction to stochastic estimation and control: Kalman filtering. Prerequisite: MEE 560.

571 Fluid Mechanics. (3) F; Jankowski, Logan, Neitzel, Rice
Basic kinematic, dynamic and thermodynamic equations of the fluid continuum and their application to some basic fluid models.

572 Fluid Mechanics. (3) N; Jankowski
Continuation of unified treatment of MEE 571 emphasizing compressible and turbulent flows. Prerequisite: MEE 571.

573 Turbulence. (3) N; Logan
Prediction methods and experimental results for turbulent shear flows. Introduction to research methods and survey of current research activity. Prerequisite: MEE 571.

574 Mechanics of Viscous Fluids. (3) N; Rice
Laminar and turbulent viscous flows. Perturbation theory, similarity solutions and numerical solutions for the various flow regimes. Prerequisite: MEE 571.

575 Mechanics of Viscous Fluids. (3) N; Rice
Laminar and turbulent boundary layer flows; other viscous flows having boundary layer characteristics. Prerequisite: MEE 574.

581 Thermodynamics. (3) F; Ditsworth, Jacobson
Basic concepts and laws of classical equilibrium thermo-dynamics. Introduction to statistical thermodynamics. Applications to engineering systems.

582 Thermodynamics. (3) S; Ditsworth, Jacobson
Continuation of MEE 581, including statistical and irreversible thermodynamics. Prerequisite: MEE 581.

583 Direct Energy Conversion. (3) N; Backus, Jacobson
Basic concepts of direct energy conversion and associated electrical, magnetic, and thermal phenomena. Prerequisite: MEE 581.

585 Heat Transfer. (3) F, S; Allen, Florschuetz, Metzger, Wood
Basic equations and concepts of heat transfer; applications to conductive, convective and radiative heat transfer. Prerequisite: MEE 488 or equivalent.

586 Heat Transfer. (3) S; Florschuetz, Metzger
Continuation of MEE 585, emphasizing convection heat transfer. Prerequisite: MEE 585.

587 Heat Transfer. (3) F; Florschuetz, Wood
Continuation of MEE 585, emphasizing radiative heat transfer. Prerequisite: MEE 585.

591 Seminar. (1-3) N
Topics such as the following are offered frequently for advanced study beyond the regular courses and for study of engineering applications of current interest: (a) Aerodynamics, (b) Hydrodynamic Stability, (c) Photovoltaics, (d) Physical Gas Dynamics, (e) Propulsion, (f) Two Phase Flow and Heat Transfer.

594 Graduate Research Conference. (1) F, S
Topics in contemporary research. Required every semester of all Mechanical Engineering graduate students registered for 9 or more semester hours. Not for degree credit.

Special Courses: MEE 484, 499, 590, 592, 598, 599, 792, 799. (See pages 32-33.)

Society, Values, and Technology

STE 201 Technology and Social Change. (2) F, S
Technology as related to social change, contemporary and possible future impacts of technology on society. (Also listed as HUP 201).

303 Energy, Technical and Societal Aspects. (2) S
The role of energy in modern technical society. Transformation of energy from natural forms into forms useful to man; physical laws and material behaviors governing transformation; methodology used to solve engineering problems. (Not for engineering degree credit.) Prerequisite: algebra.

310 Man and Machine. (2) F
Mechanical invention and technical progress, and evolution of social forms and institutions. (Also listed as HUP 310.)

311, 312 Science and Technology in History I, II. (3-3) F, 311; S, 312
Development and applications of scientific knowledge and its effects on human aspirations and values, from ancient times through Industrial Revolution to present. STE 311 is not a prerequisite for STE 312. (Also listed as HUP 311, 312.)

402 Technology, Society and Human Values. (3) F, S, SS; Welch, Stadmiller
Values which motivate mankind to create technology. Areas of conflict and resolution between basic human values and technological society. Reading and discussion with visiting lecturers. (Also listed as HUP 402.) Prerequisite: junior standing.

403 Technology and Public Policy. (3) S; Welch
Technology assessment involving natural resources, environment, and social consequences of technology related to public policy formulation, planning process and management by objectives. Case studies and group projects. Prerequisite: junior standing.

411 Social Effects of Invention. (3) S
Invention as an instrument of change in civilization. Assessment of effects of interaction of social, cultural, and technological forces. (Also listed as HUP 411).

420 Computer Privacy, Security and Ethics. (3) S; Smith, Lewis
Seminar format discussion of the role of computers in society; their uses and potential for misuse, the intrinsic assumptions, value systems, and social factors relating to computer usage. Prerequisite: Senior standing. Three hours lecture.

Special Courses: STE 484, 494, 498, 499, 591.

Division of Technology

Frank E. Cox, M.S.E., Director

Purpose

The Division of Technology provides the opportunity for students to prepare themselves as engineering technologists, industrial technologists and industrial educators. Degree programs in engineering technology and industrial technology prepare technologists as members of the total technology team comprised of scientists, engineers, technologists and technicians. The degree program in industrial education prepares students for

instructional and administrative positions in secondary and post secondary educational institutions, technical institutions and industry.

Three undergraduate degree programs are authorized in the Division of Technology by the Arizona Board of Regents: Engineering Technology, Industrial Technology and Industrial Vocational Education. Within these three programs are several options.

The degree programs offered through the Division provide not only the technical competence but also are designed to make the student aware of the urgent problems of society and to develop a deeper appreciation of the cultural achievements of man.

Organization

Division of Technology faculty members are organized into four departments under the leadership of department chairs. Each academic unit is representative of a subject matter area as follows:

Department of Aeronautical Technology

Aeronautical Engineering Technology
Aeronautical Industrial Technology

Department of Electronic Technology

Electronic Engineering Technology
Electronic Industrial Technology

Department of Industrial Technology

Graphic Communications Engineering Technology
Graphic Communications Industrial Technology
Industrial Vocational Education
Industrial Supervision

Department of Manufacturing Technology

Manufacturing Engineering Technology
Mechanical Engineering Technology
Welding Engineering Technology

Because each faculty has its own educational mission, each is organized around an individually structured core of required courses. These respective cores provide the unifying elements of mathematics, science, graphics, communications, and technical sciences appropriate to each particular field of specialization.

The technology faculty offers a variety of emphases, concentrations and patterns (refer to the faculty's catalog presentations). Because of the variety of choices available to the student, the counsel of advisors is essential.

Degrees

(Refer to pages 216 and 217 for degrees offered by Division of Technology.)

General Studies. The Division requires a total of 16 hours in behavioral and social sciences, and humanities and fine arts, with a minimum of 6 hours in each of these areas; 8 hours of science and mathematics; and 12 hours of electives to fulfill the General Studies requirements. Students shall consult their faculty advisor for the approved list from which courses may be selected.

Admission

(1) *Beginning College Students* in the Division of Technology must satisfy the minimum University requirements.

(2) *Students transferring to the Division of Technology* must have no grade lower than a C in the field of specialization to be accepted as transfer credit to meet the graduation requirements for a technology degree.

Any student enrolling in the Division of Technology (transfer, beginning, or continuing) not having English as a first language must demonstrate English proficiency by passing the TOEFL with a minimum score of 500 or other acceptable demonstration of English proficiency.

Retention. A student is expected to make satisfactory progress toward completion of degree requirements in order to continue enrollment in the Division of Technology. Any one of the following conditions will be considered unsatisfactory progress and will result in the student being placed on provisional (probationary) status:

1. A deficiency of 15 grade points.
2. A semester or summer session with grade point average less than 1.50.
3. Two successive semesters, summer sessions, or combinations of these with grade point averages below 2.00.

Disqualification can occur after one semester of probationary status. After two successive semesters on probation, a student who fails to meet the retention standards will be disqualified.

Requirements for Graduation. In order to qualify for graduation from the Division of Technology, a student must have a grade point

average of at least 2.00 for the required basic science and mathematics courses and field of specialization courses.

Department of Aeronautical Technology

PROFESSOR:
COX

ASSOCIATE PROFESSORS:
REED (TC 203), ROPER, WOOD

ASSISTANT PROFESSORS:
CARLSEN, KRAEMER, SCHOEN, STIMSON

The Department of Aeronautical Technology provides two concentrations: Aeronautical Engineering Technology and Aeronautical Industrial Technology, which prepare the graduate for entry into the aerospace industry in immediately productive professional employment, or for graduate study. These curricula emphasize the recognized principles underlying the applications of technical knowledge, as well as current technology, so that the graduate is prepared for the changes which occur so rapidly and so continually in aerospace technology.

Three curriculum areas of emphasis are offered within the two concentrations:

Aeronautical Engineering Technology	(I)
Aeronautical Industrial Technology	
Air Transportation Flight Technology	(II)
Air Transportation Management Technology	(III)

These three curriculum concentrations build upon a core of courses which are common to all three:

Aeronautical Technology Core

			Semester Hours
MAT	115	College Algebra and Trigonometry	4
MAT	260	Technical Calculus I	3
CSC	182	Elementary Fortran Programming	2
PHY	111	and 113 General Physics	4
PHY	112	and 114 General Physics	4
CHM	114	General Chemistry for Engineers or CHM 113 General Chemistry	4
ECN	201	Principles of Economics	3

MET	101	Manufacturing Processes and Materials	3
MET	121	Problem Solving	3
GRC	111	Technical Graphics	2
ELT	200	Applied Electricity/ Electronics	3
GRC	420	Technical Writing	3
AET	180	Aerospace Structures and Materials	3
AET	181	Aerospace Systems	3
AET	287	Aircraft and Aerospace Powerplants	3
AET	288	Gas Turbines and Turbomachinery	3
AET	300	Aircraft Design I	3
AET	306	Aerospace Electrical and Electronic Systems	3
AET	390	Aerospace System Analysis I	3
AET	487	Aircraft Design II	3
		Total	62

Satisfactory completion of all Department core courses, or their equivalents, plus the courses listed below for each emphasis, is necessary to qualify for graduation. Students planning to begin course work at another institution should consult an Aeronautical Technology academic advisor for assistance in planning a transferable program.

A Master of Technology program is available for qualified persons. (See Division of Technology Graduate Degrees and the *Graduate Catalog.*)

Aeronautical Engineering Technology
(Accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology.)

The Aeronautical Engineering Technology curriculum is designed to prepare the technologist for technical support of engineering activities throughout the aerospace field. Areas of responsibility include the application of applied engineering practice related to: aircraft and aerospace vehicle design, internal combustion engines, combustion processes, turbomachinery, systems analysis, and environmental control. A minimum of 130 semester hours of satisfactory credits are required to complete this program.

The following courses are required, in addition to the Department core courses, three

hours of technical electives as approved by the student's academic advisor, and the General Studies requirements:

Required courses: ELT 201, MAT 261; MET 116, 310, 311, 360, 380, 381, 407; AET 301, 309, 310, 372, 414, 415, 417, 490.

The suggested freshman pattern presented below may be useful as a general guide for new Aeronautical Engineering Technology students. Each individual student's program is subject to final approval of the academic advisor.

Suggested Course Pattern for Freshmen

Fall Semester

			Semester Hours
ENG	101	First Year English	3
AET	180	Aerospace Structures and Materials	3
MET	116	Aeronautical Welding	2
MAT	115	College Algebra and Trigonometry	4
MET	101	Manufacturing Processes and Materials	3
Total Credit Hours			15

Spring Semester

ENG	102	First Year English	3
AET	181	Aerospace Systems	3
PHY	111/	113 General Physics	4
MET	121	Problem Solving	3
MAT	260	Technical Calculus I	3
Total Credit Hours			16

Aeronautical Industrial Technology

Instruction combines thorough technical training with a general university education. The curricula are designed to prepare aeronautical industrial technologists with theoretical and practical backgrounds in the area of structures, internal combustion, turbomachinery, design, management, general and commercial aviation, systems analysis, and environmental control.

Two curriculum areas of emphasis are available in this concentration: Air Transportation Flight Technology and Air Transportation Management Technology. Each requires a minimum of 127 semester hours of satisfactory credits for completion. The two areas of emphasis are described separately below.

Air Transportation Flight Technology

(Flight training is certified by the Federal Aviation Administration.)

Air Transportation Flight Technology com-bines academic studies and flight training to prepare graduates for a variety of positions within the air transportation industry, primarily in the area of flight operations. Ground school and flight training are available, allowing the student to obtain the glider pilot, private pilot, commercial pilot and flight instructor certificates, and also the instrument pilot, instrument instructor, and multiengine pilot ratings.

While enrolled at Arizona State University, students will not receive college credit for flight instruction received at flight schools other than schools with which the University has currently contracted for such instruction. Consideration for credit will be given for flight experience and certificates received prior to enrollment at the University.

Flight instruction costs are not included in University tuition.

The following courses are required, in addition to the Department core courses, two hours ot technical electives as approved by the student's academic advisor, and the General Studies requirements:

Required Courses: AET 182, 183, 202, 303, 314, 380, 382, 383, 384, 385, 386, 391, 410, 411, 488, 489, *either* AET 387 *and* 389 *or* AET 392 *and* 393; MET 310.

The suggested freshman pattern presented below may be useful as a general guide for new Air Transportation flight Technology students. Each individual student's program is subject to final approval of the academic advisor.

Suggested Course Pattern for Freshmen

Fall Semester

			Semester Hours
ENG	101	First Year English	3
AET	180	Aerospace Structures and Materials	3
AET	182	Private Pilot Ground School	4
MAT	115	College Algebra and Trigonometry	4
GRC	111	Technical Graphics	2
Total Credit Hours			16

Spring Semester

ENG	102	First Year English	3
AET	181	Aerospace Systems	3
AET	183	Private Pilot Certificate	1

MET 101 Manufacturing Processes
and Materials 3

MET 121 Problem Solving 3

PHY 111/ 113 General Physics 4

Total Credit Hours 17

Air Transportation Management Technology

The management emphasis is designed to pre-
pare graduates for managerial and supervisory
positions within the air transportation indus-
try. It encompasses areas leading to jobs with
manufacturers, fixed-base operators, airports,
airlines, and government agencies. A depth of
technical training is included along with a
broad exposure to business management curri-
cula.

The following courses are required, in addi-
tion to the Department core courses, three
hours of technical electives as approved by the
student's academic advisor, and the General
Studies requirements:

Required Courses: AET 303, 311, 384, 391,
410, 411, 488, 489, 490; ACC 101, 102; ADS
305, ECN 202; FIN 300; MKT 300; MGT
301, 311.

The suggested pattern presented below may
be useful as a general guide for new Air
Transportation Management Technology stu-
dents. Each individual student's program is
subject to final approval of the academic advi-
sor.

Suggested Course Pattern for Freshmen

Fall Semester *Semester Hours*

ENG 101 First Year English 3

AET 180 Aerospace Structures
and Materials 3

MAT 115 College Algebra and
Trigonometry 4

MET 101 Manufacturing Processes
and Materials 3

ACC 101 Elementary Accounting 3

Total Credit Hours 16

Spring Semester

ENG 102 First Year English 3

AET 182 Aerospace Systems 3

MET 121 Problem Solving 3

PHY 111/ 112 General Physics 4

MAT 260 Technical Calculus 1 3

Total Credit Hours 16

Department of Electronic Technology

PROFESSORS:
KANNEMAN (TC 301H)
ASSOCIATE PROFESSORS:
GRADY, McCURDY, McHENRY, STRAWN,
WOOD
ASSISTANT PROFESSORS:
EDWARDS, PETERSON

Program patterns in electronics are organized
into two major categories. The first, Electronic
Engineering Technology (accredited by the
Technology Accreditation Commission of the
Accreditation Board for Engineering and
Technology—formerly ECPD), is an inte-
grated four-year program aimed at technical
careers in industry in support of engineering
functions and related activities. The second,
Electronic Industrial Technology, provides for
a variety of electronics-related careers which
are in support of general industrial functions
and related activities. Program patterns under
Electronic Industrial Technology are generally
of the two-plus-two variety, or are intern-
related in nature and are intended to support
in-process or established career patterns.

Several formal cooperative education and
internship programs are available. These pro-
grams consist of formal agreements between
the Department of Electronic Technology and
electronics industries. Cooperative programs
usually involve students at the junior or senior
level in electronics, with full-time academic
work rotated with full-time employment using
the fall, spring, and summer sessions as
school/work periods. Intern programs usually
involve continuous concurrent part-time en-
rollment at ASU and part-time employment at
a participating electronic industry. Graduation
(starting as a junior) is usually extended by
one to two semesters for either type of pro-
gram.

A Master of Technology program, with a
concentration in Electronics (with patterns in
digital systems, communication system, elec-
tronic systems and industrial systems), is
available for qualified B.S. Technology gradu-
ates. (See Division of Technology Graduate
Degrees and *Graduate Catalog.)*

All Electronics bachelor's program patterns require the general technology core courses shown below:

General Technology Core *Semester Hours*

GRC	111	Technical Graphics	2
GRC	420	Technical Writing	3
MET	101	Manufacturing Processes and Materials	3
MET	121	Problem Solving	3
		Total	11

The Electronic Engineering Technology program requires the following additional general technology core courses, for a total general technology core of 17 semester hours:

ELT	414	Applied Materials Science for Electronics (or approved technical science elective)	3
ELT	483	Applied Calculus	3

Total for Electronic Engineering Technology ... 17

All Electronics bachelor's program patterns require the basic electronics core of 17 hours shown below.

Electronics Core *Semester Hours*

ELT	202	Applied Electrical Science	3
ELT	203	Applied Electrical Science Laboratory	1
ELT	210	Active Devices	3
ELT	211	Electronic Circuits Laboratory I	1
ELT	300	Electric Circuits	3
ELT	315	Electronics Fabrication Principles I	2
ELT	330	Electronic Instrumentation	2
ELT	331	Instrumentation Laboratory	1
ELT	494A	ST: Professional Orientation	1
		Total	17

The General Studies core for all Electronics bachelor's program patterns require the courses shown below. A minimum of 6 semester hours each in humanities/fine arts and in social/behavorial sciences is required, with a total minimum of 16 semester hours combined for two groups required. The General Studies total minimum, including Mathematics/Science, is 42 semester hours (45 for Electronic Engineering Technology). Department of Electronics Advisement Form 2 should be consulted for approved electives in the General Studies area.

General Studies Core (Required Courses)

ENG	101	First Year English	3
ENG	102	First Year English	3
COM	100	Intro. to Human Communication	3
ECN	201	Principles of Economics	3
MAT	115	College Algebra and Trigonometry	4
MAT	260	Technical Calculus I	3
PHY	111	General Physics I	3
PHY	113	General Physics I Lab	1
PHY	112	General Physics II	3
PHY	114	General Physics Lab II	1
PHY	460	Elementary Atomic Physics (or CHM 113)	3
CSC	182	Elementary Fortran Programming	2
		Total	32

In addition, the Electronic Industrial Technology General Studies core requires MGT 301 Principles of Management (3); the Electronic Engineering Technology General Studies core requires MAT 261 Technical Calculus II (3)—for a total General Studies minimum of 42 (45 for Electronic Engineering Technology) semester hours, including electives.

Beyond the General Studies core, the requirements for various program patterns in electronics follow. A minimum of 24 upper division hours of electronics must be taken at Arizona State University.

A suggested freshman year course pattern for all students in the Department of Electronic Technology is shown below. Complete curriculum and four-year course patterns are available from the Department (advisement forms 3 and 4).

Suggested Course Pattern for Freshmen

First Semester *Semester Hours*

ENG	101	First Year English	3
MAT	115	College Algebra and Trigonometry	4
MET	101	Manufacturing Processes and Materials	3
GRC	111	Technical Graphics	2
COM	100	Intro. to Human Communication	3
		Social/Behavioral Science Elective	2
		Total	15-17

Second Semester

ENG	102	First Year English	3
MAT	260	Technical Calculus I	3
PHY	111	General Physics I	3
PHY	113	General Physics Lab I	1
MET	121	Problem Solving	3
		Social/Behavioral Science Elective	3
		Total	16

Electronic Engineering Technology

(Accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).)
Engineering Technology is that part of the technological field which requires the application of scientific and engineering knowledge and methods combined with technical skills in support of engineering activities; it lies in the occupational spectrum between the craftsman and the engineer at the end of the spectrum closest to the engineer. The engineering technologist is a member of the engineering team, consisting of the engineer, engineering technologist, and engineering technician. The engineering technologist must be applications oriented, building upon a background of applied mathematics through the concepts and applications of calculus. Based upon applied science and technology, the technologist must be able to: produce practical, workable and safe results quickly and economically; install and operate technical systems; configure hardware from proven concepts; develop and produce products; service machines and systems; manage construction and production processes; and provide sales support to technical products and systems.

Electronic Engineering Technology is a concentration available to students interested in applied electronics with emphasis on established electronic engineering design principles and application. This four-year program is designed primarily to prepare students for employment in technical positions in industry in engineering-related activities.

The graduate typically finds employment in most major industries at various levels of responsibility including research and development support, design support, product support, fabrication, production, testing and evaluation, technical writing, and field engineering. Some typical positions open to Electronic Engineering Technology graduates include: research and development technolo-

gist, design specialist, field engineering specialist, test equipment specialist, process control technologist, high frequency systems technologist, and technical writer.

The Electronic Engineering Technology program is arranged as a cohesive four-year program of career preparation. The department offers a rotational selection of evening courses to serve the part-time evening student.

The program elements of the Electronic Engineering Technology program are:

	Semester Hours
General Technology Core	17
Electronics Core	17
Electronic Engineering Technology Core	18
Approved Area of Emphasis	27
Approved Electives	6
General Studies (inc. core)	45
Total program (minimum)	130

Electronic Engineering Technology Core

			Semester Hours
ELT	301	Electric Networks I	3
ELT	310	Electronic Circuits I	3
ELT	311	Electronic Circuits Lab II	1
ELT	400	Electric Networks II	3
ELT	415	Electronics Fabrication Principles II	2
ELT	450	Digital Logic Principles	3
ELT	472	Communication Systems I	3
		Total	18

Area of Emphasis: In addition to the various cores required and remaining electives, the student must select an area of emphasis according to career interests within the field of electronics. The emphasis consists of 27 hours in an approved pattern which must include the equivalent of six (6) approved upper division design-laboratory emphasis units. Upper division labs related to ELT 311, 315, 331, and 415 are core labs and do not count towards the six semester hours of upper division emphasis lab requirements. Required courses for several approved areas of emphasis are shown below:

Communication Systems Technology Emphasis (Co-op program available). Required courses: ELT 404, 470, 471, 473, 475, 476, 477; plus an additional 12 hours of approved upper division emphasis electives which must include three semester hours of approved upper division emphasis labs.

Digital Systems Technology Emphasis:
Required courses: ELT 451, 452, 453, 454,
455, 456, 422, 423; plus an additional 11
hours of approved upper division emphasis
electives which must include one semester
hour of approved upper division emphasis labs.

Clinical Engineering Technology Emphasis
(Intern program available). Required courses:
ELT 420, 421, 430, 431, 451, 454, 455; ZOL
201, 202; plus an additional 6 hours of ap-
proved emphasis electives which must include
1 semester hour of approved upper division
emphasis labs.

*Computer Engineering (Software) Technol-
ogy Emphasis.* Required courses: ELT 451,
454, 455, 456, 408; ELT 486 or CSC 383;
ELT 473 or EEE 459; CSC 100; CSC 101 (or
CSC 182); IEE 330; CSC 309; plus an addi-
tional 5 hours of approved emphasis electives.

Electronic Circuits Technology Emphasis.
Required Courses: ELT 410, 411, 420, 421,
422, 423, 460, 461, 417; plus an additional 8
hours of approved upper division emphasis
electives which must include 2 semester hours
of approved upper-division emphasis labs.

Electrical Systems Technology Emphasis.
Required Courses: ELT 340 (or 440), 430,
431, 486, 460, 461; plus an additional 13
hours of approved upper division emphasis
electives which must include 3 semester hours
of approved upper-division emphasis labs.

*Electronic Manufacturing Technology
Emphasis.* Required Courses: ELT 417, 460,
461; MET 200, 301, 401; QBA 221 (or MAT
326), MGT 301; plus an additional 5 hours of
approved emphasis electives.

Applied Technical Science Emphasis. Re-
quired Courses: MET 310, 311, 360, 440, 380;
MAT 326 or 420 or QBA 221; AET 372 or
MAT 213; plus an additional 6-7 hours of
approved emphasis electives.

Approved emphasis electives in the above
patterns may include one 3-4 hour applied
technical science course.

Electronic Industrial Technology

The employment objective of the industrial
technologist is more closely allied with produc-
tion support and management in contrast with
the engineering activities associated with the
engineering technologist. Program and em-
ployment emphasis is on applied aspects of
industrial processes and upon personnel lead-
ership. The industrial technologist works with
engineering and technological personnel and
contributes to their ideas as well as supervises
and manages personnel in the coordination of
their efforts in the utilization of materials and
machines for producing and distributing in-
dustrial products.

Graduates of an electronics-oriented tech-
nology program find employment in the
electrical and electronics industry as industrial
technologists in such activities as product sup-
port and coordination, manufacturing and
process development, production support and
management.

Two-year associate degree graduates and
others who have identified specific career
needs in connection with their job require-
ments and goals, may pursue programs in
Electronic Industrial Technology which allow
for supporting patterns in industrial supervi-
sion, manufacturing technology, technical
education, business administration, aerospace
or military science, and others.

Programs in Electronic Industrial Technol-
ogy are organized around the general
technology core and the General Studies core
with the remaining requirements specified in
the program elements shown below.

	Semester Hours
General Technology Core	11
Electronics Core	17
Technical Area (approved pattern)	24
Supporting Area (approved pattern)	24
General Studies (inc. core)	42
Approved Electives	8
Total (minimum)	126

Technical Area Courses: An approved pattern
of 24 hours is required and must include the
following courses or approved equivalents.
Required courses: ELT 301, 310, 311, 417;
plus ELT 340 or 440 or 380; ELT 476 or 472;
ELT 430 or 460; ELT 450 or EEE 320; ELT
486; ELT 415 or 414 or 482 or two approved
upper division ELT lab units in addition to
core lab requirements.

Supporting Area: An approved pattern of 24
hours is required. Required courses for cur-
rently approved supporting areas are shown
below. Other proposed patterns must be ap-
proved by the Electronics Curriculum
Committee. Some of the required courses may
also be utilized for General Studies require-
ments, thus providing for additional approved
electives.

Industrial Supervision: IVE 443, 444, IVE 450 (or MGT 422), IVE 452, MGT 311, 451, plus an additional 6 hours of approved supporting pattern electives.

Manufacturing Technology: MET 200, 402, 408, 301, 401, 306, plus an additional 6 hours of approved supporting area electives.

Technical Education (satisfies technical education entrance requirements for Technical Teacher Education concentration under the Master of Technology): IVE 402, 442, 480; IVE 445 or equivalent; IVE 485 or SED 433 or equivalent.

Business Administration (satisfies business entrance requirements for MBA): ECN 201 and 202 (or ECN 500); FIN 300 or 500; QBA 221; ADS 305; MGT 301; MKT 300; ACC 101 and 102 (or ACC 500).

Aerospace/Military Science: AES/MIS 101, 102, 201, 202, 301, 302, 401, 402.

Department of Industrial Technology

PROFESSORS
PRUST (TC 201K), BARTEL, BROWN, BURDETTE, KIGIN, LITTRELL

ASSOCIATE PROFESSORS
PARDINI, WATKINS

ASSISTANT PROFESSORS
HIRATA, MATSON, WILLIAMS

LECTURER
BROCKMANN

The Department of Industrial Technology includes the following concentrations: Graphic Communications, Industrial Vocational Education and Industrial Supervision. Even though the direction varies considerably, the applied aspects of industrial processes are predominant in all specializations.

Each concentration has specific core courses required of every major in that field, in addition to the University General Studies. There are also variations in the courses taken as an area of emphasis.

Suggested freshman patterns are presented in each concentration, which should be used as a guide, but the final course selection is made with and approved by a faculty advisor.

Graphic Communications Engineering Technology

The Graphic Communications Engineering Technology concentration is designed to prepare the graduate for employment in technical positions which require engineering-related activities. These people receive educational experience in graphic communications, manufacturing, electronics and computer applications. Each major is also required to take the Engineering Technology Core as well as the General Studies courses.

			Semester Hours
CHM	114	General Chemistry for Engineers	4
CSC	182	Digital Computer Programming	2
ECN	201	Principles of Economics	3
ELT	200	Applied Electricity/Electronics	3
GRC	111	Technical Graphics	2
GRC	420	Technical Writing	3
MAT	115	College Algebra and Trigonometry	4
MAT	260	Technical Calculus I	3
MAT	261	Technical Calculus II	3
MET	101	Manufacturing Processes and Materials	3
MET	121	Problem Solving	3

The sequence in which courses are taken is very important, although slight variations are permitted. The following course selection pattern is recommended for the freshman year:

First Semester

			Semester Hours
ENG	101	First Year English	3
GRC	111	Technical Graphics	2
MAT	115	College Algebra and Trigonometry	4
MET	101	Manufacturing Processes and Materials	3
		Field of Specialization Courses	6
		Total Credit Hours	18

Second Semester

ELT	200	Applied Electricity/Electronics	3
ENG	102	First Year English	3
MET	121	Problem Solving	3
PHY	111	General Physics	3
		Field of Specialization Courses	6
		Total Credit Hours	18

The student is advised to seek assistance in planning transferable courses.

The following courses are required and should be selected with the assistance of an advisor: GRC 136, 238, 332, 333, 334, 336, 337, 436, 437, 439; MET 301, 303, 401, 418;

ELT 201, 380, 450, 451; IVE 443; IEE 330; COM 300.

Graphic Communications Industrial Technology

The Graphic Communications Industrial Technology concentration provides a diversified approach for individuals interested in graphic communications techniques. The impact of written and printed materials, such as newspapers, magazines, manuals, books, greeting cards, package printing and other visual material is of great social and technical significance in our society.

The Graphic Communications Industrial Technology concentration has two areas of emphasis. The first is the Commercial Printing aspect of the industry. These students would seek employment in firms whose specific product is printed by a graphic communications process. It is a broad based professional education which is intended to prepare students for a wide range of careers in the industry. Among these are positions in general management, production, quality control, sales, customer service, estimating and design.

The second area of emphasis is In-Plant Printing Management. The main thrust of the emphasis is the preparation of individuals for employment in in-plant facilities.

The goals of each student are reviewed and courses are suggested beyond the required courses. The selection of support courses is based on the anticipated needs of the student.

Commercial Printing Area of Emphasis

The students in Commercial Printing will be involved in educational experiences which are technically oriented with management skills a prime objective. Electives may be taken in many areas such as computer applications, design, marketing, etc.

Commercial Printing Core

			Semester Hours
CHM	101	Intro. to Chemistry	4
CSC	182	Digital Computer Programming	2
ECN	201	Principles of Economics	3
ELT	280	Electricity/Electronics	3
GRC	111	Technical Graphics	2
GRC	420	Technical Writing	3
MAT	115	College Algebra and Trigonometry	4
MAT	260	Technical Calculus I	3
MET	101	Manufacturing Processes and Materials	3

MET	121	Problem Solving	3
MGT	301	Principles of Management	3
PHY	101	Intro. to Physics	4

The suggested freshman pattern:

First Semester

ENG	101	First Year English	3
GRC	111	Technical Graphics	2
MAT	115	College Algebra and Trigonometry	4
MET	101	Manufacturing Processes and Materials	3
		Field of Specialization	6
		Total Credit Hours	18

Second Semester

CHM	101	Intro. to Chemistry	4
ENG	102	First Year English	3
MET	121	Problem Solving	3
		Field of Specialization	6
		Total Credit Hours	16

The following courses are required and should be selected with the assistance of an advisor: GRC 135, 136, 237, 238, 331, 332, 333, 334, 335, 336, 337, 339, 433, 436, 437, 438, 439; ACC 300; MGT 311; IVE 443.

In-Plant Printing Management Area of Emphasis

The pattern of study is very similar to the Commercial Printing emphasis but additional courses in analysis and computer applications are required of all majors in the In-Plant Printing Management emphasis.

In-Plant Printing Management Core

			Semester Hours
CHM	101	Intro. to Chemistry	4
CSC	182	Digital Computer Programming	2
ECN	201	Principles of Economics	3
ELT	280	Electricity/Electronics	3
GRC	111	Technical Graphics	2
GRC	420	Technical Writing	3
MAT	115	College Algebra/Trigonometry	4
MAT	260	Technical Calculus I	3
MET	101	Manufacturing Processes and Materials	3
MET	121	Problem Solving	3
MGT	301	Principles of Management	3
PHY	101	Intro. to Physics	4

The suggested freshman pattern is as follows:

		First Semester	Semester Hours
ENG	101	First Year English	3
GRC	111	Technical Graphics	2
MAT	115	College Algebra/Trigonometry	4
MET	101	Manufacturing Processes and Materials	3
		Field of Specialization	6
		Total Credit Hours	18

Second Semester

CHM	101	Intro. to Chemistry	4
ENG	101	First Year English	3
MET	121	Problem Solving	3
		Field of Specialization	6
		Total Credit Hours	16

The following courses are required and should be selected with the assistance of an advisor: GRC 135, 136, 236, 237, 238, 332, 333, 334, 335, 336, 337, 338, 339, 433, 435, 436, 438; ACC 300; MGT 311; IVE 443. Selected statistical analysis and computer applications courses will be required as recommended by the Graphic Comunications Advisory Board.

Industrial Supervision

The purpose of the Industrial Supervision concentration is to prepare supervisors and higher level personnel in manufacturing and technical areas. The concentration provides for a general education background with an emphasis in recognized technology and supervisory studies. Many students will have completed the major part of the first two years at a community college.

Contacting an advisor is suggested to coordinate the course selection for transfer to the Industrial Supervision field of specialization.

A minimum of 18 semeser hours of credit, approved by the advisor, is required in supervision and 40 semester hours of credit in a technical support pattern, such as aeronautics, drafting/design, electronics, graphic communications or manufacturing as well as courses in safety, fire science and health.

Internship and prior industrial experience (IVE 445 and 455) can be used as part of the technical concentration. Prior to the completion of the degree, the student must show evidence of adequate and appropriate occupational experience.

Industrial Supervision Core

The following courses are required of all Industrial Supervision majors:

			Semester Hours
CHM	101	Intro. to Chemistry	4
CIS	302	Electronics Data Processing	3
COM	300	Group Communication	3
ECN	202	Principles of Economics	3
ELT	280	Electricity/Electronics	3
GRC	111	Technical Graphics	2
GRC	420	Technical Writing	3
IVE	443	Industrial Safety	3
IVE	444	Modern Industries	3
IVE	450	Industrial Training	3
IVE	452	Industrial Supervision	3
MAT	115	College Algebra and Trig	4
PGS	100	Intro. to Psychology	3
PHY	111	General Physics	3
PHY	113	General Physics Lab	1

The suggested freshman pattern follows:

		First Semester	Semester Hours
ENG	101	First Year English	3
GRC	111	Technical Graphics	2
MAT	115	College Algebra/Trigonometry	4
PGS	100	Intro. to Psychology	3
		Electives or Technical Courses	6
		Total Credit Hours	15-18

Second Semester

ECN	202	Principles of Economics	3
ELT	280	Electricity/Electronics	3
ENG	102	First Year English	3
PHY	111	General Physics	3
PHY	113	General Physics Lab	1
		Electives or Technical Courses	3
		Total Credit Hours	16

The following courses are also required: MGT 301, 351; PGS 420.

Industrial Vocational Education

The Industrial Vocational Education field of specialization is composed of three areas of emphasis: Industrial Arts Education, Technical Teacher Education, and Vocational Teacher Education.

Students in each of these areas of emphasis combine technology courses, professional education, and General Studies to prepare for educational careers. Concentration in a variety of technical fields is available.

Industrial Arts Education Area of Emphasis

The Industrial Arts Education student is being prepared to teach technical subjects at the elementary and secondary school levels. Each person will choose two technical areas, such as automotives, drafting, electronics, graphic communications, metals and woods. A minimum of 60 semester credit hours, approved by an advisor, is required in technical and IVE professional courses to meet degree requirements leading to a teaching certificate. A 30 semester hour minor is available in Industrial Arts Education.

Industrial Arts Education Core

The following courses are required of all Industrial Arts Education Students:

			Semester Hours
ELT	280	Electricity/Electronics	3
GRC	111	Technical Graphics	2
GRC	135	General Graphic Arts	3
IVE	120	General Woods	3
IVE	160	General Metals	3
IVE	201	Power and Energy	3
IVE	202	Industrial Arts Design	3
IVE	300	American Industry Enterprise	3
IVE	402	Occupational Analysis and Course Development	3
IVE	442	Facility Planning and Managment	3
IVE	443, 446 or 491		3
MAT	115	College Algebra and Trig	4
		Physics, Chemistry	6

While there are variations in the sequence in which courses are taken in industrial arts education, the suggested freshman pattern may be useful as a general guide, subject to the approval of a faculty advisor.

First Semester

			Semester Hours
ENG	101	First Year English	3
GRC	111	Technical Graphics	2
IVE	120	General Woods	3
IVE	160	General Metals	3
MAT	115	College Algebra and Trigonometry	4
		Total Credit Hours	15

Second Semester

ENG	102	First Year English	3
GRC	135	General Graphic Arts	3
HIS	103	U.S. History	3
IVE	201	Energy and Power	3

IVE	202	Industrial Arts Design	2
PGS	101	General Psychology	3
		Total Credit Hours	17

The following courses are required and should be selected with the assistance of an advisor: (EDP 310; SED 310, 311, 411, 433) or (SED 400, 401, 433, 434), IVE 480; RDG 467, 480; COM 100/300.

Technical Teacher Education Area of Emphasis

The major objective of the Technical Teacher Education emphasis is the preparation of technical educators for the post-secondary level. Technical courses concentration is a requirement. Internship and prior industrial experience, approved by the advisor, is considered a means of gaining technical expertise in an industrial situation.

Prior to the completion of the degree, the student must show evidence of adequate and appropriate occupational experience.

Technical Teacher Education Core

The following courses are required of all Technical Teacher Education students:

			Semester Hours
ELT	280	Electricity/Electronics	3
GRC	420	Technical Writing	3
IVE	202	Industrial Arts Design	2
IVE	402	Occupational Analysis and Course Development	3
IVE	442	Facility Planning and Management	3
IVE	443	Industrial Safety	3
IVE	444	Modern Industries	3
IVE	446	Instructional Aids and Materials	3
IVE	480	Teaching Industrial and Vocational	3
IVE	485	Teaching Internship	4
IVE	491	Organizational and Management of Coop Programs	3
MAT	115	College Algebra and Trigonometry	4
		Physics and Chemistry	6

The following suggested freshman course pattern is to be used as a guide but final selection is to be made with the faculty advisors approval.

First Semester | Semester Hours

COM 100 Intro. Human Communication 3
ENG 101 First Year English 3
MAT 115 College Algebra/Trigonometry 4
          Technical Courses 6
          Total Credit Hours 16

Second Semester

ENG 102 First Year English 3
          Physics 3
          Social and Behavioral Sciences 3
          Technical Courses 6
          Total Credit Hours 15

The following courses are required and should be selected with the assistance of an advisor: ECN 201; COM 100 or 300.

Vocational Teacher Education Area of Emphasis

The purpose of Vocational Teacher Education offerings is to provide courses that will meet the needs of vocational teachers and prospective vocational teachers for meeting Arizona vocational certification requirements.

The selection of courses is under direct supervision of a faculty advisor.

Department of Manufacturing Technology

ASSOCIATE PROFESSORS:
SCHMIDT (T122), GRAHAM, MINTER

ASSISTANT PROFESSORS:
KELLEY, KISIELEWSKI

The Manufacturing Engineering Technology, the Mechanical Engineering Technology, and the Welding Engineering Technology concentrations of the Department of Manufacturing Technology are accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering Technology.

Increased technological complexity and sophistication has created great industrial demand for the services of those individuals who possess working knowledge of the technical phases of planning, testing, production and fabrication of consumer and industrial products and equipment. To meet these needs, three concentrations are available in the manufacturing programs: (1) Manufacturing Engineering Technology, (2) Mechanical Engineering Technology and (3) Welding

Engineering Technology. Each of these concentrations require a minimum of 130 semester hours of satisfactory credits for completion.

Each of these concentrations requires a common manufacturing and technology core in addition to the University 42 semester hour General Studies requirement.

The three concentrations in the Department of Manufacturing Technology require the manufacturing and technology core courses listed below:

Manufacturing and Technology Core | Semester Hours

MET 101 Manufacturing Processes and
          Materials 3
MET 121 Problem Solving 3
GRC 111 Technical Graphics 2
MET 200 Manufacturing Process 3
ELT 200 Applied Electricity/Electronics 3
ELT 201 Applied Electricity/Electronics
          Laboratory 1
MET 301 Manufacturing Analysis 3
MET 310 Applied Mechanics Statics 3
MET 311 Applied Mechanics-Materials 3
GRC 314 Machine Drawing 3
MET 320 Welding Survey 4
MET 401 Quality Control 3
MET 404 Applied Metallurgy 3
GRC 420 Technical Writing 3
ELT 483 Applied Calculus (or approved
          Math substitute) 3
          Total 43

A suggested freshman year course pattern for all students in the Department of Manufacturing Technology is shown below. Complete curriculum and four-year course patterns for the three concentrations in Manufacturing Technology are available from the Department.

Suggested Course Pattern for Freshmen

First Semester | Semester Hours

ENG 101 English 3
MAT 115 College Algebra and Trig 4
MET 101 Manufacturing Processes and
          Materials 3
GRC 111 Technical Graphics 2
COM 100 Intro. to Human Communication 3
          Total 15

Second Semester

ENG	102	English	3
MAT	260	Technical Calculus I	3
PHY	111	General Physics I	3
MET	121	Problem Solving	3
		Social/Behavioral Science Elective	3
		General Elective	2
		Total	17

Manufacturing Engineering Technology. This concentration is designed to prepare technologists with both conceptual and practical applications of processes, materials, and products related to metalworking industries. Accordingly, this concentration is intended to prepare students to meet the responsibilities in planning the processes of production, developing the tools and machines, and integrating the facilities of production or manufacturing.

Required courses: MET 303, 304, 305, 306, 402, 403, 405, 406, 408; AET 309, plus approved technical electives.

Mechanical Engineering Technology. This concentration is designed to prepare the individual for technical positions involved with a broad range of activities such as design, development and the evaluation of machines, power generation and transmission, instrumentation and testing. Typically, the technologist may be required to lay out, develop details and supervise the development of a machine or process, along with testing, evaluating the performance and recommending such alternatives as to make the machine or process operable and competitive.

Required courses: AET 310; ELT 340; MEE 383, 386; MET 303, 360, 380, 381, 418, 419, 440; COM 100, plus approved technical electives.

Welding Engineering Technology. This area of emphasis is designed primarily to prepare individuals for technical positions in industries utilizing welding and related processes. The focus is on the application of welding technology as applied to current and near future industrial needs. The program is structured to provide the individual with a balance of theory, application and hands-on experiences. The general areas covered by the courses are: welding processes, materials, which includes nondestructive testing, and weldment design.

Required courses: MET 306, 321, 322, 325, 410, 411, 412, 415; AET 309, plus approved technical electives.

Students planning to complete one to two years at a community college or college-accredited private technical institute prior to entering this program should consult an Arizona State University Manufacturing advisor for assistance in planning a transferable program.

Technology

AERONAUTICAL TECHNOLOGY
(Flight instruction costs are not included in University tuition)

AET 180 Aerospace Structures and Materials. (3) F, SS
Basic aerodynamics, aerospace vehicle structural design and materials. Manufacturing processes, assembly and repair techniques, and hardware selection. Two lectures, 4 hours laboratory.

181 Aerospace Systems. (3) S, SS
Aircraft and aerospace vehicle systems (hydraulics, pneumatics, auxiliary, control, instrument, etc.), weight and balance, inspection requirements and methods. Two lectures, 4 hours laboratory.

182 Private Pilot Ground School. (4) F, S, SS
Ground school in leading to FAA Private Pilot Certification. Student may begin flight training with approval of instructor. Three lectures, 3 hours recitation.

183 Private Pilot Certificate. (1) F, S, SS
Flight training for the FAA Private Pilot Certificate. Satisfactory completion of FAA tests is required. Prerequisite or corequisite: AET 182.

184 Glider Pilot Rating. (2) N
Instruction in science and techniques of soaring for FAA Glider Pilot rating. FAA license required for course completion. Two lectures and flight.

200 Interim Flight Course. (0) F, S, SS
Allows students to accrue flight time in preparation for the Instrument Pilot Rating and the Commercial Pilot Certificate. Prerequisite: Private Pilot Certificate. 150 hours flying time maximum.

202 Aviation Meteorology. (3) F, S
Evaluation, analysis, interpretation of atmospheric phenomena. Low and high altitude weather from the pilot's viewpoint. Nephology. Prerequisite: PHY 111.

287 Aircraft and Aerospace Powerplants. (3) F, SS
Theory of internal combustion engines, components, performance analysis, engine accessories, systems and environmental control. Prerequisites: PHY 111, 112, or instructor approval. Two lectures, 4 hours laboratory.

288 Gas Turbine and Turbomachinery. (3) S, SS
Development and theory of gas turbine engines. Thrust and performance analysis. Engine components, systems, aerodynamic problem applications and environmental control. Prerequisites: PHY 111, 112, or instructor approval. Two lectures, 4 hours laboratory.

300 Aircraft Design I. (3) F, S, SS
Basic applied aerodynamics and airplane performance analysis. Prerequisites: AET 287, 288; CSC 182; MAT 260; PHY 111, 112.

301 Applied Aerodynamics. (3) S
Properties of air, airfoil theory, wind tunnel testing techniques, airflow measurements, wind tunnel model development. Prerequisites: AET 300. Two lectures, 2 hours laboratory.

303 Aviation Law and Regulations. (2) F, S
Basic source of regulatory powers. Statutes, regulations, advisory circulars. State and international rules. Prerequisite: Junior standing or approval of instructor.

305 Vector and Structure Analysis. (2) F
Vector analysis and topics in structural analysis. Prerequisites: MAT 115 or equivalent and PHY 111. Junior standing or approval of instructor required.

306 Aerospace Electrical and Electronic Systems. (3) F, S
Theory and design of aircraft and aerospace vehicle electrical and electronic systems. Prerequisites: ELT 200, MAT 115, PHY 112.

309 Nondestructive Testing and Quality Assurance. (3) S
Purpose of industrial inspection, quality standards, and statistical methods. Theory and application of nondestructive and destructive testing procedures. Prerequisite: Junior standing in Technology or instructor approval. Two lectures, 4 hours laboratory.

310 Instrumentation. (2) F
Methods of collecting and analyzing experimental data. Prerequisite: ELT 200.

311 Air Traffic Management. (2) S
The National Airspace System, rules and procedures for aircraft operations, design of terminal airspace, air traffic, control standards. Prerequisite: AET 303.

314 Commercial Pilot Ground School. (3) F, S
Ground school leading to Commercial Pilot certification. Ten hours simulator required. Prerequisites: AET 183, 202.

372 Applied Linear Analysis. (3) F, S
Linear algebra, linear programming, numerical methods, computer algorithms applied to technological systems. Prerequisites: MAT 261; CSC 182.

380 Instrument Pilot Ground School. (3) F, S
Ground school leading to the FAA Instrument Pilot Rating. Ten hours simulator required. AET majors prerequisite: AET 202; corequisite AET 314. Non-AET majors prerequisite: Private Pilot Certificate; AET 202.

381 Instrument Pilot Rating. (1) F, S, SS
Flight training for the FAA Instrument Pilot Rating. Satisfactory completion of FAA Instrument Rating required. Prerequisite: AET 380; previous flying time 150 hours minimum. Not for AET majors.

382 Air Navigation. (2) F
Dead reckoning, advanced navigation methods, underlying principles. Corequisite: AET 380.

383 Commercial Pilot Certificate and Instrument Rating. (2) F, S, SS
Flight training for the FAA Unrestricted Commercial Pilot Certificate. Satisfactory completion of FAA Certificate/Rating required. Prerequisites: AET 314, 380; flying time, 150 hours minimum.

384 Airport Planning. (3) F
Community and airport planning, site selection, navigation aids, lighting, design of landing area, terminal buildings and support facilities. Prerequisite: junior standing.

385 Flight Instructor Ground School. (3) S
Ground school in preparation for the FAA Flight Instructor Certificate. Prerequisite: AET 383.

386 Flight Instructor Rating. (1) F, S, SS
Flight training for FAA Flight Instructor Certificate. Certificate required for course completion. Prerequisite: AET 385.

387 Multi-Engine and Flight Engineer Ground School. (3) F
Ground school preparation for the FAA Multi-Engine Rating and Flight Engineers Basic and Turbojet Written Examination. Prerequisites: AET 288, 306, 383 and current Second Class Medical Certificate.

389 Multi-Engine Rating. (1) F, S, SS
Flight training for the FAA Multi-Engine Rating. FAA rating required for course completion. Corequisite: AET 387.

390 Aerospace Systems Analysis I. (3) F, S
A systems concept of quantitative methods applied to planning and control for aerospace applications. Prerequisites: CSC 182; MAT 260.

391 Airport Operation. (2) F, S
Airline and general aviation operations, terminal building utilizations, support facilities, disaster plans, community relationships, airport financing, and legislation. Prerequisite: AET 384.

392 Flight Instructor Instrument Ground School. (2) S
Ground school preparation for FAA Instructor Flight Instructor Rating. Prerequisite: AET 386 or approval of instructor.

393 Flight Instructor Instrument Rating. (1) F, S, SS
Flight training for the FAA CFII. CFII certificate required for course completion. Prerequisite: AET 386. Corequisite: AET 392.

410 Aviation Safety. (2) F, S; Reed
Aviation accident prevention, human factors, life support, fire prevention, and crash survivability. Development and analysis of aviation safety programs. Prerequisite: Junior standing.

411 Aircraft Accident Investigation. (3) S; Reed
Development and evaluation of evidence, analysis, and recommendations for preventive practices. Prerequisite: AET 410.

414 Combustion Analysis. (3) S; Wood
Fuels and combustion, basic analysis of fuels chemistry and chemical kinetics of the combustion process. Prerequisites: AET 288; MAT 260; MET 380; PHY 112; CHM 114 or equivalent. Two lectures, 3 hours laboratory.

415 Propulsion. (3) F; Wood
Principals, thrust, performance cycles, combustion systems, mechanical, material and other design considerations, ram jets, rockets, and advanced propulsion systems. Prerequisite: AET 414. Two lectures, 3 hours laboratory.

417 Aerospace Systems Design. (3) F; Kraemer
Performance evaluation for rockets, missiles, and satellites. Introduction to space guidance and control, and life support systems. Prerequisites: AET 300; MET 360.

487 Aircraft Design II. (3) F, S; Reed
Basic aerodynamics and airplane performance analysis methods applied to practical design project. Prerequisites: AET 300, CSC 182.

488 The Air Transportation System. (3) F, S; Reed
Air commerce related to the transportation system, regulatory climate of airline, future operations, career planning. Prerequisites: ECN 201; MGT 301.

489 Airline Administration. (2) F, S; Reed
Administrative organizations, economics of airline administration, operational structure, relationship with federal government agencies. Prerequisite: AET 488.

490 Aerospace Systems Analysis II. (3) S; Stimson
Solution of aerospace management, planning, and control problems using linear programming. Prerequisites: AET 372, 390.

Special Courses: AET 484, 494, 498, 499, 500, 580, 584, 590, 591, 592, 593, 594, 598. (See pages 32-33.)

ELECTRONIC TECHNOLOGY

ELT 200 Applied Electricity/Electronics. (3) F, S
Introduction to principles and applications of electricity and electronics. Prerequisites: MAT 115, MET 121. Not recommended for electronics majors.

201 Applied Electricity/Electronics Laboratory. (1) F, S
Basic electricity/electronics devices, circuits and applications. Laboratory techniques, instruments. Corequisite: ELT 200. Three hours laboratory.

202 Applied Electrical Science. (3) F, S
Principles of electric circuit elements. Introduction to d-c and a-c circuit analysis. Prerequisites: MAT 115, MET 121 or CON 243.

203 Applied Electrical Science Laboratory. (1) F, S
Basic circuits, laboratory techniques and instruments. Corequisite: ELT 202. Three hours laboratory.

210 Active Devices. (3) F, S
Active device characteristics, models, and basic electronic circuit design principles. Prerequisites: ELT 202, 203. Corequisite: ELT 300.

211 Electronic Circuits Laboratory I. (1) F, S
Active device characteristics and basic electronic circuitry. Diagnostic principles and instrumentation. Corequisite: ELT 210. Three hours laboratory.

280 Electricity/Electronics. (3) S
Principles of electricity and electronics with applications toward instruction at the secondary level. Open to non-Division of Technology majors and to industrial arts, and graphic communications, and industrial supervision technology majors. Five hours lecture/recitation/laboratory.

300 Electric Circuits. (3) F, S
Graphical and analytical analysis of electric circuits and components. Application of circuit theorems. Transient and sinusoidal excitation. Prerequisites: ELT 202; MAT 115. Corequisite: MAT 260.

301 Electric Networks I. (3) F, S
Graphical and analytical analysis of electronic networks using calculus essentials. Transients. Steady-state sinusoidal frequency response. Transfer functions. Prerequisites: ELT 300, MAT 260.

310 Electronic Circuits (3) F, S
Analysis and design of bipolar and FET electronic circuits using the model approach. Amplifier and transfer function principles. Prerequisites: ELT 210, 300. Corequisite: ELT 301.

311 Electronic Circuits Laboratory II. (1) F, S
Design and application of electronic circuits. Performance evaluation and laboratory techniques. Prerequisite: ELT 211. Corequisites: ELT 301, 310. Three hours laboratory/recitation.

315 Electronics Fabrication Principles I. (2) F, S
Layout, documentation standards and basic fabrication techniques for design of electronic equipment. Prerequisites: GRC 111, MET 121; ELT 210 and 211; junior standing. Four hours lecture/recitation/laboratory. Field trips.

330 Electronic Instrumentation. (2) F
Theory and operation of measurement circuits and electronic instrumentation. Diagnostic and calibration principles and techniques. Prerequisites: ELT 210, 211 and 300. Corequisite: ELT 331.

331 Instrumentation Laboratory. (1) F
Corequisite: ELT 330. Three hours laboratory.

340 Electric Circuits and Machines. (3) F
Principles and analysis of electrical power circuits and components. Transformers. Rotating machines and related control equipment. Prerequisites: ELT 300 or 380 (or ELT 200 and PHY 112 for non-ELT majors). Four hours lecture/recitation/demonstration.

380 Electrical Systems. (3) F, S
Industrial electrical circuits and systems, machines, transformers, secondary distribution, grounding and related systems. Prerequisites: ELT 202, 203 (or 200, 201; or 280). Four hours lecture/recitation/demonstration.

400 Electric Networks II. (3) F, S; Kanneman, Peterson, Strawn
Graphical and analytical analysis of electrical networks. Time, frequency and Laplace transform domain techniques. Waveform analysis. Prerequisites: ELT 301; MAT 261.

404 Transmission Lines and Waveguides. (3) S; Peterson, Strawn
Theory and application of transmission lines, waveguides and microwave components. Analysis and matching using the Smith Chart. Prerequisite: ELT 301.

406 Control System Technology. (3) S '82; Kanneman, Grady
Control system components, analysis of feedback control systems, stability, performance, applications. Prerequisite: ELT 400 (or AET 372 or ELT 483 for non-ELT majors).

408 Analog-Logic Simulation. (3) S; Grady, Kanneman, Strawn
Analog-logic simulation of dynamic physical feedback systems. Programming and scaling techniques for linear and nonlinear simulation. Prerequisites: ELT 400, 450 (or AET 372 or MAT 262 or ELT 483 for non-ELT majors). Four hours lecture/recitation/demonstration.

410 Linear Electronic Circuits. (3) F '81; McCurdy, Kanneman, Strawn
Frequency response and feedback design of multistage electronic circuits and systems. Linear integrated circuitry. Prerequisites: ELT 301, 310.

411 Linear Electronics Circuits Laboratory. (1) F '81; McCurdy, Kanneman, Strawn
Prerequisites: ELT 311, 331. Corequisite: ELT 410. Three hours laboratory.

414 Applied Materials Science for Electronics. (3) F, S; Grady, Strawn
Introduction to mechanical, thermodynamic and electromagnetic properties of materials used in electronic technology applications; semiconductor physics, transducer physics, heat transfer. Prerequisites: PHY 111, 112; ELT 310; MAT 260.

415 Electronics Fabrication Principles II. (2) F, S; Grady, Wood
Electronic equipment design and fabrication principles and practice. Completion of electronics hardware design project and report. Prerequisites: ELT 315, 310, 311, 450; senior standing. Four hours lecture/recitation/laboratory. Field trips.

417 Microelectronics Technology. (3) A; Peterson, Strawn
Circuit parameters, component selection, layout generation and packaging of monolithic, thin film and hybrid thick film devices. Field trips. Prerequisites: ELT 200 or 202; PHY 111, 112.

420 Operational Amplifier Theory and Application. (3) S '82, SS '83; Kanneman, McCurdy, Grady
Differential and operational amplifier circuitry, feedback configurations, op-amp errors and compensation, linear and nonlinear circuitry. Applications. Prerequisites: ELT 301, 310.

421 Operational Amplifier Applications. (1) S '82, SS '83; McCurdy, Grady, McHenry
Linear integrated circuits and op-amp applications. Prerequisites: ELT 311, 331. Corequisite: ELT 420. Three hours laboratory.

422 Electronic Switching Circuits. (3) S; McCurdy, Grady, Kanneman
Analysis and design of electronic circuits operating in a switching mode. Waveshaping, timing, logic. Prerequisites: ELT 301, 310, 450.

423 Electronic Switching Circuits Laboratory. (1) S; McCurdy, Grady, McHenry
Prerequisites: ELT 311, 331. Corequisite: ELT 422. Three hours laboratory.

430 Instrumentation Systems. (3) S; Grady, Kanneman, McHenry
Measurement principles and instrumentation techniques. Signal and error analysis. Prerequisites: ELT 301, 310, 450.

431 Instrumentation Systems Laboratory. (1) S; Grady, McHenry
Prerequisites: ELT 311, 330 and 331. Corequisite: ELT 430. Three hours laboratory.

440 Electrical Power Systems Technology. (3) S; Edwards, Grady, Kanneman
Electrical power system analysis, transmission, distribution, instrumentation, protection, and related system components. Prerequisite: ELT 301 or 340 or 380 or approval of instructor.

450 Digital Logic Principles. (3) F, S; Grady, McCurdy, McHenry
Binary logic, combinational design and simplification. Introduction to sequential circuits. Introduction to digital computer principles. Prerequisites: CSC 182; junior standing.

451 Digital Electronics Laboratory. (1) F, S; Grady, McCurdy, McHenry
Prerequisites: ELT 210 and 211. Corequisite: ELT 450. Three hours laboratory.

452 Digital Systems Logic and Applications. (3) S; Kanneman, McCurdy, Grady
Analysis and design of sequential logic networks. System design techniques using complex building blocks; programmed logic. Prerequisites: ELT 450 and CSC 182.

453 Digital Systems Logic Laboratory. (1) S; Grady, McCurdy, McHenry
Prerequisite: ELT 451. Corequisite: ELT 452. Three hours laboratory.

454 Microcomputer Systems Principles. (3) F, S; Grady, Kanneman, McCurdy, Wood
Analysis and design of small computer systems. Computer organization and hardware. Machine language fundamentals and operations. Prerequisites: ELT 450 and CSC 182.

455 Microcomputer Applications Laboratory. (1) F, S; Grady, McCurdy, Wood
Prerequisite: ELT 451. Corequisite: ELT 454. Three hours laboratory.

456 Minicomputer Systems and Programming. (3) F, S; Kanneman, McCurdy, Wood
Assembly language programming. Input-output and offline diagnostics. Utilization of utility software. Prerequisites: ELT 454, CSC 182.

457 Microcomputer Systems and Applications. (3) F '81; McCurdy, Kanneman, Wood, Grady
Applications of mini- and/or micro-computer hardware and software. Special purpose controllers. Interface design and applications. Prerequisites: ELT 454 and 455.

460 Special Devices and Applications. F '82, SS '83; Grady, McHenry, Strawn
Analysis and design of electronic circuits using special active devices for linear and nonlinear applications. Prerequisites: ELT 301, 310, 450.

461 Special Devices Laboratory. (1) F '82, SS '83; Grady, McHenry, Strawn
Prerequisites: ELT 311, 331. Corequisite: ELT 460. Three hours laboratory.

470 Communication Circuits. (3) S; Kanneman, Peterson, Strawn
Analysis and design of passive and active communication circuits. Coupling networks, filters, impedance matching. Modulation and demodulation techniques. Prerequisites: ELT 310, 400, 450, 472.

471 Communication Circuits Laboratory. (1) S; Peterson, Strawn
Prerequisites: ELT 311, 331. Corequisite: ELT 470. Three hours laboratory.

472 Communication Systems. (3) S, F; Peterson, McHenry, Strawn
Systems analysis and design of AM, FM, PCM and SSB communication systems. Noise and distortion performance of communication systems. Prerequisites: ELT 301, 310.

473 Digital/Data Communication Systems. (3) F; Wood, Strawn, Kanneman
Signals, distortion, noise, error detection/correction. Transmission and system design. Interface techniques and standards. Digital hardware. Applications. Prerequisites: ELT 472, 450.

474 Antennas and Propagation. (3) F '81; Strawn, Peterson
Principles and characteristics of electromagnetic energy propagation and transmission. Antenna principles and applications. Pattern measurements. Prerequisite: ELT 404.

475 Communication Systems Laboratory I. (1) F; Strawn, Wood
Prerequisite: ELT 472 and 450. Corequisite: ELT 473. Three hours laboratory.

476 Video Circuits and Systems. (3) F; Edwards, McHenry
Radio frequency selectors, video amplifiers, synchronizing circuits, kinescopes and color demodulators. Prerequisites: ELT 310, 450. Four hours lecture/ demonstration.

477 Video Systems Laboratory. (1) S; Edwards, McHenry
Prerequisites: ELT 311, 331, 476. Three hours laboratory.

478 Communication Transmission System Design. (3) F '82; Peterson, Strawn
Analysis and design of cable TV and other communication transmission systems. Strand mapping, system layout, installation, performance characteristic measurements. Prerequisites: ELT 404, 450, 472.

479 Communication Systems Laboratory II. (1) F; Peterson, Strawn
Prerequisites: ELT 404 and 472. Three hours laboratory. May be repeated for a maximum of 2 hours credit.

482 Industrial Practice: Internship and Cooperative Programs. (1-4) F, S, SS
Specially assigned approved activities in selected electronic industries. Report required. Prerequisite: Electronic major enrolled at junior-senior level. Maximum of 6 credits.

483 Applied Calculus. (3) F, S; Strawn, Kanneman, Peterson
Applied calculus including ordinary differential equations, Laplace transforms. Prerequisite: MAT 261.

486 Computer Programming Applications. (3) F, S; Kanneman, McCurdy, Wood
Application of computer programming to the solution of technology problems of particular interest to electronics and related fields. Prerequisites: MET 121, MAT 260, CSC 182; junior standing.

488 Electronic Broadcasting Principles. (1) S; Edwards, Wood
Electronic communication broadcasting principles, practices and regulations for commercial (FCC) licensing. Prerequisites: Senior standing, or approval of instructor. Two hours lecture/recitation.

494 Special Topics. (1-4) F, S, SS
Special topics of interest to Electronics majors, including the following courses which are regularly offered.

(a) ST: Professional Orientation. (1) F, S
Topics of special interest to graduating Electronics majors. Prerequisite: Senior standing in an Electronics program in semester prior to graduation. Corequisite: GRC 420 or equivalent.

(b) ST: Electronics Projects. (1-4) F, S, SS
Special individual or small group directed projects in applied aspects of electronics with emphasis on laboratory practice or hardware solutions to practical problems. Prerequisite: Approval of instructor.

501 Network and Signal Analysis. (3) A; Strawn, Kanneman, Peterson
Network and signal analysis, theory, and applications. Transform and computer techniques. Applications. Prerequisites: ELT 400 and ELT 483.

506 System Dynamics and Control. (3) S '82; Kanneman, Grady
Time, frequency and transform domain analysis of physical systems. Transfer function analysis of feedback control systems performance and stability. Compensation. Prerequisites: ELT 400, 483.

510 Linear Integrated Circuits and Applications. (3) F '81; Kanneman, McCurdy, Grady
Analysis, design and applications of linear integrated circuits and systems. Prerequisites: ELT 301, 310, 450.

522 Digital Integrated Circuits and Applications. (3) S; Kanneman, McCurdy, Grady
Analysis, design and applications of integrated circuits and systems. Prerequisites: ELT 301, 310, 450.

530 Electronic Test Systems and Applications. (3) S; Kanneman, Grady, McCurdy, McHenry
Analysis, design and application of electronic test equipment, test systems, specifications, documentation. Prerequisites: ELT 301, 310, 330, 450.

540 Electrical Power Systems. (3) S; Edwards, Kanneman, Grady
Electrical power system analysis, transmission, distribution, instrumentation, protection, and related system components. Prerequisite: ELT 301 or 340 or 380.

552 Digital Systems and Applications. (3) S; Kanneman, Grady, McCurdy
Analysis, design and applications of digital networks and systems. Prerequisites: ELT 450 and 454.

557 Microcomputers and Applications. (3) F; Kanneman, Grady, McCurdy, Wood
Applications of small computer systems, mini- and microcomputer hardware and software. Prerequisites: ELT 454, 455.

560 Industrial Electronics and Applications. (3) F '82, SS '83; Strawn, Grady, McCurdy, McHenry
Analysis, design and application of special electronic devices, and systems to industrial control, power, communications and processes. Prerequisites: ELT 301, 310, 450.

570 Communication Circuits and Applications. (3) S; Kanneman, Peterson, Strawn
Selected topics in electronic communication circuits. Applications to analog and digital communication. Filter design. Prerequisites: ELT 310, 400, 472.

574 Antennas and Propagation. (3) F; Peterson, Strawn
Principles and characteristics of electro-magnetic energy propagation and transmission. Antenna principles and applications; pattern measurements. Prerequisite: ELT 404.

585 Electricity/Electronics Survey. (3) A; McHenry, Wood, Edwards.
Principles of electricity and electronics with applications. Prerequisites: Approval of instructor. Not open to ELT majors.

Special Courses: ELT 294, 484, 494, 498, 499, 580, 584, 590, 591, 592, 593, 594, 598, 599. (See pages 32-33.)

INDUSTRIAL TECHNOLOGY
GRAPHIC COMMUNICATIONS

GRC 111 Technical Graphics. (2) F, S
Elements of orthographic and axonometric projection; charts and graphs; graphical processes. One hour lecture and 5 hours laboratory.

135 General Graphic Arts. (3) F, S
Basic graphic arts industrial process. Two hours lecture and 4 hours laboratory. Field trips.

136 Graphic Arts Processes. (3) S
Screen process, planography, embossing, photo-fabrication, presswork, photographic and basic production techniques. Two hours lecture and 4 hours laboratory. Field trips. Prerequisite: GRC 135.

236 Layout and Graphic Arts Design. (3) F
Basic principles of typographic layout. Preparation of thumbnails, roughs and comprehensives.

237 Image Preparation. (3) S
Preparing copy for photo conversion.

238 Instruments and Controls. (3) F
Instrumentation and methodologies for materials testing and quality control. Prerequisite: GRC 136.

314 Machine Drawing. (3) S
Application of drafting skills and tolerancing techniques to engineering drawings of production parts. Prerequisite: GRC 111. Two hours lecture and 4 hours laboratory.

331 Screen Process Printing. (3) F
Theory and study of industrial applications relating to the technology and use of screen process printing. Prerequisite: GRC 136. Field trips. Two hours lecture and 4 hours laboratory.

332 Stripping and Platemaking. (3) F
Stripping negatives and positives; line, halftone, duotone, full color: contacting flats to and preparing image carriers. Field trips. Prerequisite: GRC 136. Two hours lecture and 4 hours laboratory.

333 Offset Lithography (Presswork). (3) F
Function of the offset press. Elements required for press operation; chemicals, inks, carriers, blanks and solvents. Prerequisite: GRC 136 or approval of instructor. Two hours lecture and 4 hours laboratory.

334 Offset Lithography (Camerawork). (3) F
Production of line, halftone and special effects photographic negatives and positives. Two hours lecture and 4 hours laboratory.

335 Binding and Finishing. (3) F
Operations, involving cutting, trimming, perforating, stamping, die cutting, laminating, embossing and bindery process. Prerequisite: GRC 333.

336 Color Separation. (3) S
Methods of producing separation negatives and positives. Prerequisite: GRC 334.

337 Production Management. (3) S
Planning and controlling work flow of graphic arts products. Field trips. Prerequisite: GRC 136.

339 Estimating and Cost Analysis. (3) F
Estimating printing operations and materials; elements of cost finding using selected systems. Prerequisite: GRC 136.

403 Drafting Applications. (3) S; Brown
Survey of drafting clusters: architecture, blueprint reading, construction, developments, furniture, sketching. Prerequisite: GRC 111. Six hours lecture and laboratory.

420 Technical Writing. (3) F, S; Brockmann
Writing techniques, organization of material research methods for technical writers. Prerequisite: Junior or senior standing only.

433 Production Techniques. (3) S; Williams
Systematic production planning experience. Six hours lecture and laboratory. Prerequisites: GRC 333, 334.

435 Plant Management. (3) F; Prust
Independent documentary research; equipment, personnel, plant site selection and plant management problems. Field trips. Prerequisite: GRC 337.

436 Substrates and Inks. (3) F; Prust
Technical study of ink and paper with printing processes capability stressed. Field trips. Prerequisite: Approval of instructor.

437 Advanced Color Reproduction. (3) F; Prust
Analysis of color reproduction systems. Field trips. Prerequisite: GRC 336.

438 Graphic Arts Techniques and Processes. (3) F, S, SS; Prust
Relating materials to graphic arts printed products—production practice. Prerequisite: Junior status. Six hours lecture and laboratory.

439 Photocomposition. (3) S; Prust
Detailed study of modern image preparation equipment. Prerequisite: GRC 237.

536 Technical and Research Problems. (3) F '81, S '83; Prust
Individual activities involving investigation and experimentation using graphic communications processes.

Special Courses: GRC 484, 494, 498, 499, 500, 580, 584, 590, 591, 592, 593, 594, 598. (See pages 32-33.)

INDUSTRIAL VOCATIONAL EDUCATION

IVE 120 General Woods. (3) F, S
Introduction to design and fabrication with wood products using hand tools, portable electric tools and machines. Two hours lecture and 4 hours laboatory. Field trips.

160 General Metals. (3) F, S
Machine tools, welding, casting and sheetmetal. Two hours lecture and 4 hours laboratory. Field trips.

174 Basic Automotives. (3) F, S
Operation of automobile systems, consumer education, preventative maintenance; minor repairs. Six hours lecture and laboratory. Field trips.

201 Power and Energy. (3) F, S
Concepts of energy conversion, transmission, control, utilization of heat engines, electrical, mechanical devices, fluid power and small engine repair. Two hours lecture and 4 hours laboratory.

202 Industrial Arts Design. (2) F, S
Technical sketching project design principles, lines, color and blueprint reading. One hour lecture and 3 hours laboratory.

222 Wood Technology. (3) F
Physical properties, products, safe use of tools, maintenance, machines and processes; project design and fabrication. Field trips. Six hours lecture and laboratory.

273 Automotive Electrical Systems. (3) S
Principles of electrical systems, testing and repairof battery, ignition, starting, lighting, charging and accessories. Six hours lecture and laboratory.

300 American Industry Enterprise. (3) S
The free enterprise system through the organization and operation of a simulated enterprise. Two hours lecture and 4 hours laboratory. Prerequisite: IVE 120.

322 Design and Manufacture in Wood. (3) S
Furniture, cabinet, pricing, experimentation, modified wood products, joining, forming, laminating, structural design. Field trips. Prerequisite: IVE 222. Six hours lecture and laboratory.

361 Industrial Arts Crafts. (2) A
Design and activities in plastic, leather, lapidary, lost wax process, wood and metal. Field trips. Prerequisite: Approval of instructor. Four hours lecture and laboratory.

377 Internal Combustion Engines. (3) S
Automotive engine principles, design, rebuilding, performance testing; fuels, carburetor operation and rebuilding. Field trips. Six hours lecture and laboratory. Prerequisite: IVE 174

402 Occupational Analysis and Course Development. (3) A; Bartel
Selecting instruction units through task analysis techniques; industrial and vocational course and training program development. Prerequisite: Approval of instructor.

405 Improving Instruction in Drafting. (3) S '82; Brown
Methods, evaluation, industrial practices, drafting problem sequences, and equipment. Prerequisite: GRC 111.

421 Production Wood Technology. (3) S '82; Littrell
Design and manufacture of products, economy of materials, structural factors, jigs and fixtures, work environment, assembling, finishing. Field trips. Prerequisite: IVE 222. Six hours lecture and laboratory.

424 Techniques of Construction. (3) S '82; Littrell
Buildings, nonbuildings, planning, site preparation, structure, construction materials, personnel. Field trips. Prerequisite: IVE 222. Six hours lecture and laboratory.

427 Industrial Plastics. (3) S; Littrell
Fabrication techniques, physical qualities, manufacturing processes, injection molding, vacuum forming, welding, lamination, casting. Field trips. Prerequisite: Approval of instructor. Six hours lecture and laboratory.

442 Facility Planning and Management. (3) F, SS; Brown
Planning, organizing and managing industrial and vocational education laboratories; equipment and supply selection, facility arrangement. Field trips. Prerequisite: Junior status.

443 Industrial Safety. (3) F, SS; Burdette, Prust, Watkins
Accident prevention, accident factors, methods of recording and reporting, analysis, psychological aspects, attitudes, recent legislation, safety consciousness and liability.

444 Modern Industries. (3) S; Watkins
Aspects of management, labor, plant organization and product; for interpretation of industry in industrial and vocational programs. Prerequisite: Junior status.

445 Industrial Internship. (1-10) F, S, SS; Watkins
Assignment commensurate with student's program. Manufacturing processes, technical information, management experiences, specialized instruction by industry. Division majors only. Prerequisites: approval of advisor and IVE faculty; junior-senior status.

446 Instructional Aids and Materials. (3) S'82; Burdette
Selection, preparation, construction and methods of use in industrial and vocational education. Prerequisite: approval of instructor.

450 Industrial Training. (3) N; Littrell
Training techniques and learning processes. Planning, developing, and evaluating training programs in industry and governmental agencies. Prerequisite: approval of instructor.

452 Industrial Supervision. (3) F; Watkins
Supervisory principles as applied to industrial and governmental agencies. Supervisor-employee relations, group morale, leadership techniques, policy interpretation and training. Prerequisite: approval of instructor.

453 Safety Supervision. (3) S; Prust, Watkins
Controlling physical conditions, environmental control, personal protection controls, cost analysis, systems safety analysis, auxiliary function. Prerequisites: IVE 443, 444.

455 Industrial and Vocational Programs. (1-12) F, S, SS; Bartel
Industrial, governmental, factory, and special school programs. Prerequisites: advisor and IVE faculty approval, and senior status.

460 Improving Instruction in Metals. (3) F; Pardini
Methods, curriculum, teaching aids, machining problems with lathes, mills and grinders. Prerequisite: IVE 160. Six hours lecture and laboratory.

461 Hot Metal Techniques. (3) F; Pardini
Properties of metals; sand and investment casting; pattern making. Field trips. Prerequisite: IVE 160. Six hours lecture and laboratory.

465 General Metals. (3) S; Pardini
Numerical control, chipless machining; study of special interest in metalworking processes. Prerequisite: IVE 160. Six hours lecture and laboratory.

470 Improving Instruction in Automotives. (3) F'82; Hirata
Strategies, curriculum, teaching aids, lab activities, equipment maintenance, new products. Selected skill development. Field trips. Prerequisite: approval of instructor. Six hours lecture and laboratory.

471 Automotive Power Train and Chassis. (3) S'82; Hirata
Principles and servicing of clutches, transmissions, differentials, steering, suspension, brakes, tires, front end alignment. Prerequisite: IVE 174. Six hours lecture and laboratory.

478 Engine Analysis. (3) F'81, S'83; Hirata
Automotive emission control and air conditioning operation and testing scope, infrared analysis, tune-up procedure. Field trips. Prerequisites: IVE 273, 377. Six hours lecture and laboratory.

480 Teaching Industrial and Vocational Subjects. (3) F, S, SS; Bartel, Littrell, Pardini
Teaching techniques, philosophy, organization, planning, evaluation of teaching efficiency. Prerequisite: Junior status.

485 Teaching Internship. (1-8) F, S, SS
Classroom, laboratory and training procedures in post-secondary institutions, industry and/or governmental agencies. Prerequisites: IVE 402, 480, senior status and departmental approval.

491 Organization and Management of Cooperative Programs. (3) S; Watkins
Workstudy programs for industrial and vocational occupations in high schools and community colleges. Developing and coordinating programs. Instructional materials. Prerequisite: Junior status.

513 Experimental Activities. (3) F; Pardini, Littrell
Investigation and solution of technical problems in the student's area of specialization involving material design and analysis.

540 Evaluation in Industrial and Vocational Education. (3) F'81; Bartel

Evaluative factors such as attitudes, behavioral factors, skills, technical information; instrument construction; evaluation of program effectiveness.

541 Vocational Education for Special Needs. (3) F'81; Littrell
Organizing and administering vocational programs to meet special needs of youth and adults in schools, agencies, and industry.

542 History and Philosophy of Industrial Education. (3) S'82; Littrell
Evolution of modern programs, current concepts, future trends.

544 Industrial Processes in Special Education. (3) S; Littrell
Emphasis on task analysis in development of manipulative activities for special needs learners.

545 Legal Aspects of Occupational Education. (3) F, SS; Staff
Interpretation of federal and state acts, regulations, and responsibilities related to vocational education programs.

546 Post-Secondary Occupational Education. (3) F'81, S'82; Bartel
Trends, community surveys, needs, curricula, instruction, evaluation of occupational programs, financing, emphasis on industrial occupational education at the post-secondary level.

548 Administration of Industrial and vocational Education. (3) SS '80; Brown
Improving instruction, fund and material control, student personnel problems, curricular patterns.

549 Research Techniques and Applications. (3) F'81, S'82; Littrell
Selection of research problems, analysis of literature, individual investigations, preparing reports, proposal writing.

Special Courses: IVE 484, 494, 498, 499, 580, 584, 590, 591, 592, 593, 594, 598, 599, 780, 783, 784, 790, 791, 792, 799. (See pages 32-33.)

MANUFACTURING TECHNOLOGY

MET 101 Manufacturing Processes and Materials. (3) F, S, SS
Basic manufacturing processes and engineering materials, their properties and typical applications. Three hours lecture.

110 Welding Survey. (3) F, S
Oxy-acetylene, arc, brazing, resistance, and gas tungsten-arc welding procedures for ferrous and nonferrous metals. Six hours lecture and laboratory.

116 Aeronautical Welding. (2) F
Oxy-acetylene and tungsten gas tungsten-arc welding procedures and brazing techniques used for aircraft structures. Four hours lecture and laboratory.

121 Problem Solving. (3) F, S
Methods for defining, organizing, developing ideas and solutions to problems of a technical nature. Prerequisite: MAT 115 or equivalent. Three hours lecture/recitation/laboratory.

200 Manufacturing Processes. (3) F, S
Metal removal processes emphasizing drilling, milling and lathe processes including tool bit grinding. Emphasis on production speeds and feeds. Six hours lecture and laboratory. Prerequisites: MET 101, GRC 111.

301 Manufacturing Analysis. (3) S
Introduction to the organizational and functional requirements for effective production. Includes writing production operation plans. Prerequisite: MET 200.

303 Machine Control Systems. (3) F
Theory and application of electromechanical, hydraulic, pneumatic, fluidic and electrical control systems for manufacturing. Prerequisites: MAT 260; ELT 200 or PHY 112. Six hours lecture and laboratory.

304 Casting and Forming Processes. (3) F'81, S'83
Analysis of various casting, molding, and forming processes in terms of equipment requirements, product characteristics, and manufacturing costs. Prerequisite: MET 101.

305 Manufacturing Processes. (3) S
Metal removal processes emphasizing milling, grinding, shaping, turret lathe, tracer lathe, and tool sharpening. Six hours lecture and laboratory. Prerequisite: MET 200.

306 N/C Manual Programming. (3) F
Numerical Control as related to point-to-point and continuous path systems. Methods of programming, setup and operation. Six hours lecture and laboratory. Prerequisite: MET 200.

310 Applied Mechanics-Statics. (3) F, S
Vectors, force systems, friction, equilibrium, centroids and moment of inertia. Prerequisites: PHY 111; MAT 261.

311 Applied Mechanics-Materials. (3) F, S
Deformation of members and bodies under stress. Prerequisite: MET 310. Four hours lecture and laboratory.

320 Welding Survey. (4) F
Theory and application of industrial welding processes; introductory welding metallurgy and weldment design; SMAW, GTAW, GMAW, oxy-acetylene, brazing experiences. Three hours lecture, 3 hours laboratory. Prerequisite: upperclass standing or instructor's approval.

321 Welding Processes. (3) F'81, S'83
Theory and application of welding processes commonly used for steel plate fabrications; fixturing, procedures, safety and codes covered. Prerequisite: MET 320. Six hours lecture and laboratory.

322 Welding Processes. (3) F'82
GTAW, GMAW, PAW, EBW and other processes used primarily for materials and joint configurations common to aerospace applications. Prerequisite: MET 320. Six hours lecture and laboratory.

325 Welding Power Source Analysis. (4) S'82
Design and operating characteristics of welding power sources and related equipment. Equipment selection, set-up, and troubleshooting procedures covered. Prerequisites: ELT 200, 201; MET 320. Six hours lecture and laboratory.

360 Applied Mechanics-Dynamics. (3) S
Masses; motion kinematics; dynamics of machinery. Prerequisite: MET 310.

380 Applied Thermodynamics. (3) F, S
Thermodynamics of engines, compressors, turbines and related components. Not open to engineering students. Prerequisites: MAT 120, PHY 112.

381 Applied Thermodynamics and heat Transfer. (3) F, S
Gas mixtures, vapor cycles, gas and vapor mixtures. Fundamentals of conduction radiation and convection. Prerequisite: MET 380.

401 Quality Control. (3) S; Graham, Minter
Introduction to statistical quality control methods as applied to tolerances, process control, sampling and reliability. Prerequisite: MAT 260.

402 Specialized Production Processes. (3) S'82, F'83; Schmidt
Non-traditional manufacturing processes emphasizing EDM, ECM, ECG, CM, PM, HERF, EBW, LBW, etc. Prerequisite: MET 101.

403 N/C Computer Programming. (3) S'82, F'83; Schmidt
Theory and application of computer-aided N/C languages with programming emphasis with APT and suitable post-processors. Six hours lecture and programming laboratory. Prerequisites: MET 306; CSC 182.

404 Applied Metallurgy. (3) F; Graham
Principles of metallurgy emphasizing concepts most relevant to typical manufacturing requirements; factors affecting properties and evaluation methods; metallography experiences. Two hours lecture, 3 hours laboratory. Prerequisite: MET 101.

405 N/C Continuous Path Programming. (3) S; Schmidt
Numerical Control continuous path programming related to two-, three-, and four-axis systems. Emphasis on mill and lathe systems. Six hours lecture and laboratory. Prerequisite: MET 306.

406 Machinability Theory. (2) S'82, F'83; Schmidt
Application of machinability theory to practice; implications to adaptive control systems, production costs, tool wear, surface finish. Experiments conducted. Prerequisites: MET 305, 404. Four hours lecture and laboratory.

407 Aerospace Materials. (2) F'81, S'83; Graham
Materials used for aircraft powerplants and airframes; emphasis on criteria for selection in terms of mechanical properties and manufacturing processes. Prerequisite: MET 101 or equivalent.

408 Production Tooling. (3) F '81, S'83; Schmidt
Fabrication and design of jigs, fixtures and special industrial tooling related to manufacturing methods. Prerequisite: MET 200. Six hours lecture and laboratory.

410 Welding Metallurgy. (4) S'82; Graham
Metallurgical principles applied to structural and alloy steel and aluminum weldments; laboratory emphasis on welding experiments, metallography and mechanical testing. Prerequisites: MET 320 and 404. Six hours lecture and laboratory.

411 Welding Metallurgy. (3) F.82; Graham
Metallurgical principles as applied to stainless steel, super-alloy, titanium and other refractory metal weldments and braze joints. Prerequisite. MET 410.

412 Design of Weldments. (3) S. Kisielewski
Design of welded structures and machine elements in terms of allowable stresses, joint configurations, process capabilities and cost analysis; welding procedures emphasized. Prerequisites: MET 320, MET 311.

415 Welding Codes. (2) S'82; Kisielewski, Peterson
Familiarization with and application of the various codes, standards, specifications applicable to weldments. Corequisite: MET 412.

418 Mechanical Equipment. (4) F; Kisielewski, Minter, Sheller
Integration of materials, mechanics, and drafting skills into engineering designs or modifications. Prerequisites: MET 311. Six hours lecture and laboratory.

419 Mechanical Equipment II. (4) S; Kisielewski, Minter, Sheller
Integration of materials, mechanics, and drafting skills into engineering designs or modifications. Prerequisite: MET 418. Six hours lecture and laboratory.

440 Fluid Mechanics. (3) F; Minter
Static and dynamic properties of fluids. Flow measurement and fluid control design. Prerequisites: MAT 261; PHY 111. Four hours lecture and laboratory.

Special Courses: MET 484, 494, 498, 499, 500, 580, 584, 590, 591, 592, 594, 598.

College of Fine Arts

Jules Heller, Ph.D.
Dean

Purpose

The College of Fine Arts provides for pre-professional education in the several arts disciplines and also an opportunity for non-majors to become culturally literate through participation and involvement in the creative and performing arts.

The College, through its programs in art, dance, music, and theatre reflects a wide range of challenges facing the artist and scholar in the 20th century. The arts as an integral part of our curriculum and of human expression offer the student a rewarding educational development balanced and strengthened by studies in the humanities, social sciences and the sciences.

In addition to professional curricula offered in each department or school, the College makes available courses designed to meet the specific educational needs of students pursuing majors in other colleges. The cultural life of the University community is further enriched by study opportunities offered at off-campus sites in the Continuing Education Program. The College of Fine Arts also offers community audiences many hours of cultural enjoyment through the University Art Collections, the Louise Lincoln Kerr Cultural Center, the Boulton Collection of World Music and Musical Instruments, myriad concerts, music and dance recitals, dramatic productions, opera, lectures, and seminars.

Information

Transfer of Community College Credits.

Credits transferred from accredited junior or community colleges will be accepted up to a maximum of 64 semester hours. Community college students planning to transfer to Arizona State University at the end of their first or second year should plan their community college courses to meet the requirements of the curriculum selected. Students will be permitted to follow the degree requirements specified in the Arizona State University catalog in effect at the time they began their community college work, providing their college attendance has been continuous.

Courses transferred from community colleges will not be accepted as upper division credit at Arizona State University. Students are urged to choose their courses carefully, in view of the fact that a minimum of 50 semester hours of work taken at the University must be upper division credits. It is therefore suggested that they elect General Studies courses and lower division courses in their major field while attending a community college.

General Transfer Credit.

Direct transfer of courses from other accredited institutions to the College of Fine Arts will be subject to: (1) the existence of parallel and equal courses in the College's curriculum, and (2) departmental or school evaluation of studio courses with respect to performance standards. A minimum of 30 semester hours earned in resident credit courses at Arizona State University is required of every candidate for the bachelor's degree. Transfer students enrolled in the College of Fine Arts must complete a minimum of 15 semester hours of resident credit in the major.

Undergraduate Credit for Graduate Courses.

To enable interested students to benefit as much as possible from their undergraduate studies, the Graduate College and the College of Fine Arts extend to seniors, with a grade point index of at least 2.50, the privilege of taking 500-level graduate courses for undergraduate credit. Application for admission to a graduate course for undergraduate credit must be completed in advance of

the regular registration period. The application must be approved by the instructor of the class, the student's advisor, by the chair or director of the department or school, and dean of the College in which the course is offered.

Honors Programs. The Honors Programs in the College of Fine Arts are intended for the outstandingly competent student whose interests and specific curriculum indicate that definite advantages may accrue from a program emphasizing individual study. For details of the programs in the College of Fine Arts, consult with the Honors Representatives in your department or school or the Assistant Dean.

Pre-Professional Programs. Students preparing for admission to professional graduate schools should obtain information regarding admission requirements by writing directly to schools in which they may be interested.

Degrees

Bachelor's Degrees. The College of Fine Arts offers work leading to three baccalaureate degrees: Bachelor of Arts, Bachelor of Fine Arts, and Bachelor of Music. In general, the distinctions among these curricula lie in the degree of specialization permitted in the major field, with the Bachelor of Arts degree providing a broader, scholarly, humanistic program, and the other two placing greater emphasis upon the major field while maintaining the principle of General Studies required of all University students.

In cooperation with the College of Education, all departments and schools within the College of Fine Arts offer degree programs designed to prepare teachers of art, dance, music, and theatre for the public schools. Students intending to prepare for a teaching certificate within the College of Fine Arts curricula should, with the advice and counsel of their arts education advisors, fulfill the requirements for the appropriate Bachelor of Fine Arts degree.

Bachelor's degrees are offered in the following fields:

Bachelor of Arts:

Art	Music
Dance	Theatre

Bachelor of Music:
Choral-General Music
Instrumental Music
Music Therapy
Performance (Voice, Keyboard, Orchestral Instrument, Guitar, Piano Accompanying, Jazz, Music Theatre)
Theory and Composition

Bachelor of Fine Arts:

Art	Theatre
Dance	

Master's Degrees. A graduate program consisting of a minimum of 30 semester hours of approved work leads to a master's degree in the following fields:

Master of Arts:

Art

Music History and
    Literature

Theatre

Master of Fine Arts:

Art	Theatre
Dance	

Master of Music:

Choral Music

General Music

Instrumental Music

Performance
    Solo Performance (Instrumental, Keyboard, Voice)
    Performance Pedagogy
    Piano Accompanying
    Music Theatre Performance
    Music Theatre Direction

Theory and Composition

Master of Arts in Education: (Secondary Education) (in cooperation with the College of Education)

Art Education	Music Education
	Theatre

Doctoral Degrees. The School of Music offers a Doctor of Musical Arts (D.M.A.) degree in Choral Music, Instrumental Music, or Solo Performance. In addition, the School of Music, in cooperation with the College of Education, offers both the Ed.D. and the Ph.D. in Music Education. Concentrations are available in Choral Music, General Music and Instrumental Music. For general requirements for these doctoral programs see the *Graduate Catalog.*

Bachelor Degree Requirements
General Degree Requirements. There are

requirements that pertain to each baccalaureate degree program in the College of Fine Arts.

General Studies Requirements. To meet the General Studies requirement, students in the Bachelor of Arts degree program must take a minimum of 54 semester hours of credit in General Studies. (Exception: The Bachelor of Arts in Music requires 50 semester hours of credit.) Students in the Bachelor of Fine Arts and Bachelor of Music degree programs must meet the University minimum requirement of 36 hours of credit in General Studies. In addition, students must meet the University requirement of the equivalent of two semesters of English composition. A minimum of 6 hours of course work must be taken in each of the following areas: humanities; fine arts; social and behavioral sciences; and science and mathematics. The student must elect at least one course in a laboratory science.

Courses offered within one's major department or school may not be used to meet the General Studies requirement in the College of Fine Arts. See page 36 for complete description of the University General Studies program.

Graduation Requirements. At least 126 semester hours with grades of "C" or higher in the major. Some degree programs require additional hours for graduation. A cumulative scholarship index of 2.00 is required for graduation. (See exception to this grade point requirement in the BFA Theatre curriculum).

For graduation, at least 50 credit hours must be upper division courses.

Specific Degree Requirements. In addition to the above general degree requirements, each of the degree programs offered in the College of Fine Arts has specific requirements.

Bachelor of Arts Degree: The curriculum for the degree Bachelor of Arts is designed to give the student a broad academic background with a scholarly orientation in the principal fields of human knowledge and a reasonable amount of specialized training in a selected area. This degree is offered in the fields of art, dance, music, and theatre. At least 18 semester hours of credit in the major field must be in upper division courses.

Major Requirements. The major consists of at least 45 to 60 semester hours of credit. Normally, not more than 30 semester hours will be taken in the field of specialization and approximately 15 semester hours in one or more related fields. The exact content of the major is selected by the student in consultation with his/her advisor under the rules and regulations of the department or school concerned.

General Studies Requirement. In the field of science and mathematics, the student must elect at least one course in a laboratory science.

Foreign Language Requirement. Knowledge in one foreign language equivalent to the level obtained through 16 college credit hours of instruction is required. This requirement may be fulfilled in whole or in part through language instruction in secondary schools or by other means. If acquired in secondary school, two years of instruction in one foreign language will be considered the equivalent of one year of instruction on the college level. Students who transfer from other colleges with less than two years of credit in a foreign language will be placed in a course at the next level above the work completed. Majors in art, music (voice performance) or theatre must consult their advisor on modification of the foreign language requirement.

Bachelor of Fine Arts Degree. The curriculum for the degree Bachelor of Fine Arts is designed to meet the needs of the student with specific pre-professional interest in the visual or performing arts, while providing an academic orientation in the principal fields of human knowledge. This degree is offered in the fields of art, dance and theatre.

Major Requirements. A major in art consists of 75 semester hours of credit, divided between the core curriculum and the area of specialization. A major in theatre requires 84 hours. The major in dance consists of a minimum of 70 semester hours of course work in dance and related fields. See page 313 of this catalog for detailed requirements in the dance program.

General Studies Requirement. In the field of sciences and mathematics the student must take at least one course in a laboratory science.

Bachelor of Music Degree. The curriculum for the degree Bachelor of Music is designed to give the student a broad, yet concentrated, background in the fields of music performance, music theatre, jazz, music therapy, piano accompanying, theory and composition, teaching of choral-general music, and instrumental music. Entering undergraduate

students must perform an entrance audition in their primary performing medium. Audition forms and specific audition requirements for each instrument or voice may be obtained upon request by writing the School of Music. Four official dates for these auditions will be set for each academic year. Students may request to audition on other dates if necessary or may send a tape recording if distance prohibits coming to the campus. Placement tests in theory and piano are required of all freshman and transfer students. These normally are administered during orientation week at the beginning of each semester.

Foreign Language Requirement. Students specializing in voice performance must earn 16 semester hours of credit in more than one foreign language, chosen from French, German, or Italian. A student may elect one year of one language and either one or two semesters of the other(s), chosen in conference with the advisor. For other means by which the student can meet this requirement see the statement above pertaining to foreign languages in the Bachelor of Arts degree program.

There is no foreign language requirement in any other major leading to the Bachelor of Music degree.

School of Art

PROFESSORS:
LEHRER (ART 102), BRECKENRIDGE, BROADLEY, CHOU, FINK, GOO, GRIGSBY, HAHN, HALE, HALL, HELLER, JACOBSON, LINDERMAN, MAGENTA, SCHAUMBURG, STULER, J. J. TAYLOR, WAGNER, WOODS

ASSOCIATE PROFESSORS:
DeMATTIES, ECKERT, GASOWSKI, GILLINGWATER, GULLY, JAY, JENKINS, KIMBALL, PILE, PIMENTEL, SCHMIDT, WATSON, YOUNG

ASSISTANT PROFESSORS:
BRITTON, FARNESS, HAJICEK, KAIDA, KRONENGOLD, OTIS-FRONSKE, PETERSON, RABINER, RISSEEUW, SHARER, SHIPP, J. R. TAYLOR, URRY, VERZAAL, WILSON

Major Requirements

For advisement purposes, all students registering in an art degree program will enroll through the College of Fine Arts. Each degree program and area of specialization has its own check sheet which describes the particulars of

course sequence and special requirements. These are available in the School of Art office.

Bachelor of Arts Degree Curriculum

The School of Art offers two emphases at the Bachelor of Arts level: Studio Art and Art History. These emphases are intended to give the student a broadly-based general education in the field with some more specialized work at the upper division level.

Studio Art—Consists of a minimum of 45 semester hours of credit as approved by the student's advisor. An emphasis in studio art requires 30 credit hours in studio and 15 hours in a related field(s). Normally the related field is art history. At least 18 of the 45 hours must be upper division credit. All credit applied to the emphasis must be a "C" or better. The foreign language requirement of the B.A. degree is optional but strongly recommended.

Art History—Consists of a minimum of 45 semester hours of credit as approved by student's advisor.

An emphasis in art history requires 33 credit hours of art history courses and 12 in a related field(s). Normally the related field is studio art. At least 18 of the 45 hours must be upper division credit. All credit applied to the major must be with a "C" or better. The art history areas of Ancient, Medieval, Renaissance, Baroque, Modern and Non-Western Art must each be represented with at least one course. Satisfactory completion of ARH 480, Research Methods, is required before the senior year. Other requirements are ARH 101, 102, 201; one ARH 498 Pro-Seminar; ART 111, 112 and 115. Knowledge in at least one foreign language is required, equivalent to the level obtained through 16 semester hours of instruction.

Bachelor of Fine Arts Degree Curriculum

Art—Consists of 75 semester hours of credit, with a concentration in one area selected on the basis of the student's interests. The following concentrations are available to the student: art education, ceramics, crafts, drawing, graphic design, inter-media, painting, photography, printmaking and sculpture.

All students in this degree program follow the same pattern of courses in art for the first two semesters: ART 111, 112, 113 and 115; ARH 101 and 102.

At least 30 upper division credit hours must be earned within the major, with a minimum of 12 credit hours within the concentration.

All course work counted in the major must be "C" or better. The specific requirements for the concentration are determined by the faculty advisors of the area, and are listed on School of Art checksheets.

Courses from other departments may apply to the major when it is determined they make a special contribution to the student's program of study.

Major Teaching Field Requirements

Bachelor of Fine Arts Degree in Art with a Curriculum Option in Art Education

Art—Consists of 75 semester hours of credit in art. Courses ART 111, 112, 113, 115, 201, 223 and one of the following three-dimensional courses are required: ART 231, 261, 272, 274, 276. The following art history and art education courses are required: ARH 101, 102, 454, 456; ARE 300, 302, 412, 480, 484 and 490. In addition, a minimum of 21 hours are to be taken in a specific area of art proficiency with 12 of these hours being upper division credit.

Minor Teaching Field Requirements

Elementary Education Major: Minor in Art—Consists of 27 semester hours including ART 111, 112, 113, 115; ARH 101, 102; ARE 302 and 484 which are required. The remaining 3 semester hours are to be selected in consultation with an art education advisor.

Secondary Education Major: Minor in Art—Consists of 24 semester hours including ART 111, 112, 115; ARH 101, 102; ARE 480 and 484 which are required. The remaining 3 semester hours are to be selected in consultation with an art education advisor.

Secondary Education Major: Minor in Photography—Consists of 24 semester hours including ART 112, 201, 205, 304, 306, 403; ARE 480; ARH 460; and one additional upper division photography course.

Graduate Programs

The School of Art offers programs leading to the degree of Master of Arts with a major in Art, including an emphasis in art education or art history, and the Master of Fine Arts degree with emphases in ceramics, crafts, drawing, painting, photography, printmaking, or sculpture. In cooperation with the College of Education, the degrees of Master of Arts in Education, Doctor of Education and Doctor of Philosophy are offered with a field in art education. Consult the *Graduate Catalog* for requirements for all graduate degrees.

ART

ART 111 Beginning Drawing I. (3) F, S, SS
Fundamental technical and perceptual skills using common drawing media and their application to pictorial organization. Prerequisites: ART 112 and 115. Six hours a week.

112 Two-dimensional Design. (3) F, S, SS
Fundamentals of pictorial design. No prerequisites. Six hours a week.

113 Color. (3) F, S, SS
Principles of color theory as related to the visual arts. Prerequisite: ART 112 and 115. Six hours a week.

115 Three-dimensional Design. (3) F, S, SS
Fundamentals of three-dimensional form. No prerequisites. Six hours a week.

210 Studio Art Concepts. (3) F, S, SS
Development of perceptual, imaginative, and expressive responses through problem solving, discussion, and critical evaluation. Emphasis on contemporary art concepts. Six hours a week.

DRAWING

ART 211 Beginning Drawing II. (3) F, S, SS
Continued development of technical and perceptual skills. Emphasis on materials and pictorial content. Prerequisite: ART 111, 112, 113 and 115. Six hours a week.

214 Beginning Life Drawing. (3) F, S, SS
Development of skill and expressiveness in drawing the basic form, construction and gesture from the human figure. Prerequisite: ART 111, 112, 113 and 115. Six hours a week.

311 Intermediate Drawing. (3) F, S
Emphasis on composition, exploration of drawing media. Prerequisite: ART 211, 214 and approval of instructor. Six hours a week.

314 Intermediate Life Drawing I. (3) F, S
Drawing from the model with greater reference to structural, graphic and compositional concerns. Prerequisite: ART 214 and approval of instructor. Six hours a week.

315 Intermediate Life Drawing II. (3) F, S
The human figure as the subject for drawing. Emphasis on conceptual alternatives and management of materials. Prerequisite: ART 314 and approval of instructor. Six hours a week.

411 Advanced Drawing. (3) F, S
Visual and intellectual concepts through problem solving and independent study. Emphasis on the individual creative statement. May be repeated for credit. Prerequisites: ART 311 and approval of instructor. Six hours a week.

412 Drawing Techniques of the Old Masters. (3) N
Techniques of drawing from early Renaissance to the present; silver point, bistre ink, quill pen, pastels and chiaroscuro drawings. May be repeated for credit. Prerequisite: approval of instructor. Six hours a week.

414 Advanced Life Drawing. (3) F, S
Various media and techniques on an advanced level. The human figure as an expressive vehicle in various contexts. May be repeated for credit. Prerequisite: ART 315 and approval of instructor. Six hours a week.

415 Art Anatomy. (4) N
Study of human anatomical structures as applied to the practice of figure oriented art. Prerequisite: ART 214. Three hours lecture; 5 hours studio a week.

PAINTING

ART 223 Beginning Painting. (3) F, S, SS
Fundamental concepts and materials of traditional and experimental painting media. Emphasis on preparation of painting supports, composition and color. Prerequisites: ART 111, 112, 113 and 115. Six hours a week.

227 Beginning Watercolor. (3) F, S
Painting in all water-soluble media. Emphasis on techniques, composition and color. Prerequisites: ART 111, 112, 113 and 115. Six hours a week.

323 Intermediate Painting I. (3) F, S
Development of competency in skills and expression. Assigned problems involve light, space, color, form and content. Prerequisites: ART 223 and approval of instructor. Six hours a week.

324 Intermediate Painting II. (3) F, S
Continuation of ART 323. Prerequisites: ART 323 and approval of instructor. Six hours a week.

325 Figure Painting. (3) F, S
The human figure clothed and nude as the subject for painting in selected media. Prerequisites: ART 314 and 323. Six hours a week.

327 Intermediate Watercolor. (3) A
Explorations using a variety of surfaces, and a combination of media and materials. Prerequisite: ART 227. Six hours a week.

421 Painting Materials and Techniques. (3) A
Traditional and modern materials and techniques of painting. Experimental problems in tempera, encaustic, casein emulsions, Maroger's Medium and synthetic media. Prerequisite: approval of instructor. Six hours a week.

423 Advanced Painting. (3) F, S
Continuation of ART 324. May be repeated for credit. Prerequisite: ART 324. Six hours a week.

425 Advanced Figure Painting. (3) F, S
Continuation of ART 325. May be repeated for credit. Prerequisites: ART 315, 324 and 325. Six hours a week.

427 Advanced Watercolor. (3) F, S
Continuation of ART 327. May be repeated for credit. Prerequisite: ART 327. Six hours a week.

INTER MEDIA

ART 246 Introduction to Inter-Media. (3) F, S
Experimental, conceptual and inter-disciplinary studio art with emphasis on new media and technologies. Prerequisites: ART 111, 112, 113 and 115. Six hours a week.

340 New Media Concepts. (3) F, S
Continuation of ART 246. Prerequisites: ART 201, 211, 246 or approval of instructor. Six hours a week.

341 Mixed Media. (3) A
Exploring visual effects by combining traditional and non-traditional methods, techniques and concepts. Repeatable once for credit. Prerequisites: ART 201, 223 and/or 231 or approval of instructor. Six hours a week.

PHOTOGRAPHY

ART 201 Beginning Photographic Art. (3) F, S
Development of skills and techniques of black and white photography. Emphasis on camera work and darkroom procedures. Two lectures, 3 hours laboratory.

205, 206 Intermediate Photography. (3) F, S
Photography as an art medium with additional exploration into personal photographic esthetics. Prerequisites: ART 111, 112, 113, 115, 201 or approval of instructor. Six hours a week.

304 Advanced Photography. (3) F, S
Interpretation and manipulation of light as a tool in the performance of expressive photography. Prerequisites: ART 205 or 206 and approval of instructor. Six hours a week.

305 Color Photography. (3) F, S
Application of color transparencies and prints to photographic art. Prerequisites: ART 304 and approval of instructor. Six hours a week.

306 Photo Techniques. (3) F, S
Exploration of camera and darkroom techniques with emphasis on creative control for the well crafted black and white print. Prerequisites: ART 205 or 206 and approval of instructor. Six hours a week.

401 Nonsilver Photography. (3) F, S
Recognition of the inherent characteristics of nonsilver processes and the use of these processes in the communication of ideas. Prerequisite: ART 306 and approval of instructor. May be repeated for credit. Six hours a week.

402 Extensions of the Photographic Image. (3) N
Designed to broaden the student's concept of the photographic medium. May be repeated for credit. Prerequisite: ART 304 and approval of instructor. Six hours a week.

403 Black and White Photography. (3) F, S
Advanced exploration of experimental, interpretive, and straight photography. May be repeated for credit. Prerequisites: ART 304 and approval of instructor. Six hours a week.

405 Advanced Color Photography. (3) F, S
Intensive use of subtractive color process in photographic printing. Prerequisites: ART 305 and approval of instructor. May be repeated for credit. Six hours a week.

409 Photographic Exhibition. (3) A
Care of photographic prints, print presentation and exhibition. Practical experience in gallery operations. Prerequisite: ART 304 and approval of instructor. May be repeated for credit. Six hours a week.

PRINTMAKING

ART 252 Lithography. (3) F, S
Black and white planographic printmaking utilizing stone and aluminum plate processes. Prerequisites: ART 111, 112, 113 and 115. Six hours a week.

351 Intaglio. (3) F, S
Introduction to contemporary and traditional developmental techniques for black and white prints. Prerequisite: approval of instructor. Six hours a week.

352 Intermediate Lithography. (3) F, S
Continuation of ART 252. Introduction to color techniques and advanced image-formation processes. Prerequisite: ART 252 and approval of instructor. six hours a week.

354 Screen Printing. (3) A
Various methods and applications including the photographic, stencil and transfer techniques. Prerequisite: approval of instructor. Six hours a week.

355 Photo Process for Printmaking. (3) A
Introduction to photographic principles and skills for photo-mechanical printmaking processes, including photo-silkscreen, photo-litho and photo-etching. Prerequisite: approval of instructor. Six hours a week.

451 Advanced Intaglio. (3) F, S
Various contemporary and traditional methods of printing to achieve color prints. May be repeated for credit. Prerequisite: approval of instructor. Six hours a week.

452 Advanced Lithography. (3) F, S
Continuation of ART 352. May be repeated for credit. Prerequisite: approval of instructor. Six hours a week.

454 Advanced Screen Printing. (3) A
Continuation of ART 354. May be repeated for credit. Prerequisite: approval of instructor. Six hours a week.

458 Papermaking. (3) F, S
History, theory, demonstrations, sheet forming, collage treatments and three-dimensional approaches. Prerequisite: approval of instructor. Six hours a week.

SCULPTURE

ART 231 Beginning Sculpture. (3) F, S, SS
Exploration and expression of sculptural form through ideas and concepts related to basic materials; studio safety Prerequisites: ART 111, 112, 113 and 115. Six hours a week.

331 Intermediate Sculpture. (3) F, S
Continuation of ART 231. Prerequisite: ART 231. Six hours a week.

332 Advanced Sculpture. (3) F, S
Sculptural problems related to architecture and man's environment. Exploration in all media. Color relationships as applied to sculpture. Prerequisite: ART 331. Six hours a week.

333 Experimental Sculpture. (3) N
An experimental approach to form-material relationship toward atmospheric, kinetic, audio, electronic and earth works. Prerequisite: ART 332 or approval of instructor. Six hours a week.

431 Special Problems in Sculpture. (3) F, S
Development of a personal approach to sculpture, emphasis on form, individual problems and related color technology. Professional practices and presentation. May be repeated for credit. Prerequisite: ART 332 and approval of instructor. Six hours a week.

432 New Directions in Sculpture. (3) A
Examination of environment as resource for images and ideas. Experimentation in nontraditional methods and inter-relating disciplines. May be repeated for credit. Prerequisite: ART 332 or approval of instructor. Six hours a week.

436 Architectural Sculpture. (3) N
Sculptural concepts as related to architecture and other man-made environments. Scale drawing, models, and relief sculpture. May be repeated for credit. Prerequisite: ART 332 or approval of instructor. Six hours a week.

437 Non-Permanent Sculpture. (3) N
Art of a temporary nature including sequential and conceptual works. Attitudes may be presented in films or other visual media. May be repeated for credit. Prerequisite: approval of instructor. Six hours a week.

438 Experimental Systems in Sculpture. (3) N
Systems and concepts for phase changes of materials, temperature / pressure field, time compression / extension, and electronic activation of dimensional forms. May be repeated for credit. Prerequisite: approval of instructor. Six hours a week.

CERAMICS

ART 261 Ceramic Survey. (3) F, S, SS
Handforming methods, throwing on the wheel, decorative processes, glaze application. Prerequisites: ART 111, 112, 113 and 115. Six hours a week.

360 Ceramic Throwing. (3) F, S
Design analysis and production of functional pottery. Emphasis on throwing techniques, surface enrichment and glaze application. Prerequisite: ART 261. Six hours a week.

364 Ceramic Handbuilding. (3) F, S
Search for form and personal expression through hand building techniques. Kiln firing and related problems. Prerequisite: ART 231 and 360. Six hours a week.

365 Intermediate Ceramics. (3) F, S
Studio problems and instruction with emphasis on personal expression. Prerequisite: ART 364 or approval of instructor. Six hours a week.

460 Ceramic Clay. (3) F
Research into various clay body formulations, local natural materials, slip glazes and engobes. Prerequisite: ART 365 or approval of instructor. Six hours a week.

463 Ceramic Glaze. (3) S
Glaze formulation and calculation. Prerequisite: ART 365 or approval of instructor. Six hours a week.

466 Advanced Ceramics. (3) F, S, SS
Emphasis on personal expression within structure of seminars, critiques, studio work. Professional methods of presentation / documentation of work. May be repeated for credit. Prerequisites: ART 365 or approval of instructor. Six hours a week.

CRAFTS

ART 271 Introduction to Crafts. (3) A
Studio survey of contemporary crafts. Development of professional disciplines and attitudes. Six hours a week.

272 Beginning Jewelry. (3) F, S
Emphasis on fabrication in jewelry making. Basic techniques of forming, cutting and piercing, forging and soldering. Six hours a week.

274 Beginning Wood. (3) F, S
Fundamental woodworking techniques to produce creative functional three-dimensional objects. Six hours a week.

276 Beginning Fiber Arts. (3) F, S
Structural use of fiber utilizing a variety of techniques. Surface treatment including batik, block printing, fold and tie-dye. Six hours a week.

372 Intermediate Jewelry. (3) F, S
Fabricated approach to jewelry making. Techniques in stone setting and surface embellishment. Prerequisite: ART 111, 112, 113, 115, 271 and 272 or approval of instructor. Six hours a week.

373 Metalworking. (3) A
Compression, die and stretch forming as applied to hollow form construction. Hot and cold forging techniques as applied to smithing. Prerequisite: ART 111, 112, 113, 115, 271 and 272 or approval of instructor. Six hours a week.

374 Intermediate Wood. (3) F, S
Individual and directed problems in wood, related to the production of unique functional art objects. Prerequisites: ART 111, 112, 113, 115, 271 and 274 or approval of instructor. Six hours a week.

376 Intermediate Fiber Arts. (3) F, S
Surface treatment of fabric with emphasis on silk screening. Loom controlled techniques; use of dyes.
Prerequisites: ART 111, 112, 113, 115, 271 and 276 or approval of instructor. Six hours a week.

378 Furniture I. (3) A
Design and building of contemporary furniture. Exploration in the technique of joinery, lamination, carving and finishing procedures. Prerequisites: ART 111, 112, 113, 115, 271 and 274 or approval of instructor. Six hours a week.

472 Advanced Jewelry. (3) F, S
Jewelry making with emphasis on developing personal statements and craftsmanship. May be repeated for credit. Prerequisite: ART 372 and approval of instructor. Six hours a week.

473 Advanced Metalworking. (3) A
Forging and forming techniques in individualized directions. May be repeated for credit. Prerequisites: ART 373 and approval of instructor. Six hours a week.

474 Advanced Wood. (3) F, S
Extended experience and advanced techniques in the use of wood to create functional works of art. May be repeated for credit. Prerequisite: ART 374 and approval of instructor. Six hours a week.

476 Advanced Fiber Arts. (3) F, S
Experimentation with advanced techniques in fiber and fabric. May be repeated for credit. Prerequisite: ART 376 and approval of instructor. Six hours a week.

478 Furniture II. (3) A
Form concepts are explored in construction of inventive furniture. Emphasis on media experimentation. May be repeated for credit. Prerequisite: ART 378. Six hours a week.

GRAPHIC DESIGN

ART 282 Illustration I. (3) F, S
Media and methods of contemporary illustration. Prerequisites: ART 283, 284 and approval of instructor. May be taken concurrently with 384. Six hours a week.

283 Lettering and Typography I. (3) F, S
Fundamentals of type design, composition and indication. Exploration of creative and technical aspects of typography as a means of communication. Prerequisites: ART 111, 112, 113, 115 and approval of instructor. Six hours a week.

284 Graphic Design I. (3) F, S
Esthetic, technical and professional fundamentals of graphic design. Creative problem solving in visual communications utilizing illustration, typography, and graphic imagery. Prerequisites: ART 111, 112, 113, 115 and 283 which may be taken concurrently and approval of instructor. Six hours a week.

380 Lettering and Typography II. (3) F, S
Advanced use of existing letterforms and design of type for creative application to specific graphic problems. Prerequisites: ART 283, 284 and approval of instructor. Six hours a week.

382 Illustration II. (3) F, S
Continuation of ART 282. Prerequisites: ART 282, 384 and approval of instructor. May be repeated for credit. Six hours a week.

383 Reproduction Design. (3) F, S
Design, preparation of art for printing, reproduction, pasteups, mechanicals, color separations, graphic design considerations, preparation for reproduction processes. Prerequisites: ART 380, 384 and/or approval of instructor. Six hours a week.

384 Graphic Design II. (3) F, S
Continuation of problems and development of skills introduced in ART 283 and 284. Prerequisites: ART 283, 284 and approval of instructor. May be taken concurrently with 380. Six hours a week.

481 Portfolio Preparation. (3) F, S
Development, orientation and preparation of a portfolio for the graphic design profession. Prerequisites: ART 382, 482 and approval of instructor. Six hours a week.

482 Graphic Design III. (3) F, S
Continuation of ART 384. Prerequisites: ART 380, 384 and approval of instructor. Six hours a week.

485 Graphic Design Workshop. (3-6) F, S
Professional graphic design experiences in actual client/designer situations. Involvement in the complete graphic design process from concept to finished piece. Advanced graphic design majors only. Prerequisites: Portfolio presentation and approval of instructor. Six to twelve hours a week.

SPECIAL STUDIO COURSES

ART 621 Studio Problems. (3) F, S, SS
Advanced study in the following areas:

(a) Drawing	(f) Ceramics
(b) Painting	(g) Jewelry
(c) Photography	(h) Wood
(d) Printmaking	(i) Fiber Art
(e) Sculpture	(j) Studio Art

Prerequisite: approval of instructor. May be repeated for credit. Six hours a week each section.

680 Practicum: M.F.A. Exhibition. (1-15) F, S, SS
Studio work in preparation for required M.F.A. exhibition. Public exhibit to be approved by the student's supervisory committee and accompanied by a final oral examination. Photographic documentation and written statement of problem. Prerequisite: approval of the student's supervisory committee.

Special Courses: ART 294, 484, 493, 494, 498, 499, 591, 592, 594, 598. (See pages 32-33.)

ART EDUCATION

ARE 300 Educating in the Visual Arts. (3) F, S
Studio experiences and inquiry into the ways people learn in art. An introduction to the literature in art and art education. Two lectures, 2 hours studio.

301 Art in the Elementary School. (3) F, S
(For non-majors only.) Self-understanding through the use of art, concurrent with the study of children's art work from early childhood to mid-adolescence. One lecture, 4 hours studio.

302 Child Art and Artists (3) F, S
(Majors only.) Curriculum development, instructional resources, learning and the psychology of the child, current issues in art instruction and classroom management. Prerequisite: ARE 300 and approval of instructor. Two hours lecture, 2 hours studio.

412 Critical Inquiry in Art: Art Education. (3) F, S
Investigation of the ideas underlying art from a critical and historical perspective as they relate to curriculum and instruction. Prerequisites: ARE 300, 302, 480, 484, or approval of instructor.

420 Crafts for the Elementary School Teacher. (3) F, S
Practical laboratory experiences stressing a variety of
media and activities for classroom teaching. (Not for MA
credit in Art Education). One lecture, 4 hours studio.

425 Crafts in the High School. (3) F, S
Teaching strategies and practical activities for today's
high school crafts programs (Not for MA credit in Art Edu-
cation). One lecture, 4 hours studio.

480 Adolescent Art and Artists. (3) F, S
Strategies for teaching art, understanding design and ex-
ploring concepts related to art and artists in school and
community art programs. Two hours lecture, 2 hours stu-
dio.

485 Women's View of Art. (3) A
Study of women visual artists, their lives, and the social,
political, esthetic and educational issues related to their
art. Lecture-discussion, readings and studio experiences.
Prerequisite: approval of instructor. Three hours a week.

490 Instructional Resources in Art. (3) F, S
Development of audiovisual materials in art and inquiry
into strategies for their implementation. Two lectures, 2
hours studio. Prerequisites: ARE 412 or approval of in-
structor.

510 Art in the Self-Contained and Open Classroom. (3)
A
Alternate teaching/learning strategies, art concepts, skills
and expressive objectives relevant to elementary school
art experiences for teachers.

511 Issues in Art Education. (3) A
Investigation of issues in art education.

515 Foundations of Art Education. (3) A
Behavioral foundations of education as related to art edu-
cation. Emphasis on psychological and philosophical
frame-of-reference.

520 Creativity in Art Education. (3) A
The nature of creative behavior, especially as it applies to
the teaching of the visual arts.

525 Art and Society. (3) A
Interrelationship of art, society, and social change and
their relevance to areas such as government, museums,
and technology.

540 Instructional Resources, Art Education. (3) S
Development of audio visual materials in art and inquiry
into strategies for their implementation.

545 Perception and Learning. (3) A
Concepts of perception and learning in art instruction.

550 Esthetic Inquiry. (3) F
Literature on esthetics, methods of inquiry and implica-
tions for art education.

555 Art and Electronic Media. (3) F, S
Lecture-discussion, readings, and studio experiences in
various electronic media related to the teaching of art.

570 Criticism, Issues in Contemporary Art. (3) N
Issues in contemporary art criticism and their implications
for art education.

575 Curriculum in Art and Education. (3) F, S
Literature in art education and education on existing strat-
egies for developing curriculum, the issues and problems
of differing curriculum orientations.

610 Issues and Trends in Art Education. (3) N
Investigations of issues in art education.

611 Curriculum Development in Art Education. (3) N
Development of curriculum in terms of philosophical, psy-
chological and sociological foundations.

Special Courses: ARE 294, 484, 493, 494, 498, 499,
590, 591, 592, 593, 594, 598, 599, 690, 691, 692, 790,
791, 792, 799. (See pages 32-33.)

ART HISTORY

ARH 100 Introduction to Art. (3) F, S, SS
Development of understanding and enjoyment of art and
its relationship to everyday life through the study of paint-
ing, sculpture, architecture and design. May not be taken
for credit by student who has completed ARH 300, nor
used as art history credit by art majors.

**101 History of Art from the Dawn of Civilization to the
Renaissance.** (3) F, S, SS
Ancient Near Eastern, Egyptian, Greek, Roman and medi-
eval European art to the Renaissance. Lecture, discussion.

102 History of Art from Renaissance to the Present Day.
(3) F, S, SS
Western art during the Renaissance, mannerist, baroque,
rococo, neo-classic, romantic, and modern epochs. Lec-
ture, discussion.

110 Introduction to American Indian Art. (3) A
History of American Indian art in North, Central and South
America to the time of European contact.

201 Art of the Non-Western World. (3) F
An historical survey of the visual arts in African, Oceanic,
East Asian (China, Japan), Southeast Asian, pre-
Columbian, Native American Indian, Islamic cultures. Pre-
requisites: ARH 101 and 102 or approval of instructor.

300 Introduction to Art. (3) F, S, SS
Course content same as ARH 100 but requires a higher
level of accomplishment and comprehension. May not be
taken for credit by student who has completed ARH 100,
nor used as art history credit by art majors.

305 Introduction to Islamic Art. (3) A
Architecture, painting and minor arts of the Arab coun-
tries, Iran, Turkey, North Africa, Mughal India, and Islamic
Spain.

401 American Art I. (3) F
History of art in the United States from European settle-
ment of the New World to the Columbian Exposition of
1893. Prerequisites: ARH 101 and 102 or approval of in-
structor.

402 American Art II. (3) S
History of art in the United States from the last decade of
the 19th century to World War II. Prerequisites: ARH 101
and 102 or approval of instructor.

403 Pre-Columbian Art. (3) A
American Indian art from Central Mexico to South Amer-
ica from its origins to the time of European contact.
Prerequisites: ARH 101 and 102, or 110.

404 North American Indian Art. (3) A
American Indian art from northern Mexico to Alaska. Pre-
requisites: ARH 101 and 102, or 110.

405 Southwest Indian Art. (3) A
American Indian art in the southwestern states from its
origins to the present day. Prerequisites: ARH 101 and
102, or 110.

406 Mexican Art. (3) A
Art of Mexico and related Central American cultures from
the prehistoric to the contemporary schools. Prerequisites:
ARH 101, 102 and 110 or approval of instructor.

409 History of Printmaking. (3) A
History of the print as an art form and its relation to other modes and forms of artistic expression. Prerequisites: ARH 101 and 102 or approval of instructor.

410 Ancient Near Eastern Art. (3) N
History of painting, sculpture, and architecture in Mesopotamia, Egypt, and the Aegean. Prerequisites: ARH 101 and 102 or approval of instructor.

411 Greek Art. (3) A
Art and architecture of Greece and the Hellenistic Empire. Prerequisites: ARH 101 and 102 or approval of instructor.

412 Roman Art. (3) A
Art and architecture of Etruria, Rome, and the Roman Empire. Prerequisites: ARH 101 and 102 or approval of instructor.

414 Early Christian and Byzantine Art. (3) A
Art and architecture of the early church and the Byzantine Empire from the 4th to the 15th century. Prerequisites: ARH 101 and 102 or approval of instructor.

420 Early Medieval Art. (3) A
Architecture, sculpture, and painting in the Latin West from the 7th century to the end of the Ottonian Period. Prerequisites: ARH 101 and 102 or approval of instructor.

422 Romanesque Art. (3) A
Sculpture, painting, architecture, and minor arts in western Europe during the Romanesque period. Prerequisites: ARH 101 and 102 or approval of instructor.

424 Gothic Art. (3) A
Painting, sculpture and architecture in western Europe during the Gothic period. Prerequisites: ARH 101 and 102 or approval of instructor.

428 15th-Century Art in Northern Europe. (3) A
Painting, sculpture, and architecture during the 1400s north of the Alps. Prerequisites: ARH 101 and 102 or approval of instructor.

432 Early Renaissance Art in Italy. (3) A
Painting, sculpture and architecture in Italy from 1300 to 1500. Prerequisites: ARH 101 and 102 or approval of instructor.

434 Art of the Italian High Renaissance and Mannerism. (3) A
History of Italian art during the 16th century, including the achievements and influence of Leonardo da Vinci, Raphael, and Michelangelo. Prerequisites: ARH 101 and 102 or approval of instructor.

440 Art of the 17th Century in Southern Europe. (3) A
Baroque painting, sculpture and architecture in Italy and Spain. Prerequisites: ARH 101 and 102 or approval of instructor.

442 Art of the 17th Century in Northern Europe. (3) A
Baroque painting, sculpture and architecture in Flanders, the Netherlands, France and England. Prerequisites: ARH 101 and 102 or approval of instructor.

444 Art of the 18th Century. (3) A
History of painting, sculpture, architecture, graphic arts and the decorative arts from 1700 to the French Revolution (1789). Prerequisites: ARH 101 and 102 or approval of instructor.

448 Landscape Art. (3) A
History of landscape art from Middle Ages to Victorian era. Concentration on relationships between visual arts, esthetic theory and literature. Prerequisites: ARH 101, 102 or approval of instructor.

450 Art of the Early 19th Century. (3) A
Art from the French Revolution to the Paris World's Fair of 1855. Emphasis on the neo-classic, romantic and realist movements. Prerequisites: ARH 101 and 102 or approval of instructor.

452 Art of the Late 19th Century. (3) A
Art from the mid-century to 1900. Emphasis on the pre-Raphaelite, impressionist, post-impressionist, symbolist, and art nouveau movements. Prerequisites: ARH 101 and 102 or approval of instructor.

454 Art of the 20th Century. (3) A
Developments and directions in art between 1900 and World War II. Prerequisites: ARH 101 and 102 or approval of instructor.

456 Art Since 1940. (3) A
Art since World War II, with consideration of new concepts and experimentation with media and modes of presentation. Prerequisites: ARH 101, 102 and 454 or approval of instructor.

460 19th Century Photography. (3) A
History of photography from the medium's pre-history to 1914: personalities, processes, images, and ideas. Prerequisite: ARH 101, 102 or approval of instructor.

462 20th Century Photography Before 1950. (3) A
Personalities, processes, images and ideas in photography from 1914 to 1950. Prerequisites: ARH 101 and 102 or approval of instructor.

463 20th Century Photography Since 1950. (3) A
Personalities, processes, images and ideas in photography from 1950 to the present day. Prerequisites: ARH 101, 102 and 462 or approval of instructor.

466 Photographic Publications of the 19th Century. (3) N
Photographs for magazine and book illustrations from Fox Talbot's *Pencil of Nature* to Stieglitz's *Camera Work.* Prerequisite: ARH 460 or approval of instructor.

470 Art of India. (3) N
Painting, sculpture and architecture of India and Southeastern Asia. Prerequisites: ARH 201 or approval of instructor.

471 Art of China. (3) A
Study of major forms in Chinese art: ritual bronze, sculpture, ceramic, calligraphy, painting and architecture. Prerequisites: ARH 201, or approval of instructor.

472 Art of Japan. (3) A
Japanese art from the Joman period to the present. Prerequisite: ARH 201 or approval of instructor.

474 Chinese Painting. (3) A
From Ku K'ai-chin to Ch'i Pai-shih. Major artists, styles and movements in Chinese painting. Prerequisite: ARH 201 or approval of instructor.

476 Islamic Architecture. (3) N
Major movements and styles of Islamic architecture from the 8th century through 17th century. Prerequisite: ARH 305 or approval of instructor.

477 Islamic Painting. (3) N
Manuscript illumination and painted ceramics in Iran, Turkey, Arab countries, Mughal India; Iranian oil paintings and folk art. Prerequisites: ARH 305 or approval of instructor.

478 Iranian Arts. (3) N
Architecture, painting, ceramics, carpets and minor arts of Iran from the 9th through the 19th century. Prerequisites: ARH 305 or approval of instructor.

480 Research Methods. (3) F, S
Methodology and resource material for art historical research. Techniques of scholarly and critical writing and evaluation of bibliographic sources. Prerequisites: ARH 101 and 102 or approval of instructor.

482 History of Visual Arts Criticism I. (3) N
History of theories of criticism of the visual arts. Readings from visual arts critical literature from Plato to 18th century. Prerequisites: ARH 101 and 102.

483 History of Visual Arts Criticism II. (3) N
Continuation of ARH 482, focusing on various theories of criticism of the visual arts from late 18th century to present. Prerequisite: ARH 482.

486 Twentieth Century Art Criticism. (3) N
Seminal, influential writings in development of modern art criticism. Role of art critic, art journals in relation to art community. Prerequisite: ARH 454, 483 and/or approval of instructor.

488 Art Criticism Writing. (3) N
Traditional and contemporary approaches to the criticism of art. Students will write critical essays. The latter half of the semester will stress the criticism of contemporary art in various media. Prerequisites: ART 486 and/or approval of instructor.

498 Pro-Seminar. (3) A
Undergraduate seminar in topics selected from the following. Prerequisite: approval of instructor.

Problems or criticism in:

(a) Chinese Art	(f) Modern Art
(b) Ancient Art	(g) American Indian Art
(c) Medieval Art	(h) Islamic Art
(d) Renaissance Art	(i) Photographic History
(e) Baroque Art	

591 Seminar. (3) A
Graduate seminar in topics selected from the following. Prerequisite: approval of instructor.

Problems or criticism in:

(a) Chinese Art	(f) Modern Art
(b) Ancient Art	(g) American Indian Art
(c) Medieval Art	(h) Islamic Art
(d) Renaissance Art	(i) Photographic History
(e) Baroque Art	

Special Courses: ARH 294, 484, 492, 493, 494, 499, 500, 590, 592, 598, 599. (See pages 32-33.)

AUXILIARY COURSES

ARA 454 Museum Studies. (3) A
History of the origins and development of museums. Topics covered will be the history of collecting, connoisseurship and conservation. Prerequisite: Approval of instructor.

456 Museum Studies II. (3) N
Practical operation of museums; methodology: theory/practice including organization, administration, fund raising, grant proposals, collecting, registration, budgets, personnel and education programs. Prerequisite: ARA 454.

460 Gallery Exhibitions. (3) F, S
Practical experience in all phases of department gallery operations and preparation of gallery publications. Prerequisites: approval of instructor. May be repeated for credit.

Special Courses: ARA 294, 484, 494, 498, 584, 591, 594, 598. (See pages 32-33.)

Department of Dance

PROFESSOR:
FAULKNER

ASSOCIATE PROFESSORS:
LESSARD (PEBE 115), JONES

ASSISTANT PROFESSORS:
CHLISTOWA, GREGORY, HUSKEY, LUDWIG

INSTRUCTOR:
JACOBY

Departmental Major Requirements

For advisement purposes, all students registering in a dance degree program will enroll through the College of Fine Arts. Each degree program and area of specialization has its own check sheet which describes the particulars of course sequence and special requirements. These are available in the Department of Dance office.

Bachelor of Arts Degree Curriculum

Dance—Consists of a minimum of 45 semester hours of credit in dance, of which the following are required: DAH 160, 380; DAN 130, 131†, 134, 135, 232, 234†, 235, 261†, 262, 334 and 464. Fifteen additional hours approved by an advisor must be in no more than two related fields. Two years of credit or equivalent in a foreign language is required. Additional requirements are listed on the departmental check sheet.

At least 50 credit hours, including 24 in the major, must be upper division. Grades in classes required for the major must be C or better. First semester students should take: DAH 160; DAN 134 Modern; DAN 135 Ballet; ENG 101; MTC 100; and a General Studies elective.

Bachelor of Fine Arts Degree Curriculum

Dance—Consists of 60 to 70 hours of credit with a concentration in either related arts or secondary education. Core courses required are: DAH 160, 380; DAN 130, 131†, 134, 135, 230†, 232†, 234†, 235, 261, 262, 263†, 334†, 464†, 465†, 490†. For the concentration

in related arts additional requirements include DAN 331, 332†, 335, 371†, 434†; MTC 100; MUP 131, 133; MHL 294 or 355 or 356; THP 101. For the specialization in secondary education, DAN 360, 361 must be completed as well as all state secondary certification requirements. Other requirements for each option are listed on the departmental check sheet.

At least 50 credit hours, including 30 in the major, must be upper division. Grades in classes required for the major must be C or better. First semester students should take: DAH 160; DAN 134 Modern; DAN 135 Ballet; ENG 101; MTC 100; and a General Studies elective.

Departmental Graduate Program

The faculty in the Department of Dance offer a program leading to the Master of Fine Arts degree with a major in Dance. The program is designed to train professionals in the technique, performance, choreography and theoretical bases of modern dance. Consult the *Graduate Catalog* for requirements.

DANCE HISTORY

DAH 160 Contemporary Dance. (2) F, S
Orientation to the field of dance with particular reference to trends.

280 History and Philosophy of Dance. (2) N
Dance from ancient times to the present. Consideration of dance as an art in relation to other arts; primitive, preclassic, and modern forms.

380 Dance in Diverse Cultures I. (3) F
Development of dance as a social and cultural activity in western civilization. Covers major period from primitive to modern times.

381 Dance in Diverse Cultures II. (3) S
Development of dance as a performing art in western civilization commencing with Renaissance ballet and ending with contemporary modern dance.

550 Cultural Concepts of Dance. (3) S
Cultural concepts; trends, economic, political, and geographical forces in major eras of dance history.

560 Dance Philosophy and Criticism. (3) F
Theories of criticism; esthetic experience in dance in relationship to other art forms; concepts of creativity, style, and artistic truth. (Intended to integrate and give meaning to studio skills.)

DANCE

DAN 130 Dance. (1) F, S, SS
Ballet, folk, improvisation, modern, social, square and other dance activities. Two hours a week. May be repeated for credit.

131 Music Theory for Dance. (2) S
Elements of music, music structures and their relationship to dance. Emphasis on rhythmic analysis and dance accompaniment. Prerequisite: MTC 100† or approval of instructor.

134 Technique and Theory of Modern Dance. (3) F, S
Elementary concepts of modern dance technique. Development of movement quality and performance skills. Six hours weekly. May be repeated for credit. Placement audition required. Dance majors only.

135 Technique and Theory of Ballet. (2) F, S
First year ballet technique for Dance majors. Four hours weekly. May be repeated for credit. Placement audition required.

230 Dance. (1) F, S
Intermediate levels. Continuation of DAN 130. Two hours a week. May be repeated for credit.

232 Dance Notation I. (3) F
Survey of systems of dance notation. Emphasis on learning of elementary Labanotation. Prerequisite: MTC 100 or approval of instructor.

234 Technique and Theory of Modern Dance. (3) F, S
Intermediate concepts of modern dance technique. Development of movement quality and performance skills. Six hours weekly. May be repeated for credit. Placement audition required. Dance majors only.

235 Technique and Theory of Ballet. (2) F, S
Second year ballet technique for dance majors. Four hours weekly. May be repeated for credit. Placement audition required.

261 Fundamentals of Choreography. (3) F, S
Analysis of theme and dramatic ideas drawn from poetry, drama, music and other art forms for use in dance choreography. Prerequisite: approval of instructor.

262 Dance Production I. (2) F
Theory of lighting and costuming as related to dance.

263 Dance Production II. (2) S
Theory and practice of programming, make-up, scenery and sound as related to dance production. One lecture. 2 hours laboratory. Prerequisite: DAN 262 or approval of instructor.

330 Dance. (1) F, S
Advanced levels. Continuation of DAN 230. Two hours a week. May be repeated for credit.

331 Music Literature for Dance. (3) F
Historical survey of music relative to dance. Emphasis on dance music and relation of musical vs. choreographic forms. Prerequisite: DAN 131 or approval of instructor.

332 Dance Notation II. (2) S
Intermediate study of Labanotation. Introduction to effort-shape analysis of movement. Prerequisite: DAN 232 or equivalent.

334 Technique and Theory of Modern Dance. (3) F, S
Advanced concepts of modern dance technique. Development of movement quality and performance skills. Six hours weekly. May be repeated for credit. Placement audition required.

335 Technique and Theory of Ballet. (2) F, S
Third year ballet technique for dance majors. Four hours weekly. May be repeated for credit. Placement audition required.

360 Theory and Practice of Teaching Dance. (2) F
Folk, square, social and other dance forms. Analysis and acquisition of teaching techniques and teaching materials suitable for school and recreational use. One lecture, 2 hours laboratory.

361 Theory and Practice of Teaching Dance. (3) F
Creative and modern. Analysis and acquisition of teaching techniques and teaching materials suitable for school and recreational use.

367 Children's Dance. (3) F, S
Theory and practice of teaching creative, folk, square and other dance forms for children. Designed for dance majors and related curriculum, but open to all students.

371 Dance Theatre. (1) F, S
Performance in specially choreographed dance productions. Prerequisite: approval of instructor. Three hours a week per credit hour. May be repeated for credit.

434 Technique and Theory of Modern Dance. (3) F, S
Preparation in the performance and comprehension of professional level modern dance technique. Six hours weekly. May be repeated for credit. Placement audition required.

435 Technique and Theory of Ballet. (2) F, S
Fourth year ballet technique for dance majors. Four hours weekly. May be repeated for credit. Placement audition required.

464 Choreography and Accompaniment. (3) F
Function of accompaniment for dance; experience in the use of percussion, voice, records, piano and selected instruments in relation to their use in choreography.

465 Advanced Choreography. (3) F, S
Investigation and practice of contemporary styles of choreography. Prerequisite: DAN 261, or approval of instructor.

490 Senior Performance in Dance. (2) F, S
Original choreography for solo or group performance with analysis and critique of problems encountered in production. May be repeated for total of 4 hours. Prerequisites: DAN 261†, 464 or 465.

530 Advanced Problems in Analysis of Dance Technique. (3) F
Theories and principles of human anatomy and biomechanics applied to analysis and evaluation of dance movement. Prerequisite: PED 335 or approval of instructor.

531 Choreographer/Composer Workshop. (3) S
Analysis of, experimentation with, and practice in working with composers of music for choreography. Open to experienced choreographers and composers. Prerequisites: Approval of instructor.

534, 634 Technique and Theory of Modern Dance. (3) F, S
Preparation in the performance and comprehension of professional level modern dance for first year 534 and second year 634 graduate students. Six hours weekly. May be repeated for credit. Placement audition required.

535 Technique and Theory of Ballet. (2) F, S
Graduate level ballet technique. Four hours weekly. May be repeated for credit. Placement audition required.

562 Dance Stagecraft and Production. (3) S
Theory of lighting, costuming, make-up, scenery and sound as related to dance performance. May be repeated once for credit. Prerequisite DAN 262 and 263 or equivalent.

563 Individual and Group Choreography. (3) F
Original choreography created for solo and group performance. May be repeated once for credit. Prerequisite: DAN 464 and 465† or equivalent.

571 Dance Theatre. (1) F, S
Performance in specially choreographed dance productions. Prerequisite: Approval of instructor. Three hours a week. May be repeated for credit.

591 Seminar. (1-3) N
Topics may be selected from the following:

   (a) Dance Education and Administration

   (b) Film and Dance   (c) Effort-Shape

632 Dance Notation III. (3) S
Advanced study of Labanotation. Experiences in notating and reconstruction of Labanotation dance scores. Prerequisite: DAN 332† or equivalent.

680 MFA Performance. (3-12) F, S
Studio work in preparation for required MFA concert. Public performance to be approved by the student's supervisory committee and be followed by a final oral examination. A written bound document as well as video documentation must be left with the department.

Special Courses: DAN 500, 580, 590, 591, 593, 594, 598. (See pages 32-33.)

School of Music

PROFESSORS:
UMBERSON (MUSIC 183), ANDRESS, ATSUMI,
BRITTON, CARROLL, CASTLE, COHEN,
ENGLISH, HAMILTON, JOHNSON, LOMBARDI,
LoPRESTI, McEWEN, SEIPP, SKOLDBERG,
SPINOSA, STELLHORN, STRANGE

ASSOCIATE PROFESSORS:
DEBENPORT, DOAN, FLEMING, HANNA,
HINES, HOFFER, HOOVER, KLIEWER,
LOCKWOOD, McLEOD, MAGERS, MILLER,
RATTERREE, RAUSCH, RAVE, REYNOLDS,
RUCCOLO, SMITH, STALZER, STOCKER,
SWAIM

ASSISTANT PROFESSORS:
COSAND, HACKBARTH, HAEFER, HARRIS,
HOLBROOK, METZ, MEYER, NUTAITIS, SHINN,
SUNKETT, WILLIAMSON, WILSON, WYTKO

INSTRUCTOR:
KOONCE

The School of Music is a member of the National Association of Schools of Music, and the requirements for entrance and graduation set forth in this catalog are in accordance with the published regulations of the Association. The following statement of Basic Musicianship is endorsed by the School of Music:

"All musicians, whether performers, composers, scholars or teachers, share common professional needs. Every musician must to some extent be a performer, a listener, an historian, a composer, a theorist, and a teacher. For this reason, certain subject matter areas

and learning processes are common to all baccalaureate degrees in music.

"Basic musicianship is developed in studies which prepare the student to function in a variety of musical roles which are supportive of his major concentration. All undergraduate curricula, therefore, provide the following:

1. A conceptual understanding of such musical properties as *sound, rhythm, melody, harmony, texture* and *form* and opportunities for developing a comprehensive grasp of their interrelationships as they form the cognitive-affective basis for listening, composing and performing.

2. Repeated opportunities for enacting in a variety of ways the roles of listener (analysis), performer (interpretation), composer (creation), scholar (research), and teacher.

3. A repertory for study that embraces all cultures and historical periods."

Major Requirements

For advisement purposes, all students registering in a music major program will enroll through the College of Fine Arts. All music degree programs require a minimum of 126 hours of graduation. In addition to the major requirements listed below, General Studies and other academic requirements are listed on page 36 of this catalog.

Placement Examination. All students who enroll in an undergraduate music degree program are required to perform an entrance audition in their primary performing medium (instrument or voice). Audition forms and specific audition requirements for each instrument or voice may be obtained upon request by writing the School of Music. Four official dates for these auditions will be set for each academic year. Students may request to audition on other dates if necessary or may send a tape recording if distance prohibits coming to the campus. Entering students must also take placement tests in theory and piano at the time they enter the university. This includes transfer students who have completed four semesters of theory at another institution; they are required to reach a minimum level of achievement indicated on the Theory Placement Exam. Those who fail to do so must take and pass one of the MTC 200 level theory courses.

Bachelor of Arts Degree Curriculum in the Music Program—Consists of 50 credit hours. The following courses are required:

Music Theory: MTC 125, 221, 222, 223, 320, 327, 422

Music History and Literature: MHL 341, 342

Major Performing Medium: Eight credit hours (MUP 111/311)

Class Piano: MUP 131, 132, 231, 232 (unless waived by proficiency examination)

Recital Attendance: Six semesters of MUP 100

Note: The remaining hours in music will be selected by the student in consultation with his/her advisor. At least 18 credit hours of music must be upper division.

Bachelor of Music Degree Curriculum in the Music Program— Consists of 84 credit hours. This curriculum offers fields of specialization in choral-general music, instrumental music, performance, music therapy, and theory and composition. Choral-general music and instrumental music majors are provided for students wishing to meet certification requirements for teaching in the public schools. The following requirements are included in each field of specialization:

Choral-General Music

(Note: This degree program may include a teaching minor in instrumental music.)

Music Theory: MTC 125, 221, 222, 223, 327, 431

Music History and Literature: MHL 341, 342

Conducting: MUP 209, 339

Music Education: MUE 110, 313, 480

Major Performing Medium: Eight credit hours of MUP 111 and 8 credit hours of MUP 311 to obtain a proficiency level necessary to meet the graduation recital requirement. MUP 495 completes the requirement.

Minor Performing Medium: A proficiency equal to six semesters of study in keyboard or voice (whichever is not the major performing medium). Students wishing to extend their proficiency beyond this level may continue to study in MUP 321.

Ensemble: Eight different semesters of participation including at least six semesters of MUP 352 and/or MUP 353, or the equivalent, four of which must be at Arizona State University.

Recital Attendance: Six semesters of MUP 100

Instrumental Music

(Note: It is strongly recommended that this degree program include a minor in choral music.)

Music Theory: MTC 125, 221, 222, 223, 327

Music History and Literature: MHL 341, 342

Conducting: MUP 210

Music Education: MUE 110, 317, 318, 327, 328, 336, 337, 338, 481, 482

Class Piano: MUP 131, 132, 231, 232 (unless waived by proficiency examination)

Major Performing Medium: Eight credit hours of MUP 111 and 8 credit hours of MUP 311 to obtain a proficiency level necessary to meet the graduation recital requirement. MUP 495 completes the requirement.

Ensemble: Eight different semesters of participation, four of which must be at Arizona State University. For wind and percussion players, two of the four ASU semesters must be in marching band. String players must have a minimum of six semesters of MUP 345. Wind and percussion players must have a minimum of six semesters of MUP 361 or the equivalent.

Recital Attendance: Six semesters of MUP 100.

Recommended Minor: Choral-General Music—MUE 480, MTC 431, MUP 339, 350 or 352/353 (two semesters) and voice (4 hours)

Performance

Keyboard Concentration

Music Theory: MTC 125, 221, 222, 223, 320 or 321, 327, 425 (or 428)

Music History and Literature: MHL 341, 342, 447

Repertoire and Pedagogy: MUP 451, 481

Conducting: MUP 209 or 210 or 211

Major Performing Medium: Sixteen credit hours of MUP 127 and 16 hours of MUP 327 to attain a proficiency level necessary to meet the graduation recital requirements. A half recital (MUP 495) and a full recital (MUP 496) are required.

Ensemble: Eight credit hours within a minimum of six different semesters, of which two semesters of accompanying and two semesters of chamber music are required.

Recital Attendance: Six semesters of MUP 100

Performance

Orchestral Instrument Concentration

Music Theory: MTC 125, 221, 222, 223, 320, 327, 425

Music History and Literature: MHL 341, 342, 447

Repertoire and Pedagogy: MUP 451 or 481

Conducting: MUP 210, 340

Major Performing Medium: Sixteen credit hours of MUP 127 and 16 hours of MUP 327 to attain a proficiency level necessary to meet the graduation recital requirements. A half recital (MUP 495) and a full recital (MUP 496) are required.

Class Piano: MUP 131, 132, 231, 232 (unless waived by proficiency examination)

Ensemble: Eight credit hours of large ensembles within a minimum of six different semesters, plus four credit hours of small ensembles within a minimum of four different semesters.

Recital Attendance: Six semesters of MUP 100

Performance

Voice Concentration

Music Theory: MTC 125, 221, 222, 223, 320, 327, 425

Music History and Literature: MHL 341, 342, 447

Repertoire and Pedagogy: MUP 451, 481: Two credits selected from MUP 453, 454 or a repeated enrollment of MUP 451.

Diction: MUP 250; four credit hours of diction for singers   English, Italian, German, French.

Conducting: MUP 209, 339

Major Performing Medium: Eight credit hours of MUP 111 and 16 hours of MUP 327 to attain a proficiency level necessary to meet the graduation recital requirements. A half recital (MUP 495) and a full recital (MUP 496) are required.

Class Piano: MUP 131, 132, 231, 232 (unless waived by proficiency examination)

Ensemble: Four different semesters of large ensembles, plus eight credit hours of ensembles within a minimum of six different semesters to be selected from large and/or small ensembles.

Recital Attendance: Six semesters of MUP 100

Additional Requirements: Sixteen credit hours of credit in more than one foreign language, chosen from French, German or Italian. A student may elect one year of one language, and either one or two semesters of the other(s), chosen in conference with the advisor.

Performance
Guitar Concentration

Music Theory: MTC 125, 221, 222, 223, 320, 327

Music History and Literature: MHL 341, 342, 447

Repertoire and Pedagogy: MUP 328, 451

Conducting: MUP 210

Major Performing Medium: Sixteen credit hours of MUP 127 and 16 hours of MUP 327 to attain a proficiency level necessary to meet the graduation recital requirements. A half recital (MUP 495) and a full recital (MUP 496) are required.

Class Piano: MUP 131, 132, 231, 232 (unless waived by proficiency examination)

Ensemble: Eight credit hours of ensemble within a minimum of six different semesters. Four of the eight credits must be MUP 379: Chamber Music Ensemble - Guitar.

Recital Attendance: Six semesters of MUP 100.

Performance
Piano Accompanying Concentration

Music Theory: MTC 125, 221, 222, 223, 320, 327, 428

Music History and Literature: MHL 341, 342, 447.

Diction and Repertoire: MUP 250 (2 semesters), 451, 453, 454

Conducting: MUP 209 or 210 or 211

Major Performing Medium: Sixteen credit hours of MUP 127, 8 credit hours of MUP 311, 8 credit hours of MUP 337. In addition, student will accompany two half-recitals (MUP 495), one for a singer, one for an instrumentalist during the junior year. (A half solo recital may be substituted for either of the above.) During the senior year the student will accompany two full recitals (MUP 496), one vocal and one instrumental.

Ensemble: Two semesters of MUP 379 (chamber music), one semester of MUP 379 (two-piano ensemble); one semester of MUP 487 (piano accompanying); four semesters of

MUP 388; two semesters of ensemble elective (*minimum of six different semesters*)

Recital Attendance: Six semesters of MUP 100

In addition, the student will elect two semesters of one foreign language (French, Italian, German recommended).

Performance
Music Theatre Concentration

Music Theory: MTC 125, 221, 222, 223, 327

Music History and Literature: MHL 341, 342, 447 and 2 elective hours

Conducting: MUP 209 or 210 or 211

Major Performing Medium: Eight credit hours of MUP 111 and 8 credit hours of MUP 311 to attain a proficiency level necessary to meet the graduation requirement of a public performance of two roles, one of which must be of major proportion.

Class Piano: MUP 131, 132, 231, 232 (unless waived by proficiency examination)

Ensemble: Three semesters of MUP 370, five semesters of MUP 371 and eight semesters of MUP 373

Recital Attendance: Six semesters of MUP 100

Additional requirements: Minimum of six credit hours each in theatre and dance.

Performance
Jazz Performance Concentration

Music Theory: MTC 125, 221, 222, 223, 324, 315, 316, 317, 321 (or 482), 327

Music History and Literature: MHL 341, 342, 352

Conducting: MUP 210, 341

Major Performing Medium: Eight credit hours of MUP 111 and 8 credit hours of MUP 311 to obtain a proficiency level necessary to meet the graduation recital requirements. Two half-recitals (MUP 495) are required, with one in the jazz idiom.

Class Piano: MUP 131, 132, 231, 232, 235, 236 (unless waived by proficiency exam)

Improvisation: MUP 217, 218, 417, 418

Ensemble: Eight semesters including two semesters of MUP 386 and four semesters of MUP 379 (CME: Jazz)

Recital Attendance: Six semesters of MUP 100

Music Therapy

Music Theory: MTC 125, 221, 222, 223, 327

Music History and Literature: MHL 341, 342

Conducting: MUP 211

Music Education: MUE 211, 313, 319, 329, 335, 336, 339

Music Therapy: MUE 161, 261, 361, 362, 381, 384 (4), 441, 442, 475, 476

Major Performing Medium: Six to eight semesters, must include at least four hours of MUP 311.

Piano: Proficiency equal to six semesters of study

Voice: Two semesters of study

Ensembles: Eight semesters of participation with at least four semesters in large groups and at least two semesters in small groups

Recital Attendance: Six semesters of MUP 100

Additional requirements: Four credit hours of functional dance; specified courses in Science and Social and Behavioral Sciences

(Note: Student must apply to the National Association for Music Therapy for registration as a Music Therapist on completion of the requirements for graduation.)

Music Theory and Composition

Music Theory: MTC 125, 221, 222, 223, 320, 321, 323 (four semesters), 327, 425, 428, 429, 430

Music History and Literature: MHL 341, 342, 447 and four elective credit hours.

Conducting: MUP 211, or MUP 209 and 339 or MUP 210 and 340.

Applied Music: Twelve credit hours of study, eight of which must be MUP 111.

Class Piano: MUP 131, 132, 231, 232 (unless waived by proficiency examination)

Ensemble: Eight semesters of participation

Recital Attendance: Six semesters of MUP 100

Music Minor

Elementary Education Major

Music Theory: MTC 100, 101

Music History and Literature: MHL 340

Music Education: MUE 311

Piano: Four semesters

Electives: Two credit hours

Secondary Education

Minors for students in Secondary Education and students in Liberal Arts are available through the School of Music. Consult with the Music School office for advisement sheets and advisors.

Graduate Programs

The School of Music offers the following graduate programs: the Master of Arts degree provides advanced studies in history and literature of music; the Master of Music degree has majors in the fields of performance, choral music, instrumental music, and theory and composition. The Master of Education degree— Secondary Education, with a focus on choral, general or instrumental music, the Doctor of Musical Arts degree, the Doctor of Education degree in Secondary Education (Music Education), and the Doctor of Philosophy degree in Education—Secondary Education (Music) are offered in cooperation with the College of Education. Consult the *Graduate Catalog.* A document on graduate degree programs in music may be obtained by writing to the School of Music.

MUSIC

(General Studies Electives)

MUS 100 Fundamentals of Music Notation. (3) F, S, SS
Provides nonmusic majors with sufficient symbol literacy to begin work in the field of musical learning. No credit for music majors.

101 Foundations of Music Theory. (3) S
A survey of music theory. Prerequisite: MUS 100 or approval of instructor. No credit for music majors. This course may be used to meet the music theory requirements for a minor in music.

107 Introduction To Music. (2) F, S, SS
Correlation of music with literature, science, and art. A nontechnical course in the humanities for nonmusic majors.

340 Survey of Music History and Literature. (3) F, S, SS
Major periods, composers and compositions in the history of music. May be used to meet the music history requirement for a minor in music.

347 Jazz in America. (3) F, S, SS
Current practices employed by contemporary jazz musicians; the historical development of jazz techniques.

355 Survey of American Music. (2) F, S, SS
Growth and development of America's music.

356 Survey of the Musical Theatre. (2) N
Music's place in the theatre, viewed in terms of historical importance and relative function.

357 Esthetic Perception in Music Performance. (3) F, S, SS
Introduces the nonmusic major to the esthetics of per-

formance by stressing their physical and emotional involvement in the direction, motion, intensity and color spectrum of music.

MUSIC EDUCATION

MUE 110 Orientation to Music Education. (1) F
The larger field of music education. Esthetic objectives and instructional procedures in nonverbal learning/teaching in-school observations. Prerequisite or corequisite for MUE 313, 480, 481.

161 Introduction to Music Therapy. (2) F
Overview of music therapy. Orientation to mental health, special education and related therapies. Required on-site visits.

211 Music in Recreation. (2) F
Materials, methods and organizational structures appropriate for recreational music.

261 Music Therapy I. (2) F, S
Theory, principles and practices of music therapy with emphasis on special education and assessment techniques. Prerequisite: MUE 161.

310 Music in Early Childhood Education. (3) F
Identifying and understanding musical needs of young children. Methods and materials for program development for classroom teachers.

311 Music for the Classroom Teacher. (3) F, S
Development of the classroom music program in the elementary school. No previous music experience or course work required. Not for music majors or minors.

313 Music in the Elementary School. (3) F
Methods of instruction, organization and presentation of appropriate content in music. For music majors only.

314 Music in the Elementary School. (3) S
Selected problems in elementary school classroom music and choral program. Observation and participation in school music classrooms. Prerequisite: MUE 313.

317, 318, 327, 328, 335, 336, 337, 338 Educational Methods for Teaching Instruments (1) F. S
Teaching and playing skills for school music teachers. instrument(s) named. Three hours per week.

317 Educational Methods for Violin and Viola.

318 Educational Methods for Cello and String Bass.

327 Educational Methods for Trumpet and Horn.

328 Educational Methods for Trombone, Euphonium and Tuba.

335 Educational Methods for Guitar.

336 Educational Methods for Percussion.

337 Educational Methods for Flute, Clarinet, Saxophone.

338 Educational Methods for Double Reed Instruments.

319 Educational Methods for Strings. (1) F
Teaching and playing skills for music therapists and music minors. Three hours per week.

329 Educational Methods for Brass. (1) S
Teaching and playing skills for music therapists and music minors. Three hours per week.

339 Educational Methods for Woodwinds. (1) F
Teaching and playing skills for music therapists and music minors. Three hours per week.

361 Music Therapy II. (2) F
Principles and practices for various client populations. Assessment techniques. Prerequisite: MUE 261.

362 Music Therapy III. (2) S
Development of theraputic procedures and skills. Professional standards and ethics. Prerequisite: MUE 361.

381 Music Therapy Research. (2) S
Statistics and research design appropriate for investigations in music therapy.

384 Therapy Pre-Clinical. (1) F, S
Music therapy on-site experiences. Junior standing. May be repeated for credit. Three hours per week.

441 Psychology of Music I. (2) F
Psychological and physiological aspects of music emphasizing musical behavior, function, perception and learning. Prerequisite: MUE 362.

442 Psychology of Music II. (2) S
Prerequisite: MUE 441.

475 Therapy Practicum. (3) S
Activities for music therapy majors in arranging, conducting, organizing and maintaining small and large music ensembles. Prerequisites: MUE 362 and MUP 211.

476 Internship in Music Therapy. (1) F, S
A six-month residency in an approved clinical institution.

480 Choral Music Practicum. (3) S
Methods of instruction, organization and presentation of appropriate content in choral music classes. Must be majoring in secondary education.

481, 482 Instrumental Music Practicum. (5, 5) F, S
Instrumental music as a means of developing music skills, understandings and attitudes in elementary and secondary school students. Must be majoring in secondary education.

550 Studies in Music Curricula. (3) A; Staff
Scope and sequence of musical experiences. Development of criteria for the evaluation of music curricula.

551 Advanced Studies in Elementary School Music. (3) A; Andress
For experienced teachers; organization and content of the general music classes in kindergarten and the first six grades of elementary school. Emphasis on teaching music reading and ear training to young children.

552 General Music, Music Theory and Music History Classes in the Junior and Senior High School. (3) N; Staff
Organization and content of school music classes which are not performance oriented.

553 Contemporary Elementary Music. (3) F; Andress
Identification and development of materials and techniques for teaching special units of music study to elementary (K-8) children.

564 Instrumental Music, Advanced Rehearsal Techniques. (3) A; Strange, Fleming
An in-depth analysis of instrumental techniques in preparation for a thorough discussion of band tuning problems and solutions. Discussion of productive conducting and rehearsal techniques for school music teachers.

566 Instrumental Literature for Schools. (3) N; Lombardi
Comprehensive study and analysis of all types of instrumental music.

568 Choral Music, Advanced Rehearsal Techniques. (3) A; McEwen, Stocker, Umberson
Musical and vocal techniques necessary for presentation of choral literature. Analysis and experimentation with psychological, acoustical and other problems of rehearsal and performance.

570 Choral Literature for Schools. (3) A; McEwen, Stocker
Comprehensive study and analysis of choral music for the high school with special emphasis on octavo literature.

579 Psychology of Music. (3) N; Staff
The nature of musicality and its evaluation. A review of recent research.

733 Experimental Projects and Recent Trends in Music Education. (3) S; English
Recent trends and research developments which challenge traditional practices.

744 Major Problems in the Education of Music Teachers. (3) F; English
Patterns of music teacher education and a projection of course outlines designed to accommodate the most comprehensive demands of the changing school music curriculum.

755 Philosophy and Esthetics in Music Education. (3) SS; English
Philosophy and esthetics as they influence curriculum content and teaching procedures.

Special Courses: MUE 294, 484, 494, 498, 499, 580, 590, 591, 592, 594, 598, 599, 680, 693, 700, 780, 783, 784, 790, 791, 792, 799. (See pages 32-33.)

MUSIC HISTORY AND LITERATURE

MHL 341, 342 Music History and Literature. (3) F, S
Western music from the Greeks to the present day. Prerequisite: MTC 221. Need not be taken in sequence.

352 The Evolution of Jazz. (3) A
Origin, development and styles of jazz music and its exponents. Prerequisite: MTC 223.

438 Music in the Classic Era. (3) N; Staff
Development of the classic style of the 18th century; major works of Haydn, Mozart, and Beethoven. Prerequisites: MHL 341, 342, MTC 327; the latter may be taken concurrently.

439 Music in the 19th Century. (3) N; Staff
European art music after Beethoven. Prerequisites: MHL 341, 342, MTC 327; the latter may be taken concurrently.

441 Music of the Baroque Era. (3) N; Staff
Works of major composers and stylistic tendencies of the period. Prerequisites: MHL 341, 342, MTC 327; the latter may be taken concurrently.

447 Music Since 1900. (3) F, SS; Staff
Survey of the works by major composers and stylistic trends. Prerequisites: MHL 341, 342; MTC 327 (may be taken concurrently).

532 Music Bibliography. (3) N; Haefer
Major historical and analytical writings; systematic and historical collections of music. Reading knowledge of a foreign language recommended.

535 Medieval Music. (3) N; Staff
Music of Europe in the Middle Ages, Gregorian chant, religious and secular monophony and polyphony to 1430.

536 Music of the Renaissance. (3) N; Staff
Musical thought in Europe, with emphasis on stylistic concepts and changes, c. 1430-1580.

544 World Music I. (3) N; Haefer
Music of nonliterate cultures; folk music of Europe and the Americas.

545 World Music II. (3) N; Haefer
Folk and art music of non-Western cultures.

547 Topics in American Music. (3) S
Selected topics in the history of music composers working in the Americas with emphasis upon music since 1900.

575 History of Choral Music. (3) F, SS; Staff
Major choral works.

Special Courses: MHL 294, 484, 492, 493, 494, 498, 499, 580, 590, 591, 592, 594, 598, 599, 690, 693, 783. (See pages 32-33.)

MUSIC THEORY AND COMPOSITION

MTC 125 Basic Music Theory. (3) F, S
For music majors designed to develop aural and notational skills. Meets daily.

221 Music Theory-18th Century. (3) F, S
Music from the 18th century with a view toward developing students' abilities to analyze, theorize, perform and create examples within the style. Development of related aural, visual and keyboard skills. Prerequisite: MTC 125.

222 Music Theory-19th Century. (3) F, S
Musical compositions chosen from the late 18th and 19th centuries. Harmonic progressions, melodic construction and rhythmic developments; development of related aural, visual and keyboard skills. Prerequisite: MTC 221.

223 Music Theory-20th Century. (3) F, S
Representative 20th century compositions with particular emphasis on those elements of melodic, harmonic and rhythmic treatment which break with past conventions. Development of related aural, visual and keyboard skills. Prerequisite: MTC 222.

315 Modern Arranging. (2) F
Techniques in arranging for the contemporary jazz, radio, television, and studio orchestra. Prerequisite: MTC 223.

316 Modern Arranging. (2) S
Continuation of MTC 315. Prerequisite: MTC 315.

317 Composition for Non-Composition Majors. (2) N
Phrase and period structure, melodic composition and accompaniment, composition of small forms. Not to be elected by composition majors. Prerequisite: MTC 223. May be repeated once for credit.

320, 321 Counterpoint. (2, 2) F, S
First semester, strict counterpoint in modal style; second semester, strict and free tonal counterpoint. Prerequisite: MTC 221. Need not be taken in sequence.

323 Composition. (2) F, S
Creative writing in the smaller forms including the use of harmonic textures and contrapuntal devices. Prerequisite: MTC 223. May be repeated for credit.

324 Survey of Jazz Styles. (2) A
Large ensemble compositions and recorded improvised solos. Prerequisite: MHL 352.

327 Form and Analysis I. (2) F, S
Organizing elements in the most important contrapuntal and homophonic musical forms from the Renaissance through the 19th century. Prerequisite: MTC 223.

422 Musical Acoustics. (4) F, S
Properties of sound and tone. Harmonic series, instruments, the ear, auditorium acoustics, and the reproduction of sound. A thorough knowledge of musical notation, intervals, scales and harmony, or two years of music theory will be assumed.

425 Studies in 20th Century Theory. (3) F
Continued development of analytical techniques and aural skill, with an examination of theoretical systems applicable to 20th century music. Prerequisite: MTC 223.

428 Form and Analysis II. (2) S
Organizing principles of the large forms of musical composition in the 19th and 20th centuries. Prerequisite: MTC 327.

429, 430 Canon and Fugue. (2,2) N
Polyphonic studies in form and technique. Prerequisite: MTC 321.

431 Choral Arranging. (2) S
Practical studies in editing and arranging for choral organizations. Preparation of suitable materials for young choirs and advanced groups. Study of accompaniments. Prerequisite: MTC 223.

433 Orchestration. (3) N
Theoretical and practical study of scoring for orchestral instruments in various combinations, ranging from small ensembles to symphonic orchestra and concert band. Prerequisite: MTC 223.

436 Electronic Studio Techniques. (2) F, S
Principles of electronic music systems and their applications in the composition and recording of electronic music. May be repeated for credit. Cannot be used to fulfill theory requirements on graduate degrees.

501 Theory Techniques. (2) F, S; LoPresti
Two hours a week. Credit cannot be applied toward the graduate theory requirement.

520 Advanced Analytical Techniques. (2) S, SS; Holbrook, Hanna
Analytical techniques systematically applied to music. Concentration on structural and compositional procedures.

523 Advanced Composition. (2) F, S; Cohen
Creative writing in the larger forms for chorus, orchestra and band. Prerequisites: MTC 323, 428; MHL 447 or equivalent. May be repeated for credit.

525 Pedagogy of Theory. (3) N; Hanna
Practices and principles of teaching music theory. Emphasizes most desirable and practical offerings possible. Comparative studies of existing practices.

527, 528 Evolution of Musical Theory. (3,3) F'81, S'82; Hanna
Theory from Pythagoras to the present. Need not be taken in sequence.

553 Advanced Choral Arranging. (2) F; Johnson
Choral techniques in composition and arranging. Vocal writing through analysis of choral works. Projects in both arranging and composition.

554 Advanced Scoring Problems. (2) N; Strange
Instrumentation. Playing characteristics of each instrument; writing and arranging idiomatic music for the instrument. Projects in both scoring and composition.

Special Courses: MTC 294, 484, 492, 493, 494, 498, 499, 580, 590, 591, 592, 594, 598, 599, 690, 693, 783. (See pages 32-33.)

MUSIC PERFORMANCE

MUP 100 Concert Attendance. (0) F, S
Required of all music majors for six semesters in each degree program, with a minimum of seven (7) concerts attended each semester.

111, 311, 511 Studio Instruction. (2,2,2) F, S
For majors in music degree program. Placement audition required. Piano, organ, harpsichord, voice, harp, flute, oboe, clarinet, saxophone, bassoon, trumpet, cornet, horn, euphonium, guitar, trombone, tuba, percussion, violin, viola, cello, contrabass. May be repeated for credit. Minimum contact of one hour plus studio class weekly. May not be taken for audit.

121, 321, 521 Studio Instruction. (1,1,1) F, S, SS
For secondary or minor instrument instruction and nonmajors in the university. Placement examination and audition required. Piano, organ, harpsichord, voice, harp, flute, oboe, guitar, clarinet, saxophone, bassoon, trumpet, cornet, horn, euphonium, trombone, tuba, percussion, violin, viola, cello, contrabass. May be repeated for credit. Minimum contact of one-half hour per week. May not be taken for audit.

127, 327, 527 Studio Instruction. (4,4,4 or 2) F, S
For performance majors in Bachelor of and Master of Music degree programs only. Placement examination and audition required. Piano, organ, harpsichord, voice, harp, flute, oboe, clarinet, guitar, saxophone, bassoon, trumpet, cornet, horn, euphonium, trombone, tuba, percussion, violin, viola, cello, contrabass. May be repeated for credit. Minimum contact of one hour plus studio class weekly. May not be taken for audit.

131, 132, 231, 232 Class Piano. (1,1,1,1) F, S
A four-semester sequence of courses designed for those lacking piano experience and those who need piano as a classroom tool. Emphasis on keyboard technique, sight reading simple accompaniments and improvisation. Two hours a week. May not be taken for audit.

133, 134, 233, 234 Class Voice. (1,1,1,1) F, S
Open to all students interested in the development of basic singing techniques. Two hours a week. May not be taken for audit.

209 Beginning Choral Conducting. (1) F, S
Essentials of choral conducting techniques. Two hours a week.

210 Beginning Instrumental Conducting. (1) S
Essentials of instrumental conducting techniques. Two hours per week.

211 General Conducting. (2) S
Essentials of conducting choral and instrumental music designed for music therapy and theory-composition majors. Three hours per week.

217, 218 Improvisation Workshop. (2,2) F, S
Emphasis on basic jazz literature. chord symbol reading, melodic patterns, ear training, melodic concepts and analysis of improvised solos. Prerequisite: MTC 125, one semester of MUP 111. Must be taken in sequence. May not be taken for audit.

235, 236 Jazz Piano. (1,1) F, S
Jazz keyboard experience. Emphasis will be on chord symbol reading, simple improvisation and voicing. Prerequisite: MUP 232. Two hours per week. May not be taken for audit.

250 Diction for Singers. (1) F, S
Use of phonetics in the study of song and opera literature. Language emphasis differs each semester. May be repeated for credit.

301 Advanced Class Piano. (1) F
Required for choral, general and therapy majors. Prerequisite: MUP 232 or proficiency. Open to other music majors who have completed MUP 232. Emphasis on accompaniments, ensemble playing, score reading, advanced harmonizations, repertoire, technique, and improvisation. Placement examination required. May not be taken for audit. Two hours per week.

302 Advanced Class Piano. (1) S
Required for choral, general and therapy majors. Open to other music majors who have completed MUP 301. A sequential continuation of MUP 301 skills which include both group and studio instruction. Prerequisite: MUP 301 or proficiency. Placement examination required. May not be taken for audit. Two hours per week.

328 Fretboard Harmony and Pedagogy. (3) S
Application of traditional melodic and harmonic concepts to the fingerboard. Method books and pedagogical approaches. Prerequisite: MTC 223.

337 Studio Instruction-Piano Accompanying. (2) S
Lessons for accompanying majors only. Repertoire to be selected from vocal and instrumental literature. Placement examination required. One hour lesson a week. May be repeated for credit.

339 Choral Conducting. (2) F, S
Elements of choral conducting technique and interpretation. Prerequisite: MUP 209 or MUP 211. Three hours a week

340 Instrumental Conducting. (2) F
Fundamentals of score reading and interpretation of instrumental music. Prerequisite: MUP 210 or MUP 211. Three hours a week.

341 Jazz Conducting and Field Experience. (3) S
Training and supervised practice in conducting jazz ensembles with emphasis on literature, programming and rehearsal techniques. Prerequisite: MUP 210. Two class hours and two field experience hours each week.

345 Symphony Orchestra. (1) F, S
Open to all students who can qualify on the basis of auditions with the director. Over a four-year period, the student is introduced to the masterpieces of symphony orchestra literature. Three times a week. May be repeated for credit

350 Choral Union. (1) F, S
Open to all students in the University and to interested singers in the community by audition. Preparation and performance of the larger choral works. Two hours per week. May be repeated for credit.

352 Concert Choir. (1) F, S
Membership chosen by audition. May be repeated for credit. Four hours a week.

353 University Choir. (1) F, S
Membership chosen by audition. May be repeated for credit. Four hours a week.

355 Men's Chorus. (1) F, S
Open to all male students in the University who can qualify on the basis of auditions. Rehearsal and performance of music for male voices. Two hours a week. May be repeated for credit.

357 Women's Chorus. (1) F, S
Membership chosen by audition. Two hours a week. May be repeated for credit.

361 Marching and Concert Bands. (1) F, S
Open to all students who can qualify on the basis of auditions with the director. Staging of formations and drills for football games and other events (Fall); masterpieces of symphonic band literature (Spring). Meets daily. May be repeated for credit.

362 Concert Bands. (1) F
Night rehearsals. Membership chosen by audition. May be repeated for credit.

370 Music Theatre: Techniques. (1) F, S
Exercises and improvisations for the singing actor emphasizing body awareness, isolations, and freedom of the vocal and breath mechanisms. Section 1 (Interpretation); Section 2 (Expression); Section 3 (Movement for Singers). Each section: Three hours per week. May be repeated for credit.

371 Music Theatre: Workshops. (1) F, S
Development of specific skills for musical-dramatic interpretation. Section 1 (Role Preparation); Section 2 (Styles); Section 3 (Opera Scenes); Section 4 (Musical Comedy); Section 5 (Revue Ensembles). Each section: One lecture demonstration, 1 laboratory per week. May be repeated for credit.

372 Music Theatre: Orchestras. (1) F, S
Open to all students who can qualify on the basis of auditions with the instructor. Participation in Lyric Opera Theatre productions. Section 1 (Opera Orchestra); Section 2 (Chamber Opera Orchestra); Section 3 (Opera Chamber ensemble). May be repeated for credit.

373 Music Theatre: Performance. (1) F, S
Open to all students who can qualify on the basis of auditions with the instructor. Participation in Lyric Opera Theatre productions. Section 1 (Principal Roles); Section 2 (Opera Chorus). May be repeated for credit.

374 Music Theatre: Production. (1) F, S
Participation in Lyric Opera Theatre productions. Section 1 (Vocal Performance); Section 2 (Technical Music Theatre); Section 3 (Problems in Production) to be taken concurrently with MUP 373, Section 2. May be repeated for credit.

379 Chamber Music Ensembles. (1) F, S
String, brass, woodwind, percussion, keyboard, vocal and mixed ensembles. Prerequisite: approval of instructor. Two hours a week. May be repeated for credit.

382 Collegium Musicum. (1) F, S
Singers and instrumentalists specializing in the performance of early and unusual music. Prerequisite: approval of instructor. Two hours a week. May be repeated for credit.

384 Brass Choir. (1) F, S
Specializing in public performance of music written for brass instruments. Prerequisite: approval of instructor. Three hours a week. May be repeated for credit.

385 Percussion Ensemble. (1) F, S
Rehearsal and performance of standard and original repertoire for the percussion ensemble and related instruments. Membership by approval of the instructor. Two hours a week. May be repeated for credit.

386 Stage Band. (1) F, S
Rehearsal and performance of literature for the stage band. Membership by approval of the instructor. Four hours a week. May be repeated for credit.

388 Piano Accompanying. (1) F, S
Accompanying majors (others at the discretion of instructor). Piano accompaniments found in vocal and instrumental literature; discussion of styles and performance practices; experience in public performance. May be repeated for credit. Two hours a week.

417, 418 Advanced Improvisation. (2,2) F, S
Emphasis on analysis and performance of advanced jazz literature; composition in contemporary styles. Prerequisite: MUP 218. Must be taken in sequence. May not be taken for audit.

451 Repertoire. (2) F, S
Literature available for performance in all performing media. Prerequisite: junior standing in major performance field. May be repeated for credit.

452 Piano Repertoire II. (2) S
Continuation of MUP 451 (Piano). Romantic and contemporary keyboard literature. Prerequisites: Junior standing as piano major; approval of instructor.

453 Song Literature. (2) A
American, Russian, Spanish, Scandinavian and contemporary song.

454 Song Literature. (2) A
Early Italian, English, German and French art song.

481 Performance Pedagogy and Materials. (2) F, S
Principles and methods of performance techniques for each performance field. Prerequisite: senior standing or approval of instructor. May be repeated for credit.

482 Piano Pedagogy II. (2) N
Continuation of MUP 481 (Piano). Problems and techniques of teaching intermediate to advanced piano students. Prerequisites: Junior standing as piano major; approval of instructor.

487 Piano Accompanying. (1) F, S
Keyboard majors. Piano accompaniments found in vocal and instrumental literature; discussion of styles and performance practices; experience in public performance. May be repeated for credit. Two hours per week. May not be taken for audit.

495 Solo Performance. (0) F, S
For Bachelor of Music and Bachelor of Arts in Education degree candidates where one-half recital is a graduation requirement.

496 Solo Performance. (0) F, S
For Bachelor of Music in Performance degree candidates where a full recital is a graduation requirement. Prerequisite: MUP 495.

541 The Art Song. (3) N; Hoffer
Solo song from its beginning to the present day.

545 Symphony Orchestra. (1) F,S; Lombardi
Open on the basis of audition with the director. Masterpieces of symphony orchestra literature. Three times a week. May be repeated for credit.

550 Choral Union. (1) F, S; McEwen
Open to all students in the University and to interested singers in the community by audition. Preparation and performance of the larger choral works. Two hours per week. May be repeated for credit

551 Repertoire. (2) N; Staff
Literature available for performance in all performing media. May be repeated for credit.

552 Concert Choir (1) F S, McEwen
Membership chosen by audition. May be repeated for credit. Four hours a week

553 University Choir. (1) F S Stocker
Membership chosen by audition. May be repeated for credit Four hours a week

555 Men's Chorus. (1) F S; Stocker
Open to male students in the University who can qualify

on the basis of audition. Rehearsal and performance of music for male voices. Two hours a week. May be repeated for credit.

557 Women's Chorus. (1) F, S; Staff
Membership chosen by audition. Two hours a week. May be repeated for credit.

561 Marching and Concert Bands. (1) F, S; Strange, Fleming
Open by audition only. Staging of formations and drills for football games and other events (Fall); masterpieces of symphonic band literature (Spring). Meets daily. May be repeated for credit.

562 Concert Bands. (1) F, S; Strange, Fleming
Membership chosen by audition (Fall). May be repeated for credit.

570 Music Theatre: Techniques. (1) F, S; Debenport
Exercises and improvisations for the singing actor emphasizing body awareness, isolations and freedom of the vocal and breath mechanisms. Section 1 (Interpretation); Section 2 (Expression); Section 3 (Movement for Singers). Each Section: Three hours per week. May be repeated for credit.

571 Music Theatre: Workshops. (1) F, S; Seipp, Debenport
Development of specific skills for the musical-dramatic interpretation. Section 1 (Role Preparation); Section 2 (Styles); Section 3 (Opera Scenes); Section 4 (Musical Comedy); Section 5 (Revue Ensembles). Each section: one lecture-demonstration, 1 laboratory per week. May be repeated for credit.

572 Music Theatre: Orchestras. (1) F, S; Seipp
Open to all students who can qualify on the basis of auditions with the instructor. Participation in Lyric Opera Theatre productions. Section 1 (Opera Orchestra); Section 2 (Chamber Opera Orchestra); Section 3 (Opera Chamber Ensemble). May be repeated for credit.

573 Music Theatre: Performance. (1) F, S; Seipp, Debenport
Open to all students who can qualify on the basis of auditions with the instructor. Participation in Lyric Opera Theatre productions. Section 1 (Principal Roles); Section 2 (Opera Chorus). May be repeated for credit.

574 Music Theatre: Production. (1) F, S; Staff
Participation in Lyric Opera Theatre productions. Section 1 (Vocal Performance); Section 2 (Technical Music Theatre); Section 3 (Problems in Production) to be taken concurrently with MUP 373, Section 2. May be repeated for credit.

579 Chamber Music Ensembles. (1) F, S; Staff
String, brass, woodwind, percussion, keyboard, vocal and mixed ensembles. Prerequisite: approval of instructor. Two hours a week. May be repeated for credit.

581 Performance Pedagogy and Materials. (2) N; Staff
Principles and methods of performance techniques for each performance field. May be repeated for credit.

582 Collegium Musicum. (1) F, S; Haefer
Singers and instrumentalists specializing in the performance of early and unusual music. Prerequisite; approval of instructor Two hours a week. May be repeated for credit.

584 Brass Choir. (1) F, S; Lockwood
Public performance of music written for brass instruments. Prerequisite: approval of instructor. Two hours a week. May be repeated for credit.

585 Percussion Ensemble. (1) F, S; Sunkett
Rehearsal and performance of standard and original repertoire for the percussion ensemble and related instruments. Membership by approval of the instructor. Two hours a week. May be repeated for credit.

586 Stage Band. (1) F, S; Staff
Rehearsal and performance of literature for the stage band. Membership by approval of the instructor. Four hours a week. May be repeated for credit.

588 Piano Accompanying. (1) F, S; McLeod
Piano accompanying majors (others at the discretion of the instructor). Piano accompaniments found in vocal and instrumental literature; discussion of styles and performance practices; experience in public performance. May be repeated for credit. Two hours per week.

595, 596 Solo Performance. (1, 1) F, S; Staff
For Master of Music candidates in applied music only. May be full recital, major operatic role, solo performance with orchestra, or an ensemble or lecture recital.

727 Studio Instruction. (4) F, S; Staff
For DMA candidates only. May be repeated for credit. Miminum contact of one hour per week.

796 Solo Performance. (1-5) F, S, Staff
For DMA candidates only. May be repeated for credit.

Special Courses: MUP 294, 484, 494, 498, 499, 580, 591, 594, 598, 690, 693, 783, 791. (See pages 32-33.)

Department of Theatre

PROFESSORS:
DOYLE, GOHEEN, WITT, YEATER

ASSOCIATE PROFESSORS:
AKINS (GHALL 232), DOBKIN, VINING, WRIGHT

ASSISTANT PROFESSORS:
BARTZ, DeLONG, KUPKA

Departmental Major Requirements

For advisement purposes, all students registering in a Theatre degree program will enroll through the College of Fine Arts. Special advisement check sheets, providing complete information regarding requirements and suggested electives, are available in the Department of Theatre office for each degree program and area of concentration.

Within the major (including related area studies considered part of the major), only courses with a grade of "C" or higher may be applied towards graduation. All bachelor's degrees in Theatre require the following core of course work in Theatre: THE 100, 320, 321; THP 101, 213, 215, 330, 340, 345; at

least two hours credit in THP 301, chosen from different production options; and at least three hours credit in THE 325.

Bachelor of Arts Degree Curriculum

Theatre—Consists of a minimum of 45 semester hours and a maximum of 60 semester hours. Theatre core required. Theatre electives, chosen in consultation with an advisor, may be concentrated in one area of Theatre specialization or selected to provide a balanced general program. Up to 15 hours of approved course work in a related area or areas may be included in the major.

General Studies—A minimum of 54 semester hours, to include: 12 hours representing three or more areas of the humanities and fine arts, with at least 6 hours in fine arts, to be selected from architecture, art, dance, English (except 101, 102, 104, 111, 112), foreign languages (upper division literature courses only), humanities, music; philosophy, and religious studies; 12 hours representing three or more areas of social and behavioral sciences, to be selected from anthropology (ASB only), economics, geography (GCU only), history, political science, psychology (PGS only), and sociology; at least 7 hours, including one laboratory course, from science and mathematics, to be selected from anthropology (ASM only), astronomy, biology, botany, chemistry, entomology, geography (GPH only), geology, mathematics, microbiology, physical science, physics, psychology (PSY only), and zoology.

General Studies electives may be selected from any of the above areas, as well as communication, interdisciplinary studies in Fine Arts or Liberal Arts (FIA and LIA); journalism and telecommunications; and physical education (maximum of four hours in activity courses). Permission to apply course work in other areas must be obtained by petition to the departmental Academic Affairs Committee. A list of recommended General Studies courses for Theatre majors is available in the departmental office. Courses in the major may not be used to meet General Studies requirements; related area courses may not be cross-listed in fulfillment of both major and General Studies requirements.

Foreign Language Requirement—Knowledge of one foreign language equivalent to the completion of two years' study at the college level is required. Courses taken to satisfy the

foreign language requirement may be cross-listed in fulfillment of the General Studies requirement.

Bachelor of Fine Arts Degree Curriculum

Admission to the B.F.A. program is by audition and/or interview only, and with the approval of the faculty of the Department of Theatre. All students should first register as B.A. degree candidates. Applications for admission to the B.F.A. program will be accepted from freshmen towards the end of the second semester of full-time study. Candidates for the B.F.A. degree must take the last 60 hours of course work in residence at ASU. Retention in the B.F.A. program will be determined by annual faculty review of all candidates for the degree; the review process will include consideration of the student's academic record, professional activities and growth, and artistic potential.

Theatre—Consists of a minimum of 84 hours (including approved related area studies considered part of the major). On the basis of personal interests and professional objectives, the student may select one of two curriculum options, Theatre Education or Performance/Production. The Theatre Education curriculum includes: the theatre core; THP 110, 311, 315, and THE 480; and 25 hours of professional education course work. Students in Theatre Education will complete all requirements for certification at the secondary level. The Performance/Production curriculum includes: the theatre core; 24 hours of required course work in a designated area of concentration (acting, technical theatre and design, or child drama); 9 hours of theatre history and literature; and theatre and related area electives, selected in consultation with an advisor, to complete the major requirement of 84 hours.

General Studies—A minimum of 42 hours. Required distribution of hours and approved areas of study are similar to those as indicated under the B.A. curriculum. Some adjustments are made in the Theatre Education option in order to meet certification requirements. Courses in the major may not be used to meet General Studies requirements; related area courses may not be cross-listed in fulfillment of both major and General Studies requirements.

Departmental Minor Teaching Field Requirements

Elementary Education Major: Minor in Theatre—Consists of 27 semester hours, including: THE 100, THP 101, 213, 215, 311, 318, and 411; plus one additional course in theatre history and one additional course in technical theatre.

Secondary Education Major: Minor in Theatre—Consists of 24 semester hours, including: THE 100, 480, THP 101, 213, 215 and 311; plus one additional course in theatre history, and one additional course in technical theatre.

Department Graduate Programs

The Department of Theatre offers programs leading to the degree of Master of Arts in Theatre and the Master of Fine Arts in Child Drama. Consult the *Graduate Catalog* for requirements.

THEATRE

General Studies in Theatre:
History, Literature, and Theory

THE 100 Introduction to Theatre. (3) F, S
Elements and principles of the theatre. Lecture and discussion.

300 Film: The Creative Process. (3) F, S
Elements of the theatrical film: cinematography, sound, editing, directing, acting, scriptwriting, producing, and criticism. Three lectures, 2 hours laboratory.

320, 321 History of the Theatre. (3,3) F, S
First semester traces major developments in theatre production from its beginning through the 17th century; second semester continues the survey to modern times.

325 Play Reading. (1) F, S, SS
Assigned independent reading programs of plays most frequently included in the modern repertory. May be repeated for credit in different sections. Areas of emphasis:
  (a) Modern European
  (b) Modern English and Irish
  (c) Modern American
  (d) Plays for High School Production.

420 History of the American Theatre. (3) S
History of the plays, artists, and events in the development of American theatre from colonial to modern times.

421 History of the English Theatre. (3) F
History of the plays, artists, and events in the development of the theatre in England since the Restoration.

425 History of the Oriental Theatre. (3) N
History and production techniques of theatre forms in India, China, and Japan. Prerequisite: six hours of theatre history or approval of instructor.

480 Methods of Teaching Theatre. (3) F
Analysis, organization, and presentation of textual and other classroom materials.

503 Studies in Theatre History. (3) F
Resources, ideas, and trends in a major eras of theatre history with application to modern theatre production.

504 Studies in Dramatic Structure and Criticism. (3) F
Structural principles and critical theory from the classical period to the present; related readings in dramatic literature.

505 Studies in the Theory and Practices of Acting and Directing. (3) S
Major theories and actual practices in world theatre.

506 Studies in Scenic Environments. (3) S
Coordinated studies in conceptualizing the scenic environment with emphasis on innovative visual statements appropriate to actual production.

510 Studies in Literature. (1) F, S
Assigned individual reading programs in standard sources and masterpieces in theatre literature. May be repeated for credit in different sections. Topics may be selected from the following:

(a) Acting-Directing   (c) History
(b) Design-Technical   (d) Criticism

511 Creative Drama in Professional Practice. (3) A
Survey of current research and literature, with emphasis on professional applications of creative drama techniques; empirical research projects required. Prerequisites THP 311, 411, and/or approval of instructor.

515 Problems in Directing. (3) A
Analysis of common directing problems. Topics include: creating the ensemble; conceptual unity; metaphor; non-literal strategies; organizational responsibilities of the director. Prerequisites: THP 215, 315, 415, and/or approval of the instructor.

518 Contemporary Developments in Theatre for Children. (3) A
Survey of recent production activity, with emphasis on directing techniques and new plays for children.
Prerequisites: THP 318, 418, and/or approval of instructor.

591 Seminar. (3) A
Selected topics in child drama, community theatre, and theatre history. Prerequisite: written approval of instructor.

Special Courses: THE 294, 494, 498, 499, 590, 592, 594, 598, 599. (See pages 32-33.)

THEATRE PERFORMANCE
AND PRODUCTION

THP 101 Introduction to the Art of Acting. (3) F, S, SS
Lectures, exercises, and projects in acting. Special sections provided for the nonmajor and theatre students who plan no additional acting courses.

110 Acting: Beginning Workshop. (3) F, S
Character and script analysis; rehearsal and performance of assigned scenes. Prerequisites: THP 101 and/or approval of instructor. Six hours a week.

113 Acting: Makeup. (3) F, S
Techniques of theatrical make-up. One hour lecture; 2 hours laboratory.

213 Introduction to Technical Theatre. (3) F, S
Procedures of technical theatre production and demonstration. Topics include design and construction of scenery; lighting; and properties. Three hours lecture; 3 hours laboratory.

215 Directing: Theatre Techniques. (3) F, S
Basic tools of the director: composition, blocking, floor plans, stage business, auditions, rehearsal techniques, etc. Prerequisites: THP 101, 213 or written approval of instructor.

270 Introduction to Stage Speech. (3) F, S
Exercises and techniques to free the voice and improve projection, resonance, and articulation. International Phonetic Alphabet and Standard Stage Speech will be covered. Prerequisites: THP 101, 110, and/or approval of instructor. Five hours a week.

275 Introduction to Stage Movement. (3) F, S
Exercises and techniques to achieve freedom and control; emphasis on creative movement in characterization. Prerequisites: THP 101, 110, and/or approval of instructor. Six hours a week.

301 Theatre Production. (1-3) F, S, SS
Participation in University Theatre productions. Prerequisite: written approval of instructor. May be repeated for credit.

307 Acting: The Method. (3) A
An advanced class for individualized work on concentration, personalization, self-awareness, visualization, substitution, creating inner and outer character. Exercises, monologues, and scenes. Prerequisites: THP 110, 310 and written approval of instructor.

310 Acting: Intermediate Workshop. (3) A
Rehearsal and public performance of modern plays with emphasis on realistic acting style. May not be taken concurrently with THP 315. Prerequisites. THP 101, 110, 270, 275, and/or written approval of instructor. Six hours a week.

311 Creative Drama. (3) F, S, SS
Theories, procedures, and materials for creative drama in the elementary and junior high schools. Related drama activities — storytelling, choral speaking, and puppetry. Not open to freshmen.

315 Directing: Workshop. (3) A
Rehearsal and public performance of scenes and short plays. May not be taken concurrently with THP 310. Prerequisites: THP 215 and/or written approval of instructor. Six hours a week

318 Theatre for Children. (3) A
Dramatic literature for children. Experience in acting, directing, and production techniques for child audiences.

330 Introduction to Costuming. (3) F, S
History of theatrical costume. Laboratory experience in construction of costumes. Three lectures, 2 hours laboratory.

331 Costume Construction. (3) A
Uses of materials and techniques for stage costumes with actual construction of period apparel. Prerequisite: THP 330.

340 Scene Design. (3) F, S
Studio projects in designing realistic scenery for the contemporary proscenium stage. Prerequisite: THP 213 or approval of instructor.

345 Lighting Design. (3) F, S
Principles of modern stage lighting. Two lectures, 2 hours laboratory. Prerequisite: THP 213 or approval of instructor.

370 Intermediate Stage Speech. (3) A
Exercises to develop vocal flexibility and power; integrating voice/body/emotion; creative vocal characterization; advanced phonetics. Emphasis on individual voice and speech problems. Prerequisites: THP 270 and/or approval of instructor. Five hours a week.

375 Intermediate Stage Movement. (3) A
Special movement techniques, including stage combat, fights, and falls. Prerequisites: THP 275 and/or approval of instructor. Six hours a week.

407 Acting: TV Film. (3) A
Special technical aspects of acting before a camera. Prerequisite THP 310 and/or written approval of instructor. Six hours a week.

410 Acting: Advanced Workshop. (3) A
Rehearsal and performance of period, classical, and non-realistic plays. Emphasis on delivery of poetic language. May not be taken concurrently with THP 415. Prerequisites. THP 310 and/or approval of instructor. Six hours a week

411 Advanced Studies in Creative Drama. (3) A
Application of theories, techniques, and materials for dramatization. Regular participation with children. Prerequisite: THP 311 or approval of instructor.

415 Directing: Advanced Workshop. (3) A
Rehearsal and performance of period, classical, and non-realistic plays. May not be taken concurrently with THP 410. Prerequisite: THP 315 and/or approval of instructor. Six hours a week.

417 Stage Management. (3) F, S
Readings in stage management and participation as a stage manager in a University Theatre production. Prerequisite: written approval of instructor.

418 Advanced Studies in Theatre for Children. (3) A
Experimentation with the creation, direction, and production of plays for children. Prerequisite: THP 318 or approval of instructor.

435 Advanced Technical Theatre. (3) N
Selection of materials, drafting of working drawings, tool operation, and construction techniques. Two lectures, 2 hours laboratory. Prerequisite: THP 213 or approval of instructor.

440 Advanced Scene Design. (3) A
Advanced studio projects in designing nonrealistic scenery for a variety of stage forms. Prerequisite: THP 340 or approval of instructor.

441 Scene Painting. (3) A
Studio projects in painting stage scenery. Prerequisite: THP 340 or approval of instructor.

445 Advanced Lighting Design. (3) N
Specialized techniques in stage lighting. Two lectures, 2 hours laboratory. Prerequisite: THP 345 or approval of instructor.

450, 451 Theatre Organization and Management. (3-3) F, S
Box office, publicity, production budgeting, and house management procedures. Second semester includes study of organizational structures, physical facilities, and financial planning for theatre companies at an administrative level.

460 Dramatic Composition for the Stage and Screen. (3) A
Fundamentals of and practice in writing for the theatre, the motion picture, and television. Prerequisite: written approval of instructor.

470 Advanced Stage Speech. (3) A
Major dialects for the stage. Knowledge of the International Phonetic Alphabet is required. Prerequisites: THP 270, 370, and/or written approval of instructor. Six hours a week

475 Advanced Stage Movement. (3) A
Physical movement for period, classical, and non-realistic plays. Prerequisites: THP 275, 375, and/or written approval of instructor.

494 Special Topics. (3) A
Topics may be selected from the following:

(a) Storytelling and Oral Reading
(b) Curriculum and Supervision of Child Drama in School
(c) Improvisation and Theatre Games
(d) Puppetry
(e) Playwriting for Children

498 Pro-Seminar: Children's Theatre Tour. (1-7) S
Prerequisite: written approval of instructor.

584 Internship. (1-3) A
Field research and on-site training in child drama, community theatre, and production techniques. Prerequisite: written approval of instructor.

594 Conference and Workshop in Child Drama. Prerequisite: approval of instructor. Credit, 3 hours.

Special Courses. THP 294, 498, 499, 580, 584, 590, 591, 592, 593, 594, 598, 599. (See pages 32-33.)

College of Law

Alan A. Matheson, J.D.
Dean

Purpose

The prime function of the College of Law is to train men and women for the practicing legal profession and related professional assignments. In addition, the College has the responsibility to contribute to the quality of justice administered in our society.

Juris Doctor Degree

The College of Law offers a three-year program of professional studies at the graduate level leading to the degree of Juris Doctor and entry into the many branches of the legal profession and careers in government, business, finance, industry and education.

To fulfill the requirements for a J.D. degree, a student must satisfy all of the following: (1) Admittance to the College as a candidate for the degree and satisfaction of any conditions imposed at the time of admission or prior to graduation during the law course. (2) Satisfaction of residency requirements for the College of Law. (3) Successful completion of a minimum of 87 hours of academic credit of which 66 must be graded with a cumulative weighted average of 70 or better. (4) Completion of all required College courses. (5) Completion of the degree requirements within five years of entry into law school. (6) Completion of one substantial paper.

Except in the case of a transfer student, a student must be in residence at the College as a full-time student for a minimum of six semesters or their equivalent. A semester in residence is earned where a student has been enrolled in a minimum of ten hours of course work. A transfer student must complete the work of at least three semesters in the College immediately preceding the granting of a degree.

Admissions

First-year students are admitted only for the fall semester. The formal requirements for admission to the College of Law are: (1) An undergraduate degree from an accredited four-year college or university (B.S., B.A., or equivalent). (2) A score on the Law School Admission Test (administered by the Educational Testing Service, Box 944, Princeton, N.J., in centers throughout the country). Both are to be at a level of achievement giving the applicant reasonable prospect for success in law study.

The deadline for completed applications, with college transcripts on all completed course work, the Law School Data Assembly Service Report and the Law School Admission Test score, in the Admissions Office of the College of Law, is April 1.

Each year many more students apply than can possibly be accommodated within the educational program of the College. Accordingly, the admission process is selective. Basic factors for evaluation are the undergraduate academic record and the score on the Law School Admissions Test. The higher the GPA and LSAT scores the better. These are not the only factors considered, however. The admission requirements are flexible and other evidences of ability and an applicant's prospect for significant contribution to the educational program of the law school and to public service will be carefully considered by the Admissions Committee with the object of selecting those who are likely to succeed in law study. As a state institution, the College weighs residency as a factor in admission.

Course of Study

The program of study in the College of Law is

designed for full-time students. In the first year of the three-year program, the course of study is prescribed and incorporates the time-proven techniques of legal education. This first year gives the student—by the "case method," by the "problem method," by "moot court" and through other techniques—an intensive exposure to the basic legal processes.

As a part of the program, each first year student is assigned to a small section where emphasis is placed on writing and problem solving. The second and third years contain a wide range of courses varying in format as well as subject matter, allowing students to pursue both the basic subjects of law study as well as more specialized interests. By offering the student great freedom in the selection of subjects, the educational experience is in sharp contrast to the curriculum of the first year. In addition, an extensive clinical internship program is sponsored by the College.

Grading

Law School courses are graded under the following numerical scale:

99-90 A. Distinction
89-80 B. Excellent
79-70 C. Good
69-60 D. Deficient
59-50 F. Failure

A grade of 60 or above is required to receive credit for any course.

Some limited enrollment seminars may be taken for credit without a numerical grade. The faculty determines each semester what seminars will be offered on this basis. Students are limited in the number of credits which may be taken without a numerical grade, having to complete 66 hours of numerically graded courses. In non-numerically graded classes performance below 70 is so recorded.

Retention Standards. To be eligible to continue in the law school, a student must maintain a cumulative weighted average of 70 or better at the end of each semester, summer session or quadrant.

Any student whose average for the first semester of the first year falls below 70 is automatically placed on probation, except that an average below 65 disqualifies a student from further attendance.

Continuation of enrollment shall be upon such terms and conditions as the College may impose. A student whose cumulative average thereafter falls below the 70 level will be dismissed but may apply to the Office of the Dean for readmission. The Office of the Dean shall refer the application to a faculty Committee on Re-admission. Where the academic average deficiency is slight and evidence of extenuating circumstances is convincing, readmission may be granted on a probationary status after a review of the reasons contributing to unsatisfactory performance and a finding that there is substantial prospect for acceptable academic performance. Continuation in school thereafter may be conditioned on achieving a level of performance higher than the overall 70 average.

Special Honors at Graduation. At the time of graduation, students with academic distinction in the study of law may be awarded the respective designations *cum laude, magna cum laude* and *summa cum laude*. Recipients of these awards are selected by the Law Faculty on the basis of academic performance.

Law Building and Law Library

The John S. Armstrong Law Building is in the central campus near other graduate schools of the University and the Hayden Library. The Law Building provides every modern facility for legal education and has been described by experts on planning law buildings as setting a new standard in functional design.

With an "open stack" policy of accessibility to all law students and a rated seating capacity of three-fourths of the total student body, the Law Library contains a substantial collection of law and law-related books. The modern facility has shelf capacity for approximately 200,000 volumes. The goal is to make the Arizona State University Law Library one of the most outstanding in the country.

Accreditation

The College is fully accredited by the American Bar Association and by the Association of American Law Schools.

Information

Further detailed information concerning the course of study, admission practices, expense and financial assistance will be found in the Bulletin of the College of Law. Requests for the Bulletin and for application forms should be addressed to the Admissions Office, College of Law, Arizona State University, Tempe, Arizona 85287.
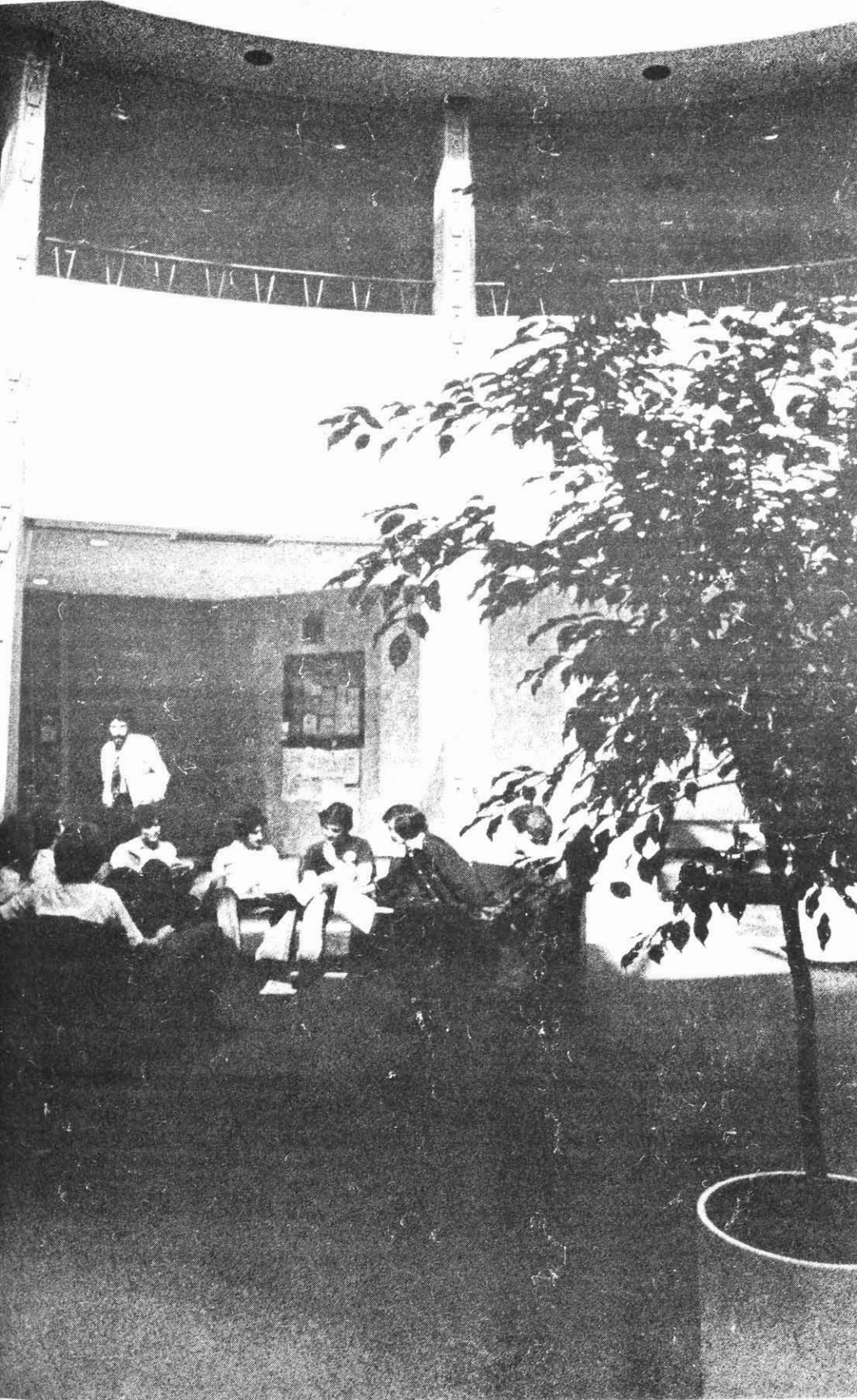
Law

PROFESSORS:
MATHESON (AH 102D), ALTMAN, BERCH, DAHL, EFFLAND, FURNISH, KAYE, LEE, LESHY, LOWENTHAL, MISNER, MORRIS, PEDRICK, PULASKI, ROSE, SCHROEDER

ASSOCIATE PROFESSORS:
ARTERIAN-FURNISH, CALLEROS, ELLMAN, GOLD, KADER, KARJALA, MORGAN, STANTON, ZANDER

DIRECTORS:
CIVIL CLINIC, EVANS, PUBLIC DEFENDER CLINIC, TOPF

LAW 501 Contracts I. (3) F; Furnish, Gold, Lee, Rose
Contract doctrines and their role in the judicial process. Judicial doctrines and, where applicable, the Uniform Commercial Code are studied in the context of contracts covering employment, personal and family arrangements, building and construction, the sale of goods, loans, assignment of wages and accounts receivable.

502 Contracts II. (3) S; Furnish, Gold, Lee, Rose
Continuation of 501.

503 Torts I. (3) F; Kader, Pedrick
Protection through the judicial process of personality, property and relational interests against physical, appropriational and defamatory harms. Doctrines of trespass, nuisance, negligence, conversion, deceit, privacy, slander, libel, seduction, alienation of affections, malicious prosecution, inducement of breach of contract and unfair competition.

504 Torts II. (2) S; Kader, Pedrick
Continuation of 503.

505 Procedure I. (3) F; Ellman, Lowenthal, Zander
The nature of judicial power, viewed in the context of historical development and constitutional grants and limitations.

507 Property I. (3) F; Arterian-Furnish, Effland, Schroeder
Law of real and personal property, various legal and equitable estates in land, life estates, remainders, concurrent interests, executory interests, limitations on creation of future interests. Modern concepts of property.

508 Property II. (3) S; Arterian-Furnish, Schroeder
Continuation of 507. The real estate contract, conveyances, the recording system, methods of title assurance, easements, licenses and promises respecting land. Introduction to legal problems in the regulation of land use and management of natural resources.

510 Constitutional Law. (4) S; Matheson
Role of courts in the federal system, distribution of powers between state and federal governments, role of procedure in litigation of constitutional questions, fundamental protection for person, property, political and social rights.

511 Criminal Law and Procedure I. (3) F; Altman, Kaye, Misner
Legislative and judicial formulations designed to deal with anti-social activity, the substantive elements of particular crimes, problems in the administration of criminal law and the penal system. The role and responsibilities of the legal profession in the administration and improvement of our system of criminal justice.

512 Criminal Law and Procedure II. (3) S; Altman, Lee, Misner
Continuation of 511.

513 Legal Research and Writing I. (1) F; Staff
Techniques of research; use of the law library; preparation of legal memoranda.

514 Legal Research and Writing II. (1) S; Staff
Continuation of 513.

600 Administrative Law. (3) A; Matheson
Administrative process, emphasizing nature of powers exercised by administrative agencies of government, problems of procedure and scope of judicial review.

601 Antitrust Law. (3) F, S; Morris, Rose
Legislation and its implementation to prevent monopoly and business practices in restraint of trade, including restrictive agreements involving price-fixing, trade association activities and resale price maintenance.

602 Commercial Law. (4) S; Furnish, Morgan, Schroeder
Legal problems arising in the distribution, payment, and financing of goods. The law of checks, notes and bank practices relating thereto; the law of sales and secured transactions, including its relationship to the federal bankruptcy act; related consumer problems. Emphasis is on the Uniform Commercial Code.

603 Conflict of Laws. (3) S; Staff
Problems arising when the operative facts of a case are connected with more than one state or nation. Choice of law, bases of jurisdiction, effect of foreign judgments, underlying federal and constitutional issues.

604 Corporations. (4) F; Morgan, Morris, Zander
The corporation as a legal tool for organizing the business enterprise in comparison with sole proprietorship and partnership. Relations of stockholders and management, varieties of stock ownership.

605 Evidence. (3) S; Staff
Principles and practice governing the competency of witnesses and presentation of evidence, including the rules of exclusion and roles of lawyer, judge and jury under the adversary system.

606 Federal Income Taxation. (3) F, S; Karjala, Lee, Pulaski
Federal income tax in relation to concepts of income, property arrangement, business activity and current tax problems, with focus on the process of tax legislation and administration.

607 Advanced Civil Procedure. (3) F, S; Berch, Schroeder
Obtaining and exchanging information in advance of trial, isolating the area of controversy, disposing of cases or issues without trial, defining the scope of litigation in terms of parties and subject matter, and the relationship between successive litigations. Litigation through appeal, including jurisdiction, right to jury, selection of jury, withdrawing case from jury, instructing jury, verdicts, judgments, appellate review.

610 Advanced Criminal Procedure. (3) S; Kaye, Pulaski
Topics in criminal procedure, with emphasis on legal constraints on grand jury investigations, police practices, pretrial release, preliminary hearings, prosecutorial discretion, and plea bargaining.

611 Estate Planning I. (3) F; Pedrick
Tax laws relating to transfer of wealth both at death and during lifetime, including federal estate tax, gift tax and income taxation of estates and trusts.

612 Family Law. (3) S; Ellman, Stanton
Legal and nonlegal problems which an individual may encounter because of a situation as a family member.

613 Federal Courts. (3) S; Berch
Federal judicial system; relationship of federal and state law; jurisdiction of federal courts and their relation to state courts.

614 Labor Relations. (3) F; Arterian-Furnish
Collective bargaining, including the right of employees to organize and to engage in concerted activities; resolution of questions concerning the representation of employees; duty of employers and unions to bargain; administration and enforcement of collective bargaining agreements.

615 Public International Law. (3) F; Staff
Role of law in international disputes. Drafting and interpretation of treaties and multilateral conventions will be considered.

616 Jurisprudence. (3) F; Kaye
Introduction to legal philosophy, with readings on the nature of law and legal reasoning, the relationship between law and morality, and equality and social justice.

617 The Legal Process. (3) N; Staff
Institutions and processes of the American legal system and their interrelationships.

618 Trusts and Estates I. (3) F; Effland, Zander
Substantive concepts involved in transmitting wealth, including intestate succession, wills and will substitutes, the modern trust as a family protective device, creation of future interests in a planned estate, social restrictions of a nontax nature and methods of devoting property to charitable purposes.

619 Trusts and Estates II. (3) S; Effland, Zander
Continuation of 618.

702 Judicial Remedies. (2,3) S; Gold
The nature and limits of injunctive, restitutionary and compensatory remedies for the protection of personal, property, political, and civil rights.

704 Corporate Finance. (2,3) N; Staff
Application of legal materials, training and judgment to problems of small- and large-scale corporate enterprises. Problems include selection of the capital structure, public offerings of corporate securities, reorganizations of solvent corporate enterprises and corporate dissolution.

705 Corporate Taxation. (2,3) F; Lee
Problems in taxability of the corporation, corporate distributions and corporate reorganizations.

706 Indian Law. (2,3) S; Staff
Inquiry into legal problems special to American Indians and tribes.

708 Law and Science. (2,3) S; Kaye
Legal control and support of science and technology and the use of scientific techniques in the legal process. Topics may include the economics of air pollution, supersonic transport aircraft, recombinant DNA research, biomedical interventions in reproduction, and statistical theory.

710 Natural Resources Development. (2,3) N; Leshy
Legal problems relating to the acquisition, distribution, development and conservation of natural resources; federal-state and interstate problems; environmental control, public lands.

711 Insurance. (2,3) F; Berch
Current trends in the business of insurance; role of government in the insurance field.

712 Creditor-Debtor Relations. (2,3) S; Furnish
Creditors' remedies in satisfaction of claims and debtors' protection and relief under bankruptcy, other laws.

715 Professional Sports. (2,3) S; Morris
Unique legal problems relating to professional sports, including their relationship to antitrust laws, the nature of the player contracts and associated tax problems.

716 Securities Regulation. (2,3) S; Karjala
Selected problems arising under the major statutes concerned with regulating the securities market.

719 Consumer Protection. (2,3) F; Staff
Problems of the individual purchaser in mass markets. Fraud, breach of warranty, holder in due course, usury and unconscionability doctrines for voiding contracts; new protective legislation.

721 Education and the Law. (2,3) F; Matheson
Current legal problems affecting institutions of higher education, faculty, students and governing boards.

722 Water Law. (2,3) S; Leshy
Acquisition of water rights; water use controls; interstate conflicts.

723 Environmental Law. (2,3) S; Leshy
Litigation, administrative law and legislation relating to problems of environmental quality. Topics covered may include air and water pollution, toxic substances, pesticides and radiation.

724 Selected Problems in Tort Law. (2,3) F; Staff

726 Legal Profession. (2,3) F, S; Staff
Organized bar, distribution of legal services in modern society, economics of the profession, professional canons of ethics for the bar and judiciary and problems in policing the profession.

728 Selected Problems: Legal Profession.

731 Professional Skills: Interviewing and Counseling. (2,3) N; Staff
Skills and techniques involved in interviewing and counseling, including interdisciplinary materials from other fields such as psychology and psychiatry.

732 Professional Skills: Problems in the Practice of Law. (2,3) N; Staff
Skills of negotiation, litigation, and drafting of typical legal instruments.

733 Professional Skills: Negotiation. (2,3) S; Lowenthal
Theoretical models of negotiations, techniques, strategy; examination of the bargaining process.

735 Estate Planning II. (2,3) S; Pedrick
Preparation of actual estate plans, and implementing legal documents for a variety of typical private clients. Both tax and nontax elements in preparation of the plans will be considered. Prerequisite: LAW 611

736 Planning for the Business Client. (2,3) F, S; Karjala, Lee
Planning transactions involving business organizations with special emphasis on income tax and corporate considerations.

737 Planning Private Real Estate Developments. (2,3) F
Legal aspects of real estate development including negotiation, legal devices for financing, promotion of sales, leasing problems and compliance with legal controls, as well as creation of private controls over land use.

738 Practice Court. (2,3) S; Staff
Students act as lawyers in conducting a case through all stages of trial, from commencement of the action to final judgment.

739 Techniques of Advocacy. (2,3) N; Staff
Designed to familiarize students with the skills of the advocate by observation, instruction and participation.

740 Problems of Litigation. (2,3) S; Staff
Current developments in the fields of practice, procedure, and evidence.

741 Freedom of Speech. (2,3) F; Staff
Freedom of speech in competition with a number of governmental and individual interests. Problems arising from governmental control of information, with particular emphasis upon regulation of the mass media.

742 Equality in Modern Society. (2,3) F; Staff
Discrimination, its social and legal effects and remedies. Focus on constitutional, statutory and private organizational attacks upon discrimination on the basis of race, religion, sex or other classifications.

744 Protections From Bureaucracy. (2,3) N
Proposed and existing mechanisms for protection of individuals from governmental action or inaction. Case studies of the operaton of the ombudsman, police civilian review boards and other such institutions.

745 The Supreme Court. (2,3) N; Staff
Intensive examination of selected current decisions of the U.S. Supreme Court.

746 Community Property. (1,3) S; Effland
Property rights of husband and wife; the Arizona community property system; homestead.

748 State and Local Government. (2,3) N
Legal problems involved in the organization and administration of governmental units including the city, county, town, village, school district and special district.

749 Land Use Regulation. (2,3) F; Schroeder
Legal problems in the regulation and control of land development by state and local governments. Administration of zoning, subdivision, and other planning controls; issues of fairness and procedure in the utilization of such controls.

754 Juvenile Justice System. (2,3) N; Altman, Stanton
Special problems in the juvenile system.

755 Criminal Trial Process. (2,3) F; Lowenthal
Criminal court procedure, from pre-trial motions through sentencing, including discovery, jury selection, jury composition, examination of witnesses, misconduct of counsel, continuances, mistrials, jury instructions and jury deliberations.

757 The Legal Monopolies: Patent, Copyright and Labor. (2,3) F; Staff
Legally created and sanctioned monopolies will be examined and compared on the basis of their justifications, objectives and limitations.

758 The Competitive Economy. (2,3) S; Rose
Legal and economic characteristics of selected problems of the industrial organization in the modern economy. Prerequisite: LAW 601.

761 Selected Problems in Antitrust. (2,3) F; Morris
Analysis of the private enforcement techniques in antitrust. Review and analysis of the various defenses, procedural problems and damage issues.

763 Selected Problems in International Law. (2, 3) N; Staff
Advanced consideration of selected problems.
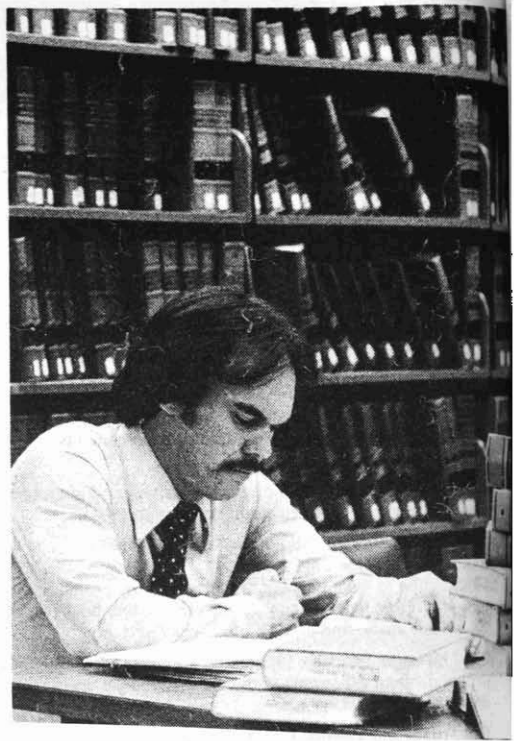
767 Selected Problems in Developing Nations. (2, 3) F; Furnish
The effect of law in social change and development through agrarian reform, industrial development, economic integration. Emphasis on Latin America.

768 International Business Transactions. (2, 3) S; Staff
Problems and policy considerations involved in international trade, tariffs, international monetary controls, development loans, etc.

770 Law Journal. (1, 2) F, S; Staff
Academic credit for successful completion of work by a member of the staff of *Arizona State Law Journal;* 5 credit hour maximum.

771-779 Internships in Law. (3, 6) F, S; Altman, Kader, Lowenthal
Supervised, practical experience with such agencies as Legal Aid, Public Defender Office, District Attorney's Office and other state and local governmental departments.

780 Moot Court. (1) F, S; Staff
Academic credit for successful completion of work as a member of the Moot Court Board of Directors; 3 credit hour maximum.

781-782-783 Individual Study. (1-3) F, S; Staff
With the approval of a faculty member, a student may research a legal subject of special interest and prepare a paper suitable for publication.

790 Field Work. (1-6) F, S; Staff
Specialized study outside the law school in a particular area where law has an impact. The work must be approved and supervised by a member of the faculty.

791 Seminar in Law. (1-3) F, S; Staff

College of Nursing

Juanita F. Murphy, Ph.D.
Dean

Purpose

The faculty of the College of Nursing acknowledges its responsibility to health care consumers for the preparation of individuals who will provide nursing care of professional quality through teaching, research and service. The purpose of the College is to provide educational programs which prepare beginning professional nurses and specialists who consider the emotional, biophysical, socio-cultural and ecological needs in the prevention and treatment of human ills. This nursing care is based on the belief that all human life has dignity and worth, that there is potential for growth in every individual, and that every individual should have the opportunity to achieve and maintain health.

It is the belief of the College of Nursing faculty that professional preparation in nursing is most appropriately composed of a combination of liberal and specialized educational content, and that the professional nurse is committed to the utilization of knowledge and skills to help other human beings achieve and maintain well-being. We also believe that the professional nurse must be prepared as a competent practitioner for the betterment of nursing and health care.

Organization

The College of Nursing is organized as follows:

Baccalaureate Program

The baccalaureate program is a generic four-year curriculum leading to the Bachelor of Science in Nursing degree. It is designed with an upper division nursing major. The first two years of the four-year baccalaureate program consist of required pre-nursing and elective courses. All students seeking the Bachelor of Science in Nursing degree are admitted to the generic baccalaureate program, including graduates of Diploma and Associate Degree in Nursing programs.

Graduate Program

The graduate program is a Master of Science degree with a major in Nursing. This program offers specialization in the following areas:

Community Mental Health-Psychiatric Nursing

Nursing of Children

Adult Health Nursing

Community Health Nursing

Continuing Education Program

This program presents a variety of course offerings both on- and off-campus, some of which are for academic credit, and all of which are designed to assist Registered Nurses to increase the knowledge and skills needed in their professional roles. Many courses are multidisciplinary and are open to other than Registered Nurses.

Degrees

Bachelor of Science in Nursing. The completion of the four-year curriculum in nursing leads to the degree of Bachelor of Science in Nursing. The purpose of the baccalaureate program in nursing at Arizona State University is to prepare beginning professional nurses who possess clinical competence to function in various health care settings. The graduate is prepared to deliver nursing and health care services to individuals, families, and communities. The program provides a foundation for graduate studies in nursing.

The program objectives for the baccalaureate curriculum are directed toward preparation of graduates with generalist abilities. With a base of theoretical and empirical knowledge from the humanities, physical, biological and behavioral sciences, and nursing, graduates are prepared to: 1) provide comprehensive patient care in concert with individuals, families, and other health team members, by utilizing skills of observation and assessment, decision-making, intervention and evaluation; 2) assume responsibility for the provision of nursing care and accountability for identifying and evaluating outcomes of that care; 3) apply the scientific process and utilize research findings in the delivery of health care; 4) assume a leadership role in the promotion, maintenance and restoration of health through teaching and collaborative planning within the interdisciplinary team; and 5) continue professional development in response to trends in health care, changing nursing roles, and the impact of these and other health issues on the consumer.

The candidate for the degree of Bachelor of Science in Nursing must complete a minimum of 126 semester credit hours. The curriculum is planned to include 40 semester credit hours of General Studies required by the University for graduation. These 40 credit hours are part of the approximately 61 semester credit hours required before entering the nursing major. There are 14 semester credit hours of additional free electives required to meet the minimum number of credits for graduation.

The upper division nursing major consists of 51 semester credit hours. Forty-eight are the prescribed professional major sequence, plus three upper division required elective credits in a course with the NUR prefix which has a clinical component. Up to nine credit hours of the aforementioned 14 free elective hours may be in approved nursing courses. Of the latter, a limit of six credit hours in approved upper division courses with the NCE prefix may be substituted and applied toward the baccalaureate degree, either as general electives or as nursing electives. All elective nursing courses must have had prior approval by the Baccalaureate Curriculum Committee. To apply for approval of any nursing credit toward minimum graduation requirements, other than courses offered at Arizona State University with the NUR prefix, students must petition to the Baccalaureate Standards Committee in advance of enrollment. Lower division nursing course credit will not be accepted toward the Bachelor of Science in Nursing degree.

Master of Science. The College of Nursing offers a program leading to a Master of Science degree which requires 36 semester credit hours. Requirements for this program are given in the *Graduate Catalog.* Persons interested in applying for admission to the program should write to the Arizona State University Graduate College for a catalog and application form.

General Information

Accreditation. The baccalaureate and master's programs of the College of Nursing are accredited by the Arizona State Board of Nursing and the National League for Nursing. The Continuing Education Program is accredited by the Western Regional Accreditation Committee of the American Nurses' Association as a provider of Continuing Education for Nursing. The College is a member of the Council of Member Agencies for the Baccalaureate and Higher Degree Programs of the National League for Nursing, and the Western Council on Higher Education for Nursing.

Scholarships and Financial Aid. For information regarding scholarships and loans, see page 30 of this catalog. Information about scholarship and loan funds for nursing students may be obtained from the University Director of Financial Aids, College of Nursing Office of Student Services, or appropriate Assistant Dean.

Student Activities. Nursing students are members of the general student body of the University, and participate in those campus activities which are of interest to them. They are represented on selected University and College of Nursing committees. Students enrolled in the baccalaureate program of the College of Nursing, pre-nursing as well as the upper division nursing, are eligible for membership in the Arizona Association of Student Nurses, the National Student Nurses Association, and ASASU. Students are represented in the Student Senate of ASASU.

Sigma Theta Tau. Beta Upsilon chapter of Sigma Theta Tau was chartered at Arizona State University College of Nursing in 1976. Membership in Sigma Theta Tau is an honor conferred on students in baccalaureate and

graduate programs who have demonstrated outstanding academic and professional achievement.

Graduate Nurse Organization. The Graduate Nurse Organization (GNO) is the coordinating body for nursing students in the graduate program. It provides programs, information, and orientation services for graduate students and complements their academic experiences.

Learning Resources. The College of Nursing offers learning resources which include the University's Hayden Library and the College of Nursing's learning resources center.

Clinical Facilities. Learning experiences with patients and families are provided in cooperation with a variety of federal, state, county, and private health and other agencies under the supervision of qualified nursing faculty. The College of Nursing has contracts with more than 80 different agencies in the Phoenix metropolitan area. Thus a variety of clinical laboratory facilities is available to students in this significant component of the programs.

Student Transportation. Students are responsible for their own transportation to and from health agencies and other selected experience settings, such as home visits to clients.

Bachelor of Science in Nursing

The program leading to the Bachelor of Science in Nursing degree is divided into the pre-nursing major and the upper division nursing major. The pre-nursing major consists of the 61 semester credit hours of prescribed prerequisite courses. The upper division nursing major consists of the 51 credit four-semester nursing sequence. The remaining 14 semester credit hours are free electives, non-nursing and/or nursing. Students are advised to have no more than 12 elective hours outstanding at the time of initial enrollment in the upper-division nursing courses.

Admission to the upper-division nursing major is *not* automatic. Students admitted to Arizona State University declaring nursing as their interest are classified as pre-nursing majors. There is a separate College of Nursing procedure for admission to the upper-division nursing major.

Students are admitted to the upper-division nursing major each fall and spring semester. Admissions are competitive and selective due to program limitations in terms of College of Nursing physical facilities, clinical resources, and availability of qualified faculty. The number of qualified applicants may exceed the number which can be accepted into each entering class.

The time required to complete the upper division major may be reduced from 4 semesters to 3 semesters for Registered Nurse students who choose to enroll full-time.

Pre-Nursing Major

Admission Requirements. Students admitted to the University automatically qualify for admission to the pre-nursing major.

Academic Advisement. Students admitted to the pre-nursing major are advised by the College of Nursing pre-nursing academic advisors. All students are encouraged to seek advisement in order to plan an appropriate program of studies. Students in the upper-division nursing major are advised by College of Nursing baccalaureate faculty.

Pre-Nursing Curriculum. There are approximately 61 semester credit hours of prerequisite course work. Comparable courses may be completed at other accredited colleges or universities. Credit for transfer is initially evaluated by the Admissions Office of ASU. In addition, the College of Nursing Baccalaureate Standards Committee reviews each transcript to determine course equivalency with the prescribed prerequisite courses and applicability of credit toward the Bachelor of Science in Nursing degree. The College of Nursing does not accept credit toward the baccalaureate nursing degree for lower-division courses in nursing or other course work with a technical-vocational orientation. Course work, particularly in the natural sciences, completed more than 10 years before the date of application to the upper-division nursing major will be evaluated for acceptability by the Baccalaureate Standards Committee. Prerequisite courses taken for pass/fail credit do not qualify toward the prerequisite or minimum 126 semester credit hour requirements.

Prerequisite Courses	Semester Hours
ENG 101 and 102 or 104	3-6
Humanities (See Humanities under General Studies) Selected with advisor approval	8
Social and Behavioral Sciences:	
PGS 100 Psychology	3
SOC 101 or 301 Sociology	3
ASB 102 or 351 Anthropology	3

CDE 232 Child Development 3

FAS 331 Family Relationships 3

Human Communications 3

Science and Mathematics:

CHM 101 Inorganic Chemistry 4

CHM 231 Organic Chemistry 4

MIC 201 and 202 Microbiology 4

ZOL 201 and 202 Anatomy and Physiology   8

ZOL 241 Human Genetics 3

FON 141 Human Nutrition 3

Statistics 3

MAT 106 Intermediate Algebra (or demonstration of math proficiency on placement test) 3
                                                 ‾‾‾‾
                                                 58-64

Any prerequisite course substitution must be approved in advance through the Pre-Nursing Academic Advisors.

Nursing Major

Admission to the upper-division nursing major is a process separate from admission to Arizona State University and to the pre-nursing major. Eligible individuals are responsible for initiating the application procedure and submitting the required documents in accordance with the designated deadlines. Qualification requirements and application procedures are described in the following section.

Admission Requirements. Minimum requirements for admission to the upper-division nursing major include:

1. Admission to Arizona State University and classification of good standing;

2. Attainment of a minimum grade point average of 2.5 in the prerequisite courses as well as in the cumulative grade point average for the total number of credit hours earned;

3. Completion of all prescribed prerequisite courses with a grade of C or better in each;

4. Submission of all documents to the College of Nursing Office of Student Services.

Application Procedures

1. Eligibility

Applicants who have completed at least 45 of the 61 prerequisite credit hours with the necessary prerequisite and cumulative grade point averages and who are currently enrolled in the remaining prerequisite courses are eligible to submit the required documents by the designated deadlines.

2. Deadlines

a. Applications for admission to the upper-division nursing major for Fall Semester must be submitted by January 31 of the same calendar year.

b. Applications for admission to the upper-division nursing major for Spring Semester must be submitted by August 31 of the preceding year.

3. Documents

The following documents must be on file in the College of Nursing Office of Student Services by the designated deadline in order for students to be considered for admission to the upper-division nursing major:

a. Certificate of Admission to Arizona State University.

b. Completed application to the upper-division nursing major. Obtain form in the College of Nursing Office of Student Services.

c. Official transcripts of completed course work from other colleges or universities. This is in addition to the transcripts on file in the Admissions Office, Arizona State University.

d. College of Nursing Health History Inventory and Record of Physical Examination completed within three months prior to deadline for application. Both forms are available in the College of Nursing Office of Student Services.

e. Registered Nurse students are required to provide evidence of current registration in Arizona.

Applicants may be requested to come for interview and/or submit additional documents in the event that further information is deemed necessary.

Selection and Notification of Admission.

A limited number of applicants can be accepted in each entering class. Therefore admissions are competitive and selective. The limited number of spaces available for each entering class will be awarded to those qualified applicants who have met the minimum criteria for admission to the upper-division nursing major and have given evidence of the most reasonable prospect for success in the nursing major. *Full admission* status may be granted to applicants who have completed all

prerequisite courses with the necessary prerequisite and cumulative grade point averages. *Provisional admission* status may be granted to applicants who have completed at least 45 of the 61 prerequisite credit hours with the necessary prerequisite and cumulative grade point averages and are enrolled in the remaining prerequisite courses.

Notification of admission status will be by June 15 for Fall Semester and December 31 for Spring Semester. Provisional admission to the upper-division nursing major will be *automatically* revoked if all prescribed prerequisite courses are not completed and the required cumulative and prerequisite grade point averages maintained.

Students must have a high school diploma or GED certificate to be eligible to write the State Board Test Pool Examinations for licensure as a Registered Nurse.

Re-admission. Students who have not been in continuous enrollment in the upper-division nursing major at Arizona State University must submit an application for re-admission to the major. Re-admission is not automatic.

Student Health. In addition to the health policies of the University, applicants to the upper-division nursing major are responsible for submitting a College of Nursing Health History Inventory and a record of physical examination completed within three months prior to deadline for application. Students enrolled in the upper-division nursing major are responsible for fulfilling the requirements in the current health policies of the College of Nursing, available from the Baccalaureate Program Office. All students enrolled in the upper-division nursing major should carry health and accident insurance as outlined in the current health policies of the College.

Liability Insurance. Students are encouraged to carry their own professional liability insurance.

Grading Policy for Nursing Courses.
Within the baccalaureate program, grades are assigned to reflect levels of achievement in relation to course objectives. The grade of D is not used inasmuch as it does not reflect acceptable performance.

Students who do not complete a required nursing course(s) satisfactorily, receiving either a grade of E (failing) or a mark of W (withdrawal), are not eligible to progress in the nursing major. To repeat any required nursing course, students must petition to the Baccalaureate Standards Committee for read-

mission to the nursing course and/or the nursing major. The form, "Petition to Standards Committee for Adjustment of Curriculum Requirements," is available from the secretary to Assistant Dean, Baccalaureate Program.

Failing a required nursing course necessitates repeating the course in its entirety. A required nursing course may be repeated *only once*.

Withdrawal is in accordance with the withdrawal policy of the University. Students who withdraw from required nursing courses must complete the form, "Withdrawal from Nursing Courses." This should be done in conjunction with the appropriate faculty member. In addition, students are responsible for completing the University withdrawal procedure. Two withdrawals from any single nursing course constitute ineligibility to continue in the nursing major.

An *incomplete* in a required nursing course must be satisfactorily removed before progression in the nursing major is permitted.

Audits are not permitted in required upper-division nursing courses.

Pass/Fail grades are not acceptable within the minimum credit requirement for graduation.

Retention in the upper-division nursing major is contingent upon maintaining sound physical and mental health. Students who appear to lack the degree of physical and mental health necessary to function successfully as a professional nurse may be required to have a medical examination and the results made available to the Baccalaureate Standards Committee of the College of Nursing. Qualifications of students whose behavior and/or performance has been questioned will be reviewed by the Baccalaureate Standards Committee. The student shall be informed of the results of the medical examination, and may appear in person before the committee and personally present information relevant to the committee's review. Such additional information may also be presented in writing without personal appearance. The decision of the committee to continue or discontinue the student's clinical nursing experience is final.

Nursing

PROFESSORS:
MURPHY (NUR 457), BRANSTETTER, JOHNSON, MANSELL, MUHLENKAMP, STEFFL, WOOD

ASSOCIATE PROFESSORS:
BRUNER, EVANESHKO, HICKS, NORTH, SANTORA, STUMPF, ZORNOW

ASSISTANT PROFESSORS:
ALBERT, BAGWELL, BLEWETT, BRAMOWETH, CONNELL, DAHL, DOUGLAS, FANCHER, FELLER, FINCH, FOOTE, GARRITY, GRANT, HENSON, JASPER, KNUDSEN, KURTH, LUDLOW, MARTHALER, McCLELLAN, MELVIN, MILLER, MILTON, OSBORN, RICHARDS, SEHESTED, SHERIDAN, TETTING, THOMPSON, TOBIASON, WHITE, WURZELL

INSTRUCTORS:
BELL, BROWN, BYRD, FAIRBURN, FOX, GILBERT, HAUENSTEIN, HUG, LANGE, NELSON, OLSON, ONG, PETERS, ROE, STARKEY, TATHWELL

LECTURER:
STELLHORN

NURSING

Enrollment is restricted to students admitted to the upper-division nursing major.

Prerequisite course numbers marked with a dagger (†) have further prerequisites. Each student is required to take the indicated prerequisite courses.

NUR 301 Professional Development I. (2) F, S
Historical development, beginning concepts of professional nursing. Changing health expectations, nursing functions, legal aspects influencing nursing practice and professional development.

302 Professional Development II. (2) F, S
Role socialization, individual development, relationships with other health professionals, ethical and legal issues as they relate to professional nursing practice. Prerequisites: NUR 301†, 310†, 320†.

310 Human Development and Adaptation I. (3) F, S
Adaptation theories, human behavior in health and illness, the holistic nature of man. Focus on health promotion and disease prevention.

311 Human Development and Adaptation II. (3) F, S
Selected altered psychological, physiological and environmental factors associated with disease. Bio-psycho-social responses of individuals experiencing acute health disruptions. Prerequisites: NUR 301† 310†, 320†

320 Nursing I. (7) F S
Beginning psychomotor skills, relationship development, health assessment and decision making. Clinical practice in maternity and adult nursing. Prerequisites or concurrent: NUR 301†, 310†. Two lectures, 2 conferences. 9 hours laboratory.

321 Nursing II. (7) F, S
Nursing concepts and practice in the care of hospitalized children and adults with acute physical and/or emotional illnesses. Prerequisites or concurrent: NUR 302†, 311†. One lecture, 2 conferences, 12 hours laboratory.

401 Nursing Research. (2) F, S
Components of the research process. Significance of research to the improvement of nursing practice and development of the profession. Prerequisites: NUR 302†, 311†, 321†.

402 Leadership in Nursing. (4) F, S
Selected theoretical frameworks for organization, management and leadership in nursing. Contemporary issues influencing nursing and the health care system. Prerequisites: NUR 401†, 410†, 420†.

410 Human Development and Adaptation III. (3) F, S
Responses of individuals and families to stressors in life-threatening and chronic disruptive states. Interrelationships of bio-psycho-social-environmental stressors and adaptation. Prerequisites: NUR 302†, 311†, 321†.

420 Nursing III. (7) F, S
Nursing process, techniques and interventions in the care of clients with life-threatening and long-term illnesses. Experiences in hospital and community. Prerequisites or concurrent: NUR 401†, 410†. Two lectures, 15 hours laboratory.

421 Nursing IV. (8) F, S
Application of management, health education, change and epidemiologic principles to nursing care of client groups in hospital and community settings. Prerequisite or concurrent: NUR 402†. Two hours conference, 18 hours laboratory.

431 Introduction to Cardiovascular Nursing. (3) F, S, SS
Selected aspects of cardiovascular nursing. Diagnostic evaluation, history and physical assessment, medical and surgical interventions, preventive and rehabilitative management. Prerequisites: NUR 302†, 311†, 321† or approval of instructor.

432 Cardiovascular Nursing Laboratory. (1) F, S, SS
Experiences to accompany NUR 431. Observation, direct care, decision-making and planning for clients in various stages of cardiac disease. Prerequisites: NUR 302†, 311†, 321† or approval of instructor. NUR 431 preceding or concurrent. Three hours laboratory.

433 Abnormal Stress in the Maternity Cycle. (3) F, S
Clinical nursing in high risk obstetrics. Abnormal stresses for pregnant women, effects in newborns and appropriate nursing interventions. Prerequisite: NUR 321† or approval of instructor. One and a half hours lecture, 4½ hours laboratory.

434 Cultural Variations of Health and Illness. (3) F, S
Health-illness beliefs, behaviors and interventions in selected ethnic cultures. Integrating scientific and folk medicine in nursing and health care. Prerequisite: NUR 321† or approval of instructor. Two hours lecture, 3 hours laboratory.

435 Nursing of Children with Developmental Disabilities (3) F, S
Congenital and acquired physical and mental developmental disorders. Evaluation of child and family. Clinical nursing in pediatric community settings. Prerequisite: NUR 320† or approval of instructor. Two hours lecture, 3 hours laboratory.

494 Special Topics. (1-4) F, S, SS
Advanced study and/or supervised practice in an area of nursing. Lecture and lab to be arranged. Prerequisite: 12 hours in the nursing major and/or approval of instructor.

498 Pro-Seminar. (1-7) N
Small group study for advanced students within their major area. Prerequisite: 12 hours in the nursing major and/or approval of the instructor.

499 Independent Study (Honors). (1-3) N
Formulate and execute an independent study on a nursing care problem. Prerequisites: NUR 401†, 410†, 420†; 3.40 GPA; application must be filed eight weeks before beginning course.

500 Research Methods. (3) F, S, Muhlenkamp
Research methods including research conceptualization and design. Prerequisite: Course that includes inferential statistics.

580 Practicum. (1-4) N; Staff
Supervised clinical application of theoretical concepts. Prerequisite: Approval of instructor.

581 Advanced Theory I. (2) F; Staff
Analysis of health care delivery systems with emphasis on current roles, issues, trends, and legislation.

582 Advanced Theory II. (2) S; Staff
Theories related to health and illness behavior.

591 Seminar. (2-4) N; Staff
Advanced topics selected to include such content areas as curriculum development, teaching in nursing programs, child mental health, leadership, gestalt therapy, cultural perspectives regarding health.

598 Special Topics. (2-4) N; Staff
Special areas of study to acquire advanced knowledge in such areas as health promotion, health management, family systems, pathophysiology, health care administration issues, individual psychotherapy, advanced physiology, stress reduction, group psychotherapy, theory development. Prerequisite: Approval of instructor in selected courses.

599 Thesis. Credit, (1-6). (6 hours required)

680 Advanced Nursing Practicum III. (2-6) F; Staff
Clinical application of theories, concepts and principles. Conference included. Prerequisites: Admission to graduate program and approval of instructor. Areas of concentration are:
1. Nursing of Children
2. Community Mental Health-Psychiatric Nursing
3. Adult Health Nursing
4. Community Health Nursing

680 Advanced Nursing Practicum IV. (2-6) S; Staff
Clinical application of theories, concepts, and principles. Conference included. See areas listed under NUR 680 III. Prerequisite: Admission to graduate program and approval of instructor.

681-682 Advanced Theory III, IV. (2,2) F, S; Dahl, Johnson, McClellan, Zornow
Analysis of advanced nursing theory in area of concentration. Focus is on health, client, environment, and nursing practice. Prerequisite: Admission to graduate program.

Special Courses. NUR 580, 590, 591, 592, 598, 680, 690, 691. (See pages 32-33.)

HUMAN DEVELOPMENT

HDE 586 Origins of Human Behavior. (3) F; Branstetter
Critical examination of theories, issues, and research to the developmental period of infancy through adolescence. Prerequisite: Course in child development or equivalent.

588 Development in Adulthood and Aging. (3) S; Branstetter
Critical examination of theories and research of adulthood and aging.

CONTINUING EDUCATION

Full descriptions of courses, topics and prerequisites are publicized each semester and are also available in the Continuing Education Program office. Courses may be repeated for credit under different specific titles.

NCE 194 Current Topics. (1-4) N
Designed to assist individuals to become knowledgeable consumers of health care services and to assume increased responsibility for maintaining wellness.

294 Special Topics. (1-4) N
Introductory courses in selected areas of health care offered for persons interested in or working in health related fields.

394 Special Problems in Health Care. (1-8) F, S, SS
Content built on prerequisite knowledge base. For R.N.'s, health-related professionals by instructor permission.

494 Special Topics. (1-4) F, S, SS
Content presumes a fundamental level of theory and practice skill; designed to lead toward analysis. For R.N.'s, health-related professionals.

598 Special Topics. (2-4) F, S, SS
Content presumes fundamental knowledge from nursing and/or related fields. For professional nurses, health/human service professionals.

Special Courses: NCE 690, 691, 790, 791. (See pages 32-33.)

College of Public Programs

Nicholas L. Henry, Ph.D.
Dean

Purpose

The College of Public Programs offers a wide range of undergraduate and graduate course work, both on- and off-campus, to full-time students and as part of continuing education. Each academic unit of the College not only assumes responsibilities in preparing its own majors, but, in addition, the units provide a variety of service courses for the rest of the University. The College is committed to providing excellence in teaching, research, and public service. Consequently, the units work closely with numerous public, quasi-public, and private agencies at the national, regional, state and local levels.

Organization

The College of Public Programs is composed of five academic units: the Department of Communication, the Center of Criminal Justice, the Department of Journalism and Telecommunication, the Department of Leisure Studies, and the Center for Public Affairs. Each academic unit is administered by a Chair/Director.

The general administration of the College is the responsibility of the Dean, who is responsible to the University President through the Provost.

Degrees

Baccalaureate Degrees. The College of Public Programs offers academic instruction in four areas. Successful completion of a four-year program of 126 semester hours as specified by the respective academic unit leads to the following bachelor's degrees:

Communication:
  Bachelor of Arts (B.A.)

  Bachelor of Science (B.S.)

Criminal Justice:
  Bachelor of Science in Criminal Justice (B.S.C.J.)

Journalism and Telecommunication:
  Bachelor of Arts (Journalism) (B.A.)
  Bachelor of Arts (Broadcasting) (B.A.)
  Bachelor of Science (Journalism) (B.S.)
  Bachelor of Science (Broadcasting) (B.S.)

Leisure Studies
  Bachelor of Science (Recreation) (B.S.)

  Specific degree requirements are explained in detail under the respective Center or Department program information section.

Graduate Degrees. Master's degree programs are offered by four academic units of the College of Public Programs. Specific requirements, as listed under the respective Center or Department section, lead to the following graduate degrees:

Communication:
  Master of Arts (M.A.)

Criminal Justice:
  Master of Science (M.S.)

Leisure Studies.
  Master of Science (Recreation) (M.S.)

Public Affairs
  Master of Public Administration (M.P.A.)

  Information on all graduate degree programs in the College of Public Programs is detailed in the *Graduate Catalog.*

Admission

Freshmen: Any incoming freshman (0-24 semester hours) who meets the minimum University admission requirements as detailed on pages 18-19 will be admitted to any chosen

undergraduate academic unit of the College as a pre-major in that respective academic unit. Students should refer to the information section of the catalog with reference to their preferred area of study for requirements to be admitted as a major in the respective unit.

Transfer Students: Any person applying for admission or transfer to an academic unit of the College will be admitted as a major of that unit if the student has met the specific requirements as listed in the information section for the respective Center/Department.

Transfer Credit. In most cases, course work successfully completed at a regionally accredited four-year institution of higher education will be accepted into the College of Public Programs respective academic unit.

Course work successfully completed at an accredited two-year institution of higher education (community or junior college) will transfer as lower division credit up to a maximum of 64 semester hours.

Successful completion is defined for purpose of transfer as having received a grade comparable to an A, B, or C at ASU. The acceptance of credits will be determined by the Director of Admissions and the utilization of credits toward degree requirements will be at the discretion of the individual academic unit.

Advisement. A student who has been admitted to the College of Public Programs will be assigned an academic advisor from the faculty of the academic unit that the student has selected as his/her major area of study. Questions on advisement should be directed to the student's academic advisor or to the Student Services Office of the College of Public Programs.

Course Load. A normal course load per semester is 15-16 credit hours. The maximum number of hours for which a student can register is 18 credit hours unless an overload petition has been filed and approved by the Center/Department Standards Committee *and* the Undergraduate Programs Committee of the College.

Overload petitions are not ordinarily granted to students who have a cumulative grade point average of less than 3.0 and do not state valid reasons for the need to register for the credits. Students who register for credit hours in excess of 18 and do not have an ap-

proved overload petition on file will have courses randomly removed through an "administrative drop" action.

English Proficiency. Students must demonstrate a reasonable proficiency in written English. Reasonable proficiency is defined as achieving a grade of "C" or better in both ENG 101 and ENG 102, or in ENG 104 or its equivalent. Should a student receive a grade lower than "C" in the courses indicated above, he/she must repeat the course until specified proficiency is demonstrated.

Foreign Language Requirement. The Department of Journalism and Telecommunications is the only academic unit of the College that has a foreign language requirement in order to successfully complete work for the Bachelor of Arts degree in either journalism or broadcasting. Refer to the degree requirement section of the Department of Journalism and Telecommunications for detailed information.

General Studies Requirement. All students in the College of Public Programs are required to complete a minimum of 37-57 semester hours of General Studies courses in order to be eligible for graduation in any of the undergraduate curricula offered by the College. Students should refer to the appropriate Center/Department section for specific information. Course offerings may be taken from those listed under the General Studies program on page 36.

All students in the College of Public Programs must meet minimums as listed below.

I.   *Humanities and Fine Arts:* Nine (9) semester hours minimum. Must include courses in at least two subject areas.

II. *Social and Behavioral Sciences:* Eighteen (18) semester hours minimum. Must include courses in at least three subject areas.

III. *Science and Mathematics:* Ten (10) semester hours minimum. Must include at least two subject areas. A laboratory science course is required.

Students may not use courses from their major department to satisfy General Studies requirements.

Special Credit Options
Pass/Fail Grade Option

I.   The Pass/Fail option is intended to broaden the education of Public Programs undergraduates by allowing them to take

upper division (300-400 level) courses outside their area of specialization. A mark of "P" contributes to the student's earned hours but does not affect the grade point average. A mark of "E" is computed into the grade point average.

II. Only Public Programs students with 60 or more hours of earned credit and a minimum cumulative grade point average of 2.00 may take courses under the Pass/Fail option.

III. The Pass/Fail option may be used under the following conditions.
A. Enrollment for Pass/Fail must be indicated during registration and may *not* be changed after the late registration period.
B. Students may *not* enroll for Pass/Fail in courses which are:
  1. In the student's major.
  2. Counted toward or required to supplement the major.
  3. Counted as Independent Study (CRJ 499).
  4. Taken for Honors Credit.
C. Only one course under the Pass/Fail option may be taken per semester.
D. No overloads will be authorized in a semester when the Pass/Fail option is used. Total semester hour load includes Pass/Fail option course.
E. A maximum of 12 credit hours taken under the Pass/Fail option may be counted toward graduation requirements.

IV. Pass/Fail option is not available during Summer Sessions or in Correspondence Study.

Undergraduate Credit for Graduate Courses:
In order to enable undergraduate students to enrich their academic development, the Graduate College and the individual academic units of the College of Public Programs will allow qualified students to take graduate level courses for undergraduate credit. In order to qualify for admission to a graduate level course, the student must have senior status (87 or more semester hours successfully completed) and a cumulative grade point average of 3.0 or higher. In addition, permission to enroll must be given prior to registration and must be approved by the instructor of the course, the student's advisor, the Center/Department chair, and the Dean of the College in which the course is offered.

Academic Standards and Retention

Good Standing: Any pre-major or major student of the respective academic units of the College will be considered in good standing if the student maintains a cumulative grade point average of 2.0 or higher in all courses taken at Arizona State University.

Probation: Any student who does not maintain good standing status as described above may be placed on probation. A student on academic probation is required to observe any limitations or rules the College may impose as a condition for retention.

Disqualification, Reinstatement, and Appeals: The terms of disqualification, reinstatement, and appeals are identical with those of the University as set forth on page 35 of this catalog.

All academic discipline action is the function of the Student Services Office, Wilson Hall, Room 232, under the direction of the Dean of the College. Students who are having academic problems should contact this office for advisement.

Honors Program. The College of Public Programs provides an Honors Program for undergraduates of exceptional ability. This program includes special courses with outstanding faculty and limited class size, special advisement, and the preparation of a senior honors thesis.

Center for Urban Studies (CUS)

The Center for Urban Studies is an interdisciplinary research, planning and service unit located within the Center for Public Affairs. CUS seeks to promote the analysis and understanding of urban phenomena and the factors which shape urban decision making. The Center emphasizes applied studies directed at improving the effectiveness, efficiency, responsiveness and equity of urban systems. As a community resource, CUS is prepared to undertake research, tailored to specific client needs, in a wide variety of issue areas.

The Division of Public Opinion Research provides a mechanism for assessing and reporting community sentiment and reactions to news events, public policy and topics of broad public interest. This unit, which specializes in telephone interviewing, offers a full range of services including study design, questionnaire development, pretesting, interviewing and supervision, coding, data processing and analysis.

The Division of Policy Analysis and Evaluation focuses upon questions of efficiency, effectiveness and general public sector productivity at all levels of government. This division has a strong interdisciplinary orientation and is prepared to engage in evaluative research in a number of different substantive policy areas.

The Division for Aging Studies is an interdisciplinary research unit which emphasizes the analysis and understanding of the distinctive lifestage problems of elderly populations. This unit places special stress on the aged in the Southwest.

The Division of Policy Planning and Implementation focuses on the understanding of social, economic, political and physical processes in urban areas and their relationship to regional and national systems, trends and policy. The emphasis is on the means to identify present and future problems, specify solutions and evaluate their public policy consequences.

Communication

PROFESSORS:
GOYER (STAUF 412), ARNOLD, DAVIS, PERRILL, RICHARDS, STITES

ASSOCIATE PROFESSORS:
BULEY, DAVEY, HIRSCH, JAIN, McHUGHES, REINARD, K. VALENTINE, WIGAND

ASSISTANT PROFESSORS:
BOSTER, CRAWFORD, MAYER, , C. VALENTINE

Departmental Major Requirements
Bachelor of Arts Degree Curriculum

Communication—Consists of 45 semester hours, of which at least 30 hours must be in Communication courses and a minimum of 15 hours in one or more approved related areas. At least 24 of the 30 hours in Communication must be in courses other than COM 301, 302, 484 or 499, and not more than six hours in COM 294 and/or 494 may be counted toward the major. The core courses, COM 100, 332, and either 334 or 335, are required, and at least 18 hours of the major must be in upper division course work. A grade of "C" or better in all course work counted toward the major is required, and all majors, upon attaining junior standing, must have achieved and must maintain a cumulative average of 2.5 or better in all course work.

Within the Communication major, several areas of emphasis are available, including intercultural communication, interpersonal communication, organizational communication, and public communication. Specific course work is determined by the student in consultation with his/her advisor. The Bachelor of Arts in Communication provides a liberal education in the study of human communication, as a basis for careers in various professions, business and industry, education, public relations, or public service.

General Studies: To satisfy the General Studies Requirement for the B.A. degree in Communication, students must complete a minimum of 55 semester hours, of which at least 12 hours must be in humanities and fine arts, 18 hours must be in social and behavioral sciences, and 10 hours must be in science and/or mathematics. The remaining 15 hours are electives and may be selected from any of the preceding areas. In humanities and fine arts at least two subject fields must be represented; in social and behavioral sciences at least three subject fields must be represented; and in science and mathematics at least two subject fields must be represented, including a laboratory science. Communication majors may not use courses included in the major to fulfill the General Studies requirements.

Bachelor of Science Degree Curriculum

Communication—Consists of 45 semester hours, of which at least 30 hours must be in Communication courses and a minimum of 15 hours in one or more approved related areas. At least 24 of the 30 hours in Communication must be in courses other than COM 301, 302, 484 or 499, and not more than 6 hours in COM 294 and/or 494 may be counted toward the major. The core courses, COM 100, 332 and 335, are required, and at least 18 hours of the major must be in upper division course work. A grade of "C" or better in all course work counted toward the major is required, and all majors, upon attaining junior standing, must have achieved and must maintain a cumulative average of 2.5 or better in all course work.

Within the Communication major, several areas of emphasis are available, including intercultural communication, interpersonal communication, organizational communication, and public communication. Specific course work is determined by the student in consultation with his/her advisor. The Bache-

lor of Science in Communication provides a scientific and behavioral emphasis in the study of human communication as a basis for careers in various professions, business and industry, education, public relations, or public service.

General Studies—To satisfy the General Studies requirement for the B.S. degree in Communication, students must complete a minimum of 55 semester hours, of which at least 9 hours must be in humanities and fine arts, 18 hours must be in social and behavioral sciences, and 12 hours must be in science and mathematics. The remaining 16 hours are electives and may be selected from any of the preceding areas. In the humanities and fine arts, at least two subject fields must be represented; in social and behavioral sciences at least three subject fields must be represented; and in science and mathematics one physical science, one life science, and one mathematics course are required. One science must be a laboratory science. Communication majors may not use courses included in the major to fulfill the General Studies requirements.

Departmental Major Teaching Field Requirements
Bachelor of Arts in Education Degree
—Secondary Education Curriculum

Communication Arts Major—Consists of 60 semester hours and is designed to provide preparation for teaching in three different fields. Students pursuing this major must complete 24 hours in Communication and at least 18 hours in each of two other related fields. The Communication Arts major must complete the core courses, COM 100, 332, and either 334 or 335, and at least one course in each of the designated areas in the field of Communication. At least 18 hours of the major must be in upper division courses, and two Communication activity courses (COM 301, 302) must be completed. However, not more than 4 hours in activity courses may be counted toward the major. Specific courses to complete the major are selected by the student in consultation with his/her advisor.

Communication Major—Consists of 36 semester hours in Communication and anticipates the addition of a minor of at least 24 hours. The Communication Education major must complete the core courses, COM 100, 332, and either 334 or 335, and at least one course in each of the designated areas in the field of Communication. At least 18 hours of the ma-

jor must be in upper division courses, and two Communication activity courses (COM 301, 302) must be completed. However, not more than 4 hours in activity courses may be counted toward the major. Specific courses to complete the major and the minor are selected by the student in consultation with his/her advisor.

General Studies—Students majoring in Communication Education must complete a minimum of 39 hours in General Studies in addition to the University English requirement. Required are at least 8 hours in humanities and fine arts; 8 hours in social and behavioral sciences, and 8 hours in science and mathematics. Also required are one course in national and Arizona government, one course in United States history, one course in general psychology, one science course and one mathematics course. Courses taken within the major or the minor may be counted toward the General Studies requirement when necessary.

Minor in Communication—Consists of 24 semester hours in Communication, including the core courses, COM 100, 332, and either 334 or 335, and COM 480. At least 9 of the additional hours must be in upper division course work.

Communication Internships—Communication internships at the undergraduate level (COM 484) and at the graduate level (COM 584) are available to qualified students for 1-6 hours of credit. The internship consists of supervised field experience in the analysis and management of communication systems. Internships must receive prior approval from the Internship Committee; may be repeated once for credit, but only three units may be applied toward the major; and are not open to freshmen or sophomores. Further details available in the departmental office.

Departmental Graduate Programs
The Department of Communication offers programs leading to the degrees of Master of Arts and Master of Science. Consult the *Graduate Catalog* for requirements.

COMMUNICATION

COM 100 Introduction to Human Communication. (3) F, S, SS
Focus on the basic theory and dimensions of human interaction, including individual and group experiences in human communication.

110 Personal Relationship Communication I. (3) F, S, SS
Demonstration and practice of communication techniques for meeting people, developing rapport, changing relationships, and maintaining a relationship over time.

200 Human Communication Systems. (3) S
Human communication processes and systems, major areas of theory and research, and the scientific bases of human communication behavior.

210 Personal Relationship Communication II. (3) F
Exploration of theoretical, ethical, and philosophical approaches to communication in human relationships. Prerequisite: COM 110.

220 Survey of Speech Communication. (3) S
Introduction to theory and practice for students developing a teaching minor or contemplating a major within the Secondary Education curriculum.

221 Voice Improvement. (3) F, S
Intensive personal and group experience to improve normal vocal usage, including articulation and pronunciation.

241 Introduction to Oral Interpretation. (3) F, S
The communication of literary materials through the mode of performance. Verbal and nonverbal behavior, interface of interpreter with literature and audience, and rhetorical and dramatic analysis of literary modes.

243 Interpreters Theatre Workshop. (3) S
Students will create and practice ensemble interpretation of literature using a variety of media in diverse settings.

263 Minority Communication. (3) S
Communication behaviors and strategies of minorities through analysis of Black American, Mexican American, Native American, and other domestic social movements.

265 General Semantics. (3) F
Analysis of relationship to language to reality: nature of meaning, levels of abstraction, application of general semantics to everyday contexts.

294 Special Topics. (3) F, S, SS
Special topics courses, including the following which are regularly offered, are open to all students. See Departmental syllabus for course descriptions.

  (a) Communication Effects

  (b) Communication and Social Movements

  (c) Political Image Making

  (d) Communication Perspectives for the Teacher

  (e) Message Construction and Communication

  (f) Communication Design

  (g) Women's Communication

  (h) Intercultural Communication Workshop

  (i) The Rhetoric of Protest

300 Group Communication. (3) F, S, SS
Principles and processes of small group communication. Attitudes and skills for effective participation and leadership in small groups. Small group problem-solving and decision-making. Not open to freshmen.

301 Communication Activities. (1) F, S, SS
Participation in forensics or Interpreters Theatre; or for student/teachers enrolled in SED 433. May be repeated for credit but not more than 4 hours may be applied toward the major. Prerequisite: approval of instructor.

302 Classroom Apprenticeship. (1-3) F, S, SS
For students extending their study of a content area by assisting with classroom supervision and exercises in other COM courses. May be repeated for credit but not more than 3 hours may be applied toward the major. Prerequisite: approval of applicable course instructor.

303 Interviewing. (3) F, S
Principles and practice for interviewers. Interview types such as: information-gathering, employee selection and appraisal. Not open to freshmen.

304 Job Interview Training. (1) F, S
Mini-semester workshop (15 class hours; check department office for dates). Prepares students for job placement interviews including resume preparation and simulated interviews. Not open to freshmen or sophomores.

305 Large Group Communication. (3) S
Theory, methods, and individual communication behavior relevant to large group interaction systems. Public discussion and parliamentary procedure in various types of public and deliberative assemblies. Not open to freshmen.

311 Public Speaking. (3) F, S, SS
Verbal and nonverbal communication in platform speaking. Discussion and practice in vocal and physical delivery and in purposeful organization and development of public communication. Not open to freshmen.

312 Argumentation and Debate. (3) F, S
Philosophical and theoretical foundations of argumentation and forensics, emphasizing problems in argumentation and debate.

320 Communication and Consumerism. (3) F, S
Critical evaluation of messages designed for public consumption. Perceiving, evaluating, and responding to political, social, and commercial communication.

330 Nonverbal Communication. (3) F, S, SS
The effects of space, time, body language, environment, objects, and voice quality on communication. Televised section not open to Communication majors.

332 Introduction to Communication Inquiry. (3) F, S, SS
Bases of human communication inquiry including introduction to notions of theory, philosophy, problems, and approaches to the study of communication. Prerequisite: COM 100.

334 Rhetorical Research Methods in Communication. (3) F, S
Historical development of communication/rhetorical theory and the modes of qualitative research in the field of communication. Prerequisite: COM 332.

335 Empirical Research Methods in Communication. (3) F, S
Empirical research methods in communication including introductions to experimental, survey, descriptive, and quantitative approaches. Prerequisite: COM 332.

341 Interpretation in Social Contexts. (3) F
Adaptation and performance of literature in situations of crisis and conflict, notably in prisons, mental hospitals, and centers for the aged. Prerequisite: COM 241 or approval of instructor.

344 Oral Traditions in Literature. (3) S
Literary forms evolving from oral myths, legends, folk tales, and fables. Prerequisite: COM 241 or approval of instructor.

363 Intercultural Communication. (3) F, SS
Processes and problems of communication between people from different racial, ethnic, and cultural backgrounds in both domestic and international settings. Not open to freshmen.

365 Language, Culture, and Communication. (3) S
Cultural influences of language on communication, including social functions of language, bilingualism, biculturalism, and bidialectism.

400 Leadership in Group Communication. (3) F, S; Richards
Theory and process of leadership in group communication, emphasizing philosophical foundations, contemporary research, and applications to group situations. Prerequisite: COM 300 or approval of instructor.

405 Communication in Business and Profession. (3) F, S, SS; Hirsch, Richards, Jain
Interpersonal, group, and public communication methods and practices in business and profession.

406 Organizational Communication. (3) S; Wigand
Communication systems, processes, and problems in formal organizations. Prerequisite: Upper division standing.

407 Organizational Communication Internship. (3) F, S; Wigand, Perrill
Supervised practice in the analysis and management of communication systems within a formal organization. Prerequisite: COM 406 and approval of instructor. May be repeated once for credit.

412 Advanced Argumentation. (3) S; Reinard, Mayer
Advanced study of argumentation theories and research as applied to public forum, adversary, scholarly, and legal settings. Prerequisite: COM 312 or approval of instructor.

415 Communication Behavior in the Elementary School. (3) S; Davey
Communication behavior of elementary children; methods of facilitating expressive, receptive, and interpersonal communication; interaction among teachers, students, parents, and administrators.

433 Quantitative Methods in Communication Research. (3) S
Introduction to the philosophy and practice of empirical communication research. Prerequisite: COM 333 or approval of instructor.

441 Interpretation as Literary Criticism. (3) S; K. Valentine, McHughes
Communication of literature through the medium of performance. Problems of content, structure, and style in poetry, drama, and prose. Prerequisite: COM 241 or approval of instructor.

442 Interpretation and the Mass Media. (3) S; K. Valentine, McHughes
The relationship of modern media (radio, TV, and film) to oral interpretation and literature.

443 Interpreters Theatre: Theory and Practice. (3) F, S; K. Valentine, McHughes
Studies in visual perception, audience psychology, theory, and criticism; practice in directing, analyzing, scripting, and staging of literature. Prerequisite: COM 243 or approval of instructor.

450 Public Address. (3) F; Davis, McHughes
Critical study of significant speakers and speeches of the past and present.

465 Advanced General Semantics. (3) F, S
Advanced concepts, principles, and applications of general semantics and language in human behavior. Prerequisite: COM 265.

467 Communication of Innovations. (3) S; Wigand
Role of communication in diffusion of innovations. Principles for effective use of communication for planned change in various social systems. Prerequisite: upper division standing.

473 Persuasion. (3) F; Reinard, Arnold
Communication variables which influence and modify attitudes and behavior of receivers. Prerequisite: COM 100 or 312.

476 Political Communication. (3) F; Hirsch
Theory and research related to political campaign communication. The persuasive process of political campaigning, the role of the media, the candidate and image creation. Prerequisite: upper division standing.

477 Legal Communication. (3); Reinard, Hirsch
The legal setting as a communication event, featuring discussion of jury selection, legal interviewing, negotiations, and jury behavior. Prerequisite: upper division standing.

478 Crisis Communication. (3) S; Arnold
Role of communication in crisis development and intervention.

479 Communication and Aging. (3) F; Arnold
Dynamics of aging as it relates to communication.

480 Methods of Teaching Communication. (3) F, S; Stites
Analysis, organization, and presentation of textual and other classroom materials.

481 Teaching Practicum. (2) SS
Teaching high school students the fundamentals of forensics.

484 Communication Internship. (1-6) F, S

494 Special Topics. (3) F, S, SS
Special topics courses, including the following which are regularly offered, are open to all students.

(a) Criticism of Empirical Research

(b) Measurement in Communication

(c) Communication Internship

(d) Communication and Sexuality

(e) Urban Communication

(f) Advanced Public Speaking

(g) International Communication

(h) Studies in Communication Education

(i) Speech Writing and Manuscript Speaking

(j) Preachers and Preaching

(k) Women's Communication

(l) Ethics in Communication

(m) Methods of Agitation and Control

(n) Medical Communication

(o) Directed Research in Communication

(p) Inter-racial Communication

(q) Research Studies in Esthetics

(r) Vocal Behavior in Language

501 Quantitative Research in Communication. (3) S; Boster
Quantitative research methods, including empirical, experimental, and statistical tools employed in analyzing communication data. Prerequisite: COM 500.

502 Qualitative Research in Communication. (3) S; Davey
Qualitative research methods, including historical/critical, descriptive, and case study techniques for analyzing communication. Prerequisite: COM 500.

584 Communication Internship. (1-6) F, S

591 Seminar. (3) F, S

Topics may be selected from those listed below.

(a) Communication Studies: The Rhetorical Tradition

(b) Relationship Communication

(c) Contemporary Rhetorical Theory

(d) Rhetorical Criticism

(e) Persuasion

(f) Interpretation: Historical Functions

(g) Interpretation: Contemporary Perspectives

(h) Group Communication

(i) Empirical Research in Communication

(j) Theories and Processes of Communication

(k) Organizational Communication

(l) Communication Education

(m) Theory and Model Construction in Communication

(n) Intercultural Communication

(o) Political Communication

(p) Language in Communication

(q) Minority Communication

(r) Nonverbal Communication

(s) Analysis of Communication Data

Special Courses: COM 499, 500, 580, 590, 592, 593, 594, 598, 599. (See pages 32-33.)

Center of Criminal Justice

Michael C. Musheno, Ph.D., Director

Purpose and Philosophy

The primary purpose of the Center of Criminal Justice is to provide the foundations for professional development to pre-service and in-service personnel in the field of criminal justice.

Criminal justice is a multi-disciplinary, problem-oriented field of scholarship, research, and teaching, embracing those aspects of social, behavioral, natural, and forensic sciences relevant to understanding crime and social deviance, and entailing a critical examination of the systems which have evolved for handling attendant problems.

Degrees

Bachelor of Science in Criminal Justice.

The curriculum for the Bachelor of Science degree in Criminal Justice is designed to provide the student with a broad, liberal education. The curriculum maintains a strong multi-disciplinary foundation, is social science oriented, academic in content, and has as its

objective the preparation of students as generalists for entry level positions in the criminal justice system.

Master of Science in Criminal Justice.

The curriculum for the Master of Science degree with a major in Criminal Justice is designed to prepare students for professional positions in functional criminal justice agencies, for teaching positions in community and four-year colleges, or for further study and research in the field of criminal justice. Information on the Master of Science in Criminal Justice is detailed in the *Graduate Catalog*.

Pre-Criminal Justice Major

Admission Requirements. Students admitted to the University automatically qualify for admission to the pre-criminal justice major.

Academic Advisement. Students admitted to the pre-criminal justice major are advised by the Center of Criminal Justice academic advisors. All students are encouraged to seek advisement in order to plan an appropriate program of studies. Students in the upper-division criminal justice major are advised by Center of Criminal Justice faculty.

Admission to Undergraduate Program

Undergraduate students at Arizona State University may apply for admission to the Center of Criminal Justice during the second semester of their sophomore year. Students transferring from outside institutions need not make separate application for admission to the Center, inasmuch as they will be routinely admitted at the time of admission to the University, provided they meet admission criteria.

Candidates for admission must meet the following minimum requirements:

1. Possess a 2.50 cumulative GPA or higher. If a candidate has completed course work at Arizona State University, the GPA is based on ASU work only, ignoring the effect of grades at another institution. (The GPA at ASU must include a minimum of 9 semester hours in the major.)

2. Have junior standing (defined here as a minimum of 56 semester hours).

It is expected that the student would maintain or exceed the same academic standards as required for admission.

Degree Requirements

The Center of Criminal Justice awards a Bachelor of Science degree in Criminal Justice upon the successful completion of a curriculum of 126 semester hours consisting of:

	Semester Hours
General Studies Requirements	46
Criminal Justice Major	45
Electives	35
Total	126

In addition, the student must fulfill the following requirements:

1. Have accumulated a minimum of 50 semester hours of upper division courses.

2. Have completed a minimum of 30 semester hours, including 24 in criminal justice courses at this University.

3. Have obtained a grade "C" or better for all criminal justice courses taken at this University.

4. Have met the University's residency and scholarship requirements.

5. Have demonstrated a reasonable proficiency in written English by receiving a grade of "C" or better in both ENG 101 and 102, or in ENG 104 or its equivalent.

General Studies Program. To meet the University's General Studies requirements, and to assure breadth and depth of the student's education, all criminal justice students must complete a total of 46 semester hours of General Studies courses, excluding all criminal justice courses and the related courses counted toward the major, with the designated minimum semester hours in each of the following fields:

Humanities and Fine Arts .... 9 sem. hrs.
Must include courses in at least two subject areas. Courses may be chosen from the listing on the Center's curriculum check sheet.

Social and Behavioral Sciences .... 18 sem. hrs.
Must include courses in at least three subject areas. Courses may be chosen from the listing on the Center's curriculum check sheet.

Sciences and Mathematics .... 10 sem. hrs.
Must include a science course with a laboratory section, and at least one mathematics course at the level approved by the Center. Courses may be chosen from the listing on the Center's curriculum check sheet.

Other General Courses .... 9 sem. hrs.
All criminal justice students must complete a course in Communication, and ENG 104 or both ENG 101 and 102 as part of these 9 hours. Additional courses may be taken from the above fields as limited by the exceptions indicated, or other fields as approved by the student's advisor.

Criminal Justice Program. A major in criminal justice consists of 45 semester hours of credit, of which 9 must be taken in related fields approved by the Center of Criminal Justice. CRJ 100, 200, and 301 are required for all degree candidates. Additionally, a group of criminal justice courses may be recommended to ensure a comprehensive exposure to all aspects of criminal justice.

Electives. Students are encouraged to utilize the unique opportunities afforded by the University to pursue personal educational interests, whether in the form of a broad sampling of other disciplines, or the deeper probing of a single field.

Transfer of Community College Credits. Credits transferred from accredited community colleges will be accepted as lower division credits up to a maximum of 64 semester hours. The acceptance of credits will be determined by the Director of Admissions, and the applicability of credits toward degree requirements will be determined by the Center of Criminal Justice.

Criminal Justice

PROFESSORS:
MUSHENO (AG142B), HAYNES, KENNEDY

ASSOCIATE PROFESSORS:
BRUNS, HERNANDEZ, McCLEARY. SCHADE, SHUMAN

ASSISTANT PROFESSORS:
BORTNER, CAVENDER, DATESMAN, MELICHAR

CRJ 100 The Criminal Justice System. (3) F, S, SS
Overview of the criminal justice system. Roles of law enforcement personnel, the courts, and correctional agencies. Philosophical and theoretical views in historical perspective.

200 Concepts and Issues of Criminal Justice. (3) F, S, SS
Issues relating to criminal justice policies, perspectives, techniques, roles, institutional arrangements, management, uses of research, innovative patterns. Prerequisite: CRJ 100 or approval of instructor.

301 Research and Statistics in Criminal Justice. (3) F, S, SS
Introductory exposure to methods of statistical analysis.

Application of social science research methods to criminal justice problems. Problem formulation, study and analysis of data in the context of contemporary agency needs. Prerequisites: CRJ 100 and one mathematics course more advanced than MAT 105 or approval of instructor.

306 The Police Function. (3) F, S, SS
Alternative objectives, strategies, programs, institutional arrangements, roles, perspectives, and interagency relationships of the police. Prerequisites: CRJ 100, 200, or approval of instructor.

308 The Adjudication Function. (3) S
Objectives, processes, settings, roles, and perspectives of the courts, prosecution, and defense. Prerequisites: CRJ 100, 200, or approval of instructor.

310 The Correctional Function. (3) F, S, SS
Alternative correctional objectives, strategies, programs, institutional arrangements, roles, perspectives and interagency relationships. Prerequisites: CRJ 100, 200, or approval of instructor.

311 Prevention of Delinquent and Criminal Behavior. (3) F, S
Theories of prevention, individual, group, and community approaches: intervention at appropriate stages; contemporary law enforcement and corrections practices. Prerequisites: CRJ 100, 200, or approval of instructor.

320 Criminal Justice and Community Relations. (3) F, S
Relationship between criminal justice and community served. Focus on social stratification, interest groups, and racial/ethnic minorities. Prerequisites: CRJ 100, 200 or approval of instructor.

340 Juvenile Justice. (3) F, S
A critical examination of the history and development of the juvenile court and the juvenile justice system. Prerequisites: CRJ 100, 200 or approval of instructor.

360 Law and Social Control. (3) F, S, SS
Resolution of social issues through the application of law as an agent of social control. Nature, sanctions, and limits of law. Categories of law and schools of jurisprudence. Prerequisites: CRJ 100, 200 or approval of instructor.

402 Criminal Justice Theory.(3) F, S; Datesman, Kennedy
A conceptual examination of the criminal justice system. Integration of contemporary thought into an operational frame of reference. Prerequisites: CRJ 100, 200 and one upper division criminal justice course or approval of instructor.

404 Imperatives of Proof in Criminal Justice. (3) F, S; Haynes
Problems and means of establishing identity and fact in relation to arrest, detention, adjudication, sentencing, and correctional case management. Prerequisites: CRJ 100, 200 and one upper division criminal justice course or approval of instructor.

440 Organization and Administration of the Criminal Justice System. (3) F, S. SS; Bruns, Shuman
System-wide analysis of organizational structures. Management and administrative policies of criminal justice agencies—law enforcement, courts, and corrections. Prerequisites: CRJ 100, 200 and one upper division criminal justice course or approval of instructor.

461 Substantive Criminal Law. (3) F, S, SS; Shuman, Cavender
Criminal liability. Crimes against persons, property, and society. Governmental sanctions of individual conduct as formulated by legislatures and the courts. Prerequisite: CRJ 360 or approval of instructor.

462 Procedural Criminal Law. (3) F, S; Shuman
The criminal process. Constitutional and legal problems associated with criminal procedures. Due process of law. Prerequisites: CRJ 100, 200 and one upper division criminal justice course or approval of instructor.

463 Discretionary Justice. (3) F, S, SS; Haynes, Musheno
Use of discretionary authority throughout all phases of the criminal justice system. Cross-purpose effect of discretionary justice. Constitutional limitations on and judicial review of discretionary authority. Prerequisites: CRJ 100, 200 and one upper division criminal justice course or approval of instructor.

470 Survey Research in the Public Sector. (3) F, S, SS
Introduction to survey research methods with an emphasis on public sector applications. Prerequisites: CRJ 100, 200 and one upper division criminal justice course or approval of instructor.

484 Internship in Criminal Justice. (3 or 6) F, S, SS
Assignments in a criminal justice agency designed to further the student's integration of theory and practice. Placements are arranged through consultation with students and agencies. May be repeated for credit but not more than 6 hours may be applied toward the major. Prerequisites: Junior status and completion of required courses (CRJ 100, 200, and 301) or approval of instructor.

494 Special Topics in Criminal Justice. (1-3) F, S, SS
Topics chosen from various fields of criminal justice. Prerequisites: CRJ 100, 200, and one upper division criminal justice course or approval of instructor.

498 Pro-Seminar. (3) F, S
Small group study and research for advanced students. Prerequisites: CRJ 100, 200 and one upper division criminal justice course or approval of instructor.

499 Independent Study. (1-3) F, S, SS
Original study or investigation in the advanced student's field of interest under the supervision of a faculty member. May be repeated for credit but not more than 6 hours may be applied toward the major. Prerequisites: Senior status, major GPA of 3.0 or better and approval of instructor.

500 Criminal Justice Research Methods. (3) F, S. SS; Bortner, McCleary, Musheno
Theories and methods of research with emphasis on development of designs most relevant to criminal justice data and problems. Prerequisite: approval of instructor.

501 Criminal Justice System, Theory and Issues. (3) F, S; Hernandez, Schade
Analysis of the criminal justice structure and process within various theoretical frameworks. Issues such as discretion, diversion and plea negotiations. Prerequisite: approval of instructor.

502 Primary Management in Criminal Justice. (3) S; Bruns, Haynes
Concepts of modern management and their application to criminal justice agency supervision and management. Prerequisite: approval of instructor.

503 Crime and Social Causation. (3) S; Bortner, Cavender
Theories of deviance and crime as they relate to social policies and specific response of the criminal justice complex. Prerequisite: approval of instructor.
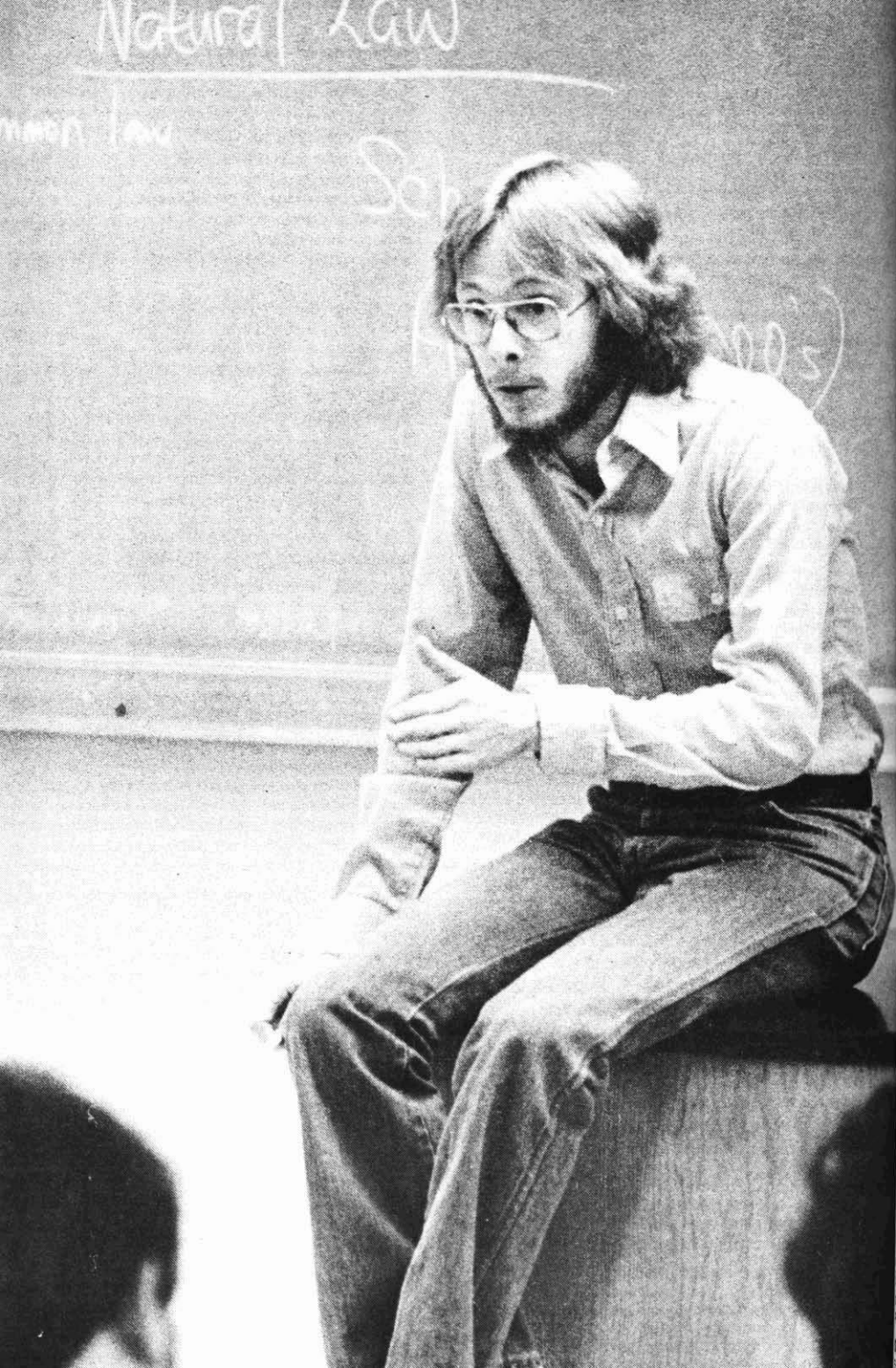
509 Statistical Problems in Criminal Justice Research.
(3) F, S; McCleary
Methodological problems of research design and statistical methods specific to criminal justice. Prerequisite: CRJ 500 and approval of instructor.

510 Understanding the Offender. (3) F; Cavender, Kennedy
Survey of learning, personality, and biological theories of causation and their relevance to understanding criminal and delinquent behavior. Prerequisite: approval of instructor.

513 Intervention Strategies and Delivery Systems. (3) S; Kennedy
Analysis of delivery systems and strategies utilized by social and criminal justice agencies in the prevention of rehabilitation of delinquent and criminal behavior. Review of current research. Prerequisite: CRJ 503 or 510 or approval of instructor.

514 Criminal Justice Policy Analysis. (3) F; Musheno
Assessment of the politics of criminal justice policy as well as an understanding of the basic tools available to social scientists for analyzing the formulation, implementation and evaluation of criminal justice policy. Prerequisite: approval of instructor.

530 Criminal Justice Education. (3) F; Bruns, Hernandez
Development and philosophy of criminal justice education and training. Problems of curriculum development and evaluation. Examination and evaluation of teaching methodologies and instructional aids. Prerequisite: approval of instructor.

540 Criminal Justice Administration. (3) S; Haynes, Musheno
Administrative policies and practices used in criminal justice agencies, and their application to the various facets of the criminal justice administrative process. Prerequisite: approval of instructor.

541 Criminal Justice Planning: Innovation and Change. (3) S; Bruns, Haynes
Normative factors in planning for standards and goals in the criminal justice system. Application of innovation and change techniques in an interdependent system. Prerequisite: approval of instructor.

550 Survey Research in the Public Sector. (3) F, S, SS
Design and implementation of survey research methods with an emphasis on public sector applications. Prerequisites: CRJ 500, 509 or PAF 500, 501, or equivalent, or approval of instructor.

560 Women and Crime. (3) F; Datesman
Nature and extent of female crime, causation theories, and the treatment of females in the criminal law and criminal justice system. Prerequisite: approval of instructor.

570 Juvenile Delinquency. (3) F; Bortner
Study of delinquency, including causation theories, alternative definitions of delinquency, official statistics and the critique, and an analysis of the interaction between social institutions and youth. Prerequisite: approval of instructor.

571 Juvenile Justice System. (3) S; Bortner, Datesman
Graduate-level introduction to juvenile justice system, including historical development, philosophical orientation, organizational structure, and contemporary controversies. Prerequisite: approval of instructor.

Special Courses. CRJ 584, 590, 591, 592, 593, 594, 598, 599. (See pages 32-33.)

Journalism and Telecommunication

PROFESSORS:
BENNETT (STAUF A231B), MILNER
ASSOCIATE PROFESSORS:
CRAFT, CROWDER, ELLIS, HOY
ASSISTANT PROFESSORS:
ANDERSON, FLYNN, LANCE, LEIGH, SILVER, SMITH

Departmental Major Requirements

Freshmen enrolling in the Department of Journalism and Telecommunication and students transferring from other departments within the University must complete a minimum of 30 semester hours with at least a 2.25 cumulative grade point average before they will be permitted to enroll in department courses beyond the 100 level. These 30 semester hours must include the following courses:

	Semester Hours
ENG 101 and 102, or ENG 104	3-6
POS 110 or POS 300	3
MCO 110	3
Laboratory Science (General Studies)	4
General Studies Electives	14-17
Total	30

A student who has completed 30 semester hours at another institution must remove any of the preceding course deficiencies during the first two semesters in the department. Journalism/Telecommunication students must maintain a 2.25 cumulative grade point average to continue to enroll in courses in the department. To ensure students receive a broad academic background, no more than 36 semester hours of courses in the major may apply to the 126 semester hours required for graduation. At least 18 hours of departmental courses, including one writing course, must be taken at Arizona State University. A student must make a "C" or higher grade in all courses taken in the major and in the required related field area. Specific courses that may be used to fulfill the related field requirement are listed in a brochure available in the department.

The journalism news-editorial sequence is accredited by the American Council on Education for Journalism.

Bachelor of Arts Degree Curriculum

Broadcasting—Consists of 45 semester hours of credit of which 30 must be in departmental courses and 15 in a related field. Students must take a required core of courses consisting of MCO 110 and 402 and TCM 200†, 201†, 235† and 332†. In addition, the student must choose 9 credit hours in a major professional emphasis area. These include: Production: TCM 336†, 437† and 431†; Management: TCM 433†, 435† and 472†; Broadcast News: TCM 300†, 315† and 494 (Public Affairs Broadcasting). Bachelor of Arts majors are also required to complete 16 hours of a foreign language or the equivalent to the 202 level.

These courses are in addition to other degree requirements. (See Graduation Requirements, page 39.)

Journalism—Consists of 45 semester hours of credit of which 30 must be in departmental courses and 15 in a related field. Students must take a required basic core, consisting of MCO 110 and 402 and JRN 201†, 301†, 313† and one of the following, MCO 314, 412† or 421†. In addition the student must choose 9 credit hours in a major professional emphasis area. These include; News-editorial: JRN 413†, 420† and 494 (In-depth Reporting); Public Relations: JRN 340†, 401† and 414; Photojournalism: JRN 351†, 451† and 452†.

Bachelor of Arts majors are also required to complete 16 hours of a foreign language or the equivalent to the 202 level. These courses are in addition to other degree requirements. (See Graduation Requirements, page 39.)

Bachelor of Science Degree Curriculum

Broadcasting—Consists of 45 semester hours of credit, of which 30 must be in departmental courses and 15 in a related field. Students must take a required basic core consisting of MCO 110 and 402, and TCM 200†, 201†, 235† and 332†. In addition the student must choose 9 credit hours in a major professional emphasis area. These include Production; TCM 336†, 437† and 431†; Management: TCM 433†, 435† and 472†; Broadcast News: TCM 300†, 315† and 494 (Public Affairs Broadcasting).

Bachelor of Science majors are also required to complete 15 credit hours which shall consist of one course from each of the following areas: statistics, computer science, communication (applied speech), English composition and management/marketing. These courses are in addition to other degree requirements. (See Graduation Requirements, page 39).

Journalism—Consists of 45 semester hours of credit, of which 30 must be in departmental courses and 15 in a related field. Students must take a required basic core consisting of MCO 110 and 402, JRN 201†, 301†, 313† and one of the following: MCO 314, 412† or 421†. In addition the student must choose 9 credit hours in a major professional emphasis area. These include: News-editorial: JRN 413†, 420† and 494 (In-depth Reporting); Public Relations: JRN 340†, 401† and 414; or Photojournalism: JRN 351†, 451† and 452†.

Bachelor of Science majors are also required to complete 15 credit hours which shall consist of one course from each of the following areas: statistics, computer science, communication (applied speech), English composition and management/marketing. These courses are in addition to other degree requirements. (See Graduation Requirements, page 39).

Departmental Major Teaching Field Requirements

Bachelor of Arts in Education Degree Curriculum

Journalism—Consists of 45 semester hours of credit. Courses MCO 110, JRN 201†, 301†, 313†, 351† and 480† are required. An additional 27 hours, including 15 hours in departmental course offerings, must be taken on approval by the advisor in consultation with the student. The remaining courses may be in closely related fields.

Departmental Minor Teaching Field Requirements

Journalism—Consists of 24 semester hours of credit. Courses MCO 110, JRN 201†, 301†, 313†, 351† and 480† are required. The remaining courses are to be selected in consultation with a journalism advisor.

The General Studies program for the Department of Journalism/Telecommunication majors consists of a total of 54 semester credit hours with 12 credit hours required in humanities and fine arts, 18 credit hours in social and behavioral sciences, and 12 credit hours in science and mathematics. Additional courses

may be taken in each of the three groups and/or from General Studies electives to complete the 54 total required.

Each Broadcasting and Journalism major is required to take a minimum of 15 credit hours in background courses, which can also be used to satisfy General Studies requirements. Students will be required to take one course in each of the following: political science (either 110 or 300), history, economics, advertising (301), and English (beyond the freshman English level).

MASS COMMUNICATION

MCO 110 Introduction to Communication. (3) F, S, SS
Organization, function and responsibilities of the media and adjunct services. Primary emphasis on newspapers, radio, television and magazines. Not open to students with credit for MCO 120.

120 Media and Society. (3) F,S
Role of newspapers, magazines, radio, television and motion pictures in American society. Not open to students with credit for MCO 110.

314 History of Communications. (3) F,S
American journalism from its English and colonial origins to the present day. Development and influence of newspapers, magazines, radio, television and news gathering agencies.

402 Communications Law. (3) F,S,SS; Anderson, Milner
Legal aspects of the rights, privileges and obligations of the press, radio and television.

421 News Problems. (3) S; Staff
Trends and problems of the news media, emphasizing editorial decisions in the processing of news. Prerequisite: nine hours of mass communication/journalism/telecommunication courses, or approval of instructor.

430 International Communication. (3) F,S; Bennett, Smith
Comparative study of communication and media systems. Information gathering and dissemination under different political and cultural systems.

450 Visual Communication. (3) N; Hoy
Theory and tradition of communication through the visual media with emphasis on the continuity of traditions common to modern visual media.

JOURNALISM

JRN 201 Journalism News Writing. (3) F,S,SS
Writing news for the print media. Prerequisites: MCO 110 or 120, successful completion of English proficiencey requirement and demonstrated typing ability of 30 words per minute.

301 Reporting. (3) F,S
Fundamentals of news gathering, interviewing and in-depth reporting. Prerequisite: JRN 201†.

313 Introduction to Editing. (3) F,S
Copyediting and headline writing. Electronic editing on video display terminals. Prerequisite: JRN 301†.

340 Magazine Writing. (3) F,S
Writing and marketing magazine articles for publication. Prerequisite: JRN 301† or approval of instructor.

351 Photojournalism I. (3) F,S
Taking, developing and printing pictures for newspapers and magazine production on a media deadline basis. Students should have their own cameras. Prerequisite: JRN 201† or approval of instructor.

401 Public Relations Techniques. (3) F,S; Smith
Theory and practice of publicity, public relations and related techniques and procedures. Prerequisite: JRN 201† or approval of instructor.

412 Editorial Interpretation. (3) N; Milner
The press as an influence on public opinion. The role of the editorial in analyzing and interpreting current events. Prerequisite: JRN 301†

413 Advanced Editing. (3) F,S; Anderson, Flynn
Theory and practice of newspaper editing, layout and design, picture and story selection. Prerequisite: JRN 313†.

414 Business and Industrial Publications. (3) S; Smith
Theory and practice of layout, typography and design for magazines, brochures and industrial publications.

420 Reporting Public Affairs. (3) F,S; Schatt
Instruction and assignments in reporting the courts, schools, government, city hall, social problems and other areas involving public issues. Prerequisite: JRN 301†.

422 Business Reporting. (3) N; Milner
Analyzing and reporting economic and consumer affairs. Prerequisites: three hours of economics, JRN 301†.

451 Photojournalism II. (3) F,S; Hoy
Theory and practice of photojournalism with emphasis on shooting, lighting and layout for the media. Prerequisite: JRN 351†.

452 Photojournalism III. (3) F,S; Hoy
Advanced theory and practice of photojournalism with emphasis on the photo essay and illustrations in black and white and color. Prerequisite: JRN 451†.

480 Methods of Teaching Journalism. (3) F; Staff
Methods of instruction, organization and presentation of appropriate content in journalism. Prerequisite: six hours of journalism at 300 level and above or approval of instructor.

TELECOMMUNICATION

TCM 200 Fundamentals of Radio-Television. (3) F,S,SS
Structure of telecommunications in the U.S.: history, regulation, organization, with emphasis on broadcasting. Relationship to advertising, research and government agencies. Prerequisite: MCO 110 or 120.

201 Broadcast News Writing. (3) F,S,SS
Writing for electronic media, news and continuity. Prerequisites: MCO 110 or 120, successful completion of English proficiency requirement and demonstrated typing ability of 30 words per minute.

235 Studio Techniques. (3) F,S,SS
Introduction to the theory, techniques and operation of telecommunication production equipment, audio and video. Prerequisite: TCM 200†. One lecture, 4 hours studio.

300 Videography. (3) N
Basics of video continuity as used in telecommunication news and information. Prerequisites: TCM 201† and 235†.

315 Broadcast News Reporting. (3) F,S
News and information practices of networks, stations and industry and education telecommunication centers. Advanced practice in writing, reporting and editing. Prerequisites: TCM 201†, 235†.

332 Broadcast Programming. (3) F,S,SS
Programming theory and evaluation, regulation, ethics and responsibilities, and basics of audience psychographics and effects. Prerequisites: TCM 200†, 201† and junior standing.

336 Television Production. (3) F,S
Planning, staging and presenting television programs and segments. Prerequisites: TCM 201†, 235†. One lecture, 4 hours studio.

343 Broadcast Announcing. (3) F,S
Techniques of radio and television announcing. Prerequisites: TCM 201†, 235†.

431 Advanced Writing for Telecommunication. (3) F,S; Bennett
Technique and practice in writing for telecommunication, including broadcast, industrial and educational areas. Prerequisite: TCM 201† and junior standing.

433 Broadcast Station Operations. (3) F; Bennett
Programming planning, traffic, music, news, continuity, sales and promotion. Operational procedures in the departments of a radio or television station. Prerequisites: TCM 201† and 332† or approval of instructor. May be repeated for credit.

435 Cable TV and Emerging Telecommunication Systems. (3) F; Craft
Structures and utilization of cable, industrial and instructional television and satellite and videocassettes. Prerequisite: TCM 332†.

437 Television Directing. (3) S; Craft
Directing television programs for broadcast, cable, industry, and education. Prerequisite: TCM 336†. One lecture, 4 hours studio.

472 Broadcast Station Management. (3) S; Bennett, Ellis
Management principles and practices, including organization, procedures, policies, personnel problems and financial aspects of station management. Prerequisite: TCM 332.†

Special Courses: MCO 492, 493, 494, JRN 499, TCM 499, MCO 580, JRN 584, TCM 584, MCO 590. (See pages 32-33.)

Leisure Studies

PROFESSORS:
CHEATHAM (GHALL 204), GREEY

ASSISTANT PROFESSORS:
CHRISTENSEN, HALEY, HOEFT

Departmental Major Requirements

Freshmen enrolling in the Department of Leisure Studies and students transferring from other departments within the University must complete a minimum of 25 semester hours with a minimum of 2.25 cumulative grade point average before being officially admitted to the Bachelor of Science program in Recreation. As part of this minimum requirement, the students must successfully complete REC

160 and ENG 101-102 *or* ENG 104 (or the English Proficiency Examination) with a grade of "C" or better.

Transfer students who have completed 25 semester hours or more at another institution must remove any of the above course or scholastic deficiencies prior to being admitted to the Bachelor of Science program in Recreation.

The student must maintain a minimum 2.25 cumulative GPA to continue to enroll in courses in the Department.

The student must complete a minimum of 37 semester hours in upper and lower division General Studies courses as listed in the College of Public Programs requirements (page 343). General Studies courses may not be used concurrently toward the General Studies requirement and related requirements within the major core.

Bachelor of Science Degree Curriculum

Consists of 54-67 semester hours of course work including related studies. The following courses are major courses required of all undergraduate majors:

			Semester Hours
REC	160	Leisure and Society	3
REC	210	Urban Leisure Systems	3
REC	330	Theory and Principles of Recreation Programming	3
REC	462	Administration of Leisure Services	3
REC	463	Senior Internship	12
		Total	24

The remaining courses will be selected in consultation with a departmental advisor and determined by the needs and area of professional emphasis chosen by the student.

Students may select one of the following areas of professional emphasis: Urban Recreation, Tourism and Commercial Recreation, Recreation for Special Populations, Youth Agency Administration, Outdoor Recreation, or Recreation Resource Planning and Management. Additionally, 400 clock hours of recreation leadership experience are required prior to doing Senior Internship (REC 463). Students are not permitted to take additional course work during the Senior Internship placement period.

A student must attain a grade of "C" or better in all courses within the major including the related area. Specific courses which may

be used to fulfill the related requirements are listed in a brochure available in the Department.

LEISURE STUDIES

REC 120 Dynamics of Play. (3) F,S
Theoretical bases of play. Factors influencing play choices and attitudes. Analysis of game structure and function.

150 Outdoor Living Skills. (3) F, S
Theories and practical skills for outdoor living. Wilderness philosophy, outdoor experience culminating in ACA certification (if desired). Overnight trips.

160 Leisure and Society. (3) F, S
Analysis of the human relationship to leisure. Historical survey of philosophical, psychological, and socioeconomic bases for development of systems that provide leisure programs.

210 Urban Leisure Systems. (3) F, S
Systematic overview of interrelated public, private and commercial urban leisure services. Prerequisite: REC 160.

330 Theory and Principles of Recreation Programming. (3) F, S
Foundations for effective program planning. Theory and principles related to varied settings and types of activity. Formal planning process. Prerequisites: REC 160†, 210†.

350 Designs for Recreation. (4) F
Design and development of leisure and recreational resources with a focus upon man and his environment.

364 Recreation for Special Populations. (3) F, S
Concepts, methods, settings involving recreational services as applied to special groups in American society; e.g., youthful and adult offenders, alcoholics, drug addicts, mentally retarded, mentally ill, and physically handicapped. May include field experience.

370 Outdoor Recreation Systems. (3) F
Survey of outdoor recreation resource delivery in the public sector.

400 Therapeutic Recreation. (3) S
Principles, practices of program development, evaluations, professional roles and support services related to therapeutic recreation service. Prerequisite: REC 364†.

410 Tourism and Commercial Recreation. (3) S
Survey and analysis of the role and impact of tourism and commercial recreation enterprise on the community, state and citizen. Prerequisite: Approval of instructor.

462 Administration of Leisure Services. (3) F,S
Basic principles of administration and their application to successful administration practices. Analysis of administrative function, structure and policies. Prerequisite: REC 330†.

463 Senior Internship. (6 or 12) F, S, SS
Supervised guided experience in selected agencies. Prerequisites: REC 330†, 472†, senior standing. Recreation majors only.

470 Camp Organization and Administration. (2) F
Organization and administration of camps. Preparation for camp management; consideration of budget, campsite and personnel.

540 Recreation Services for the Aged. (3) S; Hoeft
Recreational activities, special facilities, use of volunteers, public relations techniques, fund raising, and the dynamics of interpersonal relationships relative to the senior citizen.

552 Philosophical Foundations of Leisure. (3) F; Cheatham

Analysis of fundamental philosophical concepts as they relate to principles and practices of organized programs for leisure.

558 Current Issues in Recreation. (3) F; Christensen
Contemporary issues and problems confronting the leisure services profession. Prerequisite: REC 552.

569 Commercial Recreation. (3) F'82; Haley
Procedures in determining public needs, initiating enterprise, promoting activity, and evaluating the total project in terms of both proprietor and public.

570 Outdoor Recreation Planning. (3) S'82
Planning for administrative duties in varied recreation settings. Prerequisites: REC 370 or equivalent.

Special Courses: REC 294, 298, 484, 492, 493, 494, 497, 498, 499, 500, 580, 584, 590, 591, 592, 593, 598, 599, 691. (See pages 32-33.)

Center for Public Affairs

PROFESSORS:
KARNIG (WILSON 224), BECKER, HENRY, SACKTON. WESCHLER

ASSOCIATE PROFESSORS:
BROWN, CAYER, HALL, MANKIN, MUSHENO, MUSHKATEL

ASSISTANT PROFESSORS:
ERIBES, IVEY, WILSON

LECTURER:
DeBOLSKE

The Center for Public Affairs has been established as a separate academic unit located within the College of Public Programs. Its basic aims are: (1) to offer professional education programs leading to graduate degrees in public administration and to encourage mid-career education for public administrators by offering evening course work at the state government complex; (2) to maintain a research program designed to identify problems, disseminate information and propose solutions to major public problems; (3) to provide a high level of public service in meeting needs in Arizona and the nation.

PAF 500 Research Methods. (3) F, S; Hall, Karnig, Weschler, Wilson
Approaches and techniques for the gathering of data in public administration for survey research and methodology. Various data analysis methods. Prerequisite: PAF 501 or formal educational background in statistics.

501 Statistics in Administration. (3) F, S; Becker, Wilson
Application of statistical methods to problems in finance, personnel, survey and planning. Prerequisite: POS 301 or MAT 226† or equivalent.

502 Computers in Administration. (3) N; Ivey
Experience in use of computer technology for public administration problem solving.

503 Organizational Theory. (3) A; Mankin, Henry, Cayer
Organizational theories and current research emphasis
with application to public administrative organizations.

504 Comparative Administration. (3) N; Brown
Literature on comparative public administration theory.
Bureaucracies and their impact on the political develop-
ment process. Selected nations will be studied.

505 Intergovernmental Relations. (3) A; Hall, DeBolske,
Weschler
Evolution, growth, present status and characteristics of
the U.S. federal system of government. Federal-state rela-
tions, state-local relations, regionalism, councils of
government, interstate cooperation, grants-in-aid, and
revenue sharing.

506 Regional Cooperation, Programs and Associations.
(3) N; DeBolske, Weschler
Inter- and intrastate regional political and administrative
cooperative devices and bodies.

507 Bureaucracy and Public Affairs. (3) A; Henry, Cayer,
Karnig, Weschler
Public administration, covering public ethics, organization
theory, personnel, budgeting, systems analysis, and criti-
cal public policy issues.

510 Governmental Budgeting. (3) F, S; Sackton, Mushka-
tel, Brown, Hall
Legal, social, economic, and political nature of govern-
mental budgets and the budgetary process. Theories and
social consequences of budget decision-making and prac-
tices of budget control.

511 Governmental Finance Management. (3) A; Sack-
ton, Mushkatel, Becker
Sources of funding, management of funds and debts and
general pattern of expenditures, in states, counties, cities,
and districts.

512 Public Affairs Economics. (3) A; Becker, Wilson
Role of economics in public affairs with examples from
transportation, urban form, Rio Salado project, housing
land use, flood control, growth, aspects of energy eco-
nomics.

520 Public Management. (3) A; Staff
The management process in government and public agen-
cies, with emphasis on the executive leadership within the
public sector.

521 Public Personnel Management. (3) A; Mankin, Cayer
History of the civil service, recruitment, selection, position
and wage classification, motivational analysis, productivi-
ty, public unionism, and ethics in the public service.

522 Public Labor Relations. (3) A; Mankin, Cayer
Rise of public unionism, managerial policy toward union-
ism, conflict resolution, impact of unionism on budgets,
personnel policies and public policy.

523 Public Information Systems. (3) N; Hall, Ivey
Systems analysis concepts and theory as applied to ad-
ministration. Alternative modes of information organization
and their impact on public decision-making.

524 Community Conflict Resolution. (3) N; Hall
Interdisciplinary approach to understanding the dynamics
of community conflict. Strategic considerations in policy
design and advocacy; potential reaction to conflict. Rele-
vant models and research findings generated by both
case studies and comparative methods.

525 Public Program Management. (3) A; Staff
Governmental service programming: formulating, financ-
ing, operating, evaluating and reporting. Analysis of
interagency relationships and the role and conduct of re-
search in the programming process.

530 Management of Urban Government. (3) A; Karnig,
Mushkatel
Administrative practices and behavior within the urban
political administrative environment. Functional areas such
as citizen participation, urban planning, urban transporta-
tion, and the conflicts between urban politics and
administrative efficiency.

531 Comparative Urban Administration. (3) N; Brown
Development of urban governments within different cultur-
al, social and political milieu. Cities within developing
countries as well as in the developed countries of Europe
and North America.

532 Urban Planning Administration. (3) A; Eribes, Mush-
katel
Historical and present day uses of urban planning and
procedures for its implementation. Basic principles and
practices.

533 Politics of Urban Planning. (3) A; Eribes, Brown,
Mushkatel, Weschler
Urban planning policy issues frequently faced by local,
state and federal government. Consideration of the rela-
tionships between the political leader, the professional
planner and the citizen.

535 The City and County Manager. (3) A; Staff
The manager's role and resources in the differing forms of
administrative, legislative and community sectors.

540 Public Policy Analysis. (3) A; Staff
Theories which attempt to explain public policy formula-
tion. Application of social science to policy issues.

541 Topics in Public Policy Analysis. (3) A; Staff
May be repeated for credit. Topics may be offered from
the following: (a) Aging, (b) Art, (c) Education Policy, (d)
Environmental Public Policy, (e) Health, (f) National Public
Policy, (g) Public Safety, (h) Recreation, (i) Transportation,
(j) Welfare.

542 Science, Technology and Public Affairs. (3) N; Staff
The influence of science and technology on governmental
policy-making; scientists as administrators and advisors;
governmental policy-making for science and technology;
government as a sponsor of research and development.

543 Public Management of Land. (3) N; Becker, Wes-
chler
Extent, basis, procedures, and consequences of land
management by agencies of federal, state and local gov-
ernments.

544 Preparation of Reports in Public Administration. (3)
N; Sackton
Intensive practice in written and oral presentation of re-
ports to conferences covered with problems in public
administration. Visual aid techniques.

545 Research Data Management. (3) N; Ivey, Wilson
Techniques and problems associated with data manage-
ment in a research environment. Data base management
systems, security and integrity, accessibility and cost.

**546 Data Base Management Systems in Public Admin-
istration.** (3) N; Ivey
Concept and use of modern data base management sys-
tems in an administrative organization. Advantages and
disadvantages of this approach.

550 Survey Research in the Public Sector. (3) N; Wilson
Design and implementation of survey research methods
with an emphasis on public sector applications. Same
course as CRJ 550. Prerequisites: PAF 500 and 501, or
CRJ 500 and 509, or equivalent, or approval of instructor.

551 Urban Planning Evaluation. (3) N; Eribes, Weschler
Concepts, principles and methods employed by public

planners in the analysis of urban problems involving multiple criteria decisions. Prerequisite: Formal graduate level course work in statistics and planning.

552 Urban Housing Policy. (3) N; Eribes, Mushkatel
Comprehensive consideration of the revitalization of American cities with major emphasis upon the housing process and related institutions and services.

553 Social Impacts of Planning. (3) N; Becker, Eribes, Mushkatel, Weschler
Analyzes the planning needs of various social groups in urban settings and the appropriate mechanisms of public sector planning for multiple publics.

554 Urban Growth Administration. (3) N; Becker, Eribes, Mushkatel
Examines the process of urban growth and change. Partnership roles played by public and private sectors in *management is emphasized*

555 Environmental Policy and Management. (3) N; Becker, Weschler, Wilson
Analysis of environmental policy and planning issues and principles related to the analysis and management of natural and urban/regional resources.

556 Urban Policy Making. (3) N; Eribes, Karnig, Mushkatel, Weschler
Analysis of the opportunities and costs of influencing public policy and the roles of officials and bureaucracies in decision making.

591 Seminar. (3) F, S; Staff
Topics may be selected from the following: (a) General

Public Administration, (b) Public Finance Administration, (c) Public Management, (d) Urban Affairs and Urban Planning, (e) Public Policy Analysis.

593 Planning Workshop. (3) N; Eribes, Mushkatel
Practical team research and field experience. Emphasis on the synthesis of public sector planning methodologies, concepts and techniques learned in prior course work.

600 Applied Research Methods. (3) A; Staff
Specialized research techniques and methods of economic, political, social, and management analysis.
Prerequisite: Formal graduate level course work in statistics.

601 Policy Analysis and Program Evaluation. (3) A; Staff
Consideration of normative issues of policy formulation and empirical methods of analyzing and evaluating public policy. Prerequisite: PAF 600.

602 Seminar in Public Administration I. (3) A; Staff
Treatment of public administration approaches toward planning, service delivery systems, government responsiveness, conflict resolution, and intergovernmental relations.

603 Seminar in Public Administration II. (3) A; Staff
Treatment of public administration approaches toward organization development and behavior, budgeting and public finance, personnel management, labor-management relations, and information systems. Prerequisite: PAF 602.

Special Graduate Courses: PAF 580, 584, 590, 592, 594, 598, 599. (See pages 32-33.)

School of Social Work

Ismael Dieppa, D.S.W.
Dean

The School of Social Work offers two degree programs: a two-year program leading to the degree of Master of Social Work (M.S.W.) and a Bachelor of Social Work (B.S.W.). The programs are accredited by the Council on Social Work Education for the preparations of M.S.W. and B.S.W. level Social Work practitioners.

Degrees
Bachelor of Social Work

The School's undergraduate curriculum leads to a Bachelor of Social Work degree (B.S.W.). During the freshman and sophomore years, students concentrate on obtaining a strong background in General Studies and are classified as pre-majors until they are officially admitted to the major. Entrance into the social work major from the pre-major is *not* automatic (see section on Admissions).

Junior and senior social work majors focus on social work courses in: social policy, human behavior and social environment, social work direct practice, social work research, and field instruction in community agencies. In addition, majors take additional courses in related areas and electives.

Objectives

The undergraduate curriculum is designed to prepare students for beginning level social work practice, and to provide preparation for graduate training in social work. It also offers social welfare content in General Studies courses for Liberal Arts students.

In consideration of the varied cultural and ethnic composition of Arizona and the Southwest, the program prepares students for transethnic social work and actively recruits from ethnic minority groups.

Degree Requirements

All candidates for graduation in the Bachelor of Social Work curriculum are required to present at least 126 hours of credit, of which at least 50 hours must consist of upper division courses. A cumulative grade point index of 2.00 is required for graduation.

Requirements for the Bachelor of Social Work degree:

		Semester Hours
I.	Communications Requirement	6
II.	General Studies Requirement	51
III.	Social Work Core Requirement	42
IV.	Related Social Work Requirement	15
V.	Electives	12
	Total	126

I. Communication Requirement.

ENG 101—3 credit hours

ENG 102—3 credit hours
or
ENG 104*—3 credit hours (see page 27, "University English Proficiency Requirement").

*Those students taking ENG 104 must complete 3 additional hours in any subject to total 126 semester hours for graduation.

II. General Studies Requirement.
To meet University General Studies requirements and to assure breadth and depth to the student's education, all social work students must complete a total of 51 semester hours of General Studies courses with the designated minimum semester hours in each of the following fields. Students may choose the requirements for the catalog under which they entered the University or the following:

Humanities and Fine Arts .... 11 sem. hrs.
Required: Philosophy 101 or 103 (3 hrs.)

Elective: Spanish 101, 102 (8 hrs.)* or: Architecture (APH and certain DES courses only); Art History (ARH courses only); Dance History (DAH courses only); English (except ENG 101, 102, 104); Foreign Language (Spanish recommended); Humanities (HUP courses only); Music (MHL and MTC courses only); Philosophy (except PHI 101, 103); Religious Studies; Theatre (THE courses only).

*Highly recommended

Social and Behavioral Sciences .... 21 sem. hrs.
    Required: SOC 101 Intro. to Soc (or SOC 301 Principles of Soc) (3 hrs.); POS 110 Government and Politics (3 hrs.); ECN 100; or 201; or 202 (3 hrs.); PGS 100 Intro to Psychology (3 hrs.); SOC 341 Modern Social Problems (3 hrs.); PGS 341 Developmental Psychology (3 hrs.); HIS (topical, indigenous series) (3 hrs.) e.g., 362, 364, 367, 368, 370, 380, 422, 424, 425, 428, 430

Sciences and Mathematics .... 10 sem. hrs.
    Required: A lab science (4 hrs.); BIO 330 Ecology and Conservation (3 hrs.)

    Elective: BIO 300 Natural History of Arizona (3 hrs.) *or* GLG 300 Geology of Arizona (3 hrs.) *or* Anthropology (ASM courses only) (3 hrs.)

Additional Courses .... 9 sem. hrs.
    Required: FAS 331 Family Relationships (3 hrs.); FON 141 Human Nutrition (3 hrs.); Statistics.

III. Social Work Core Requirements

		Semester Hours
SWU 271	Introduction to Social Work	3
SWU 291	Community Resources	3
SWU 301	Human Behavior in the Social Environment I	3
*SWU 310	SW Practice I - Skills	3
SWU 331	Social Policy and Services I	3
SWU 402	Human Behavior in the Social Environment II	3
*SWU 410	SW Practice II - Systems	3
*SWU 411	SW Practice III - Settings	3
*SWU 412	Field Instruction I	6
*SWU 414	Field Instruction II	6
SWU 420	Practice Oriented Research	3
SWU 432	Social Policy and Services II	3

SWU 412 and 414 each require 16 hours weekly per semester in the field. Students must file an application for field work before registering for the courses.

*Majors Only

No credit will be granted toward fulfilling major core requirements in any upper division course in the student's major unless the grade in that course is at least a "C".

IV. Related Areas. (15 hours) Although the practice model of the program is a social work generalist, related areas and electives offer students opportunities to pursue their interests in special areas of service. Students are urged to consult their advisors for specific course suggestions.

V. Electives. (12 hours) In order to fulfill the University requirement of 126 credit hours for graduation, the student has the option of taking 12 credit hours in any college or department within the University. Students are encouraged, in consultation with their advisor, to use these elective courses to supplement their particular area of concentration suggested under related areas. Economics, education, management, political science, psychology, quantitative systems and sociology are only a few of the academic units offering a specialized knowledge of value to the professional social work practitioner.

Admissions

The Bachelor of Social Work degree program at Arizona State University is divided into the pre-social work major and the social work major.

Pre-social work major consists of freshman and sophomore students who have been admitted to the University and have declared social work as their major, as well as students transferring to the School of Social Work from other colleges within the University and other universities or junior colleges who have not successfully completed the admission process to the program. Students transferring from other universities or community colleges as pre-majors should follow the procedure outlined on pages 20-21 of this catalog. Students transferring from another college within the University must obtain a "Change of College" form from the Undergraduate Social Work office.

Admission Procedure for Social Work Majors. (Students having 45 credit hours or more). In order to meet accreditation standards, the Undergraduate Program of the School of Social Work has had to place a limitation on the number of social work majors enrolled. Students wishing to enter the social work major are required to apply for admission to the program in addition to obtaining an official certificate of admission to the University. A student is eligible to apply for admission to the social work major during the spring semester of his/her sophomore year. It

is expected that applicants will have completed 60 semester hours by the end of the Spring Semester in which they are applying. Ordinarily students are admitted to the major at the beginning of the fall term following the Spring Semester in which they applied.

Students who have been pre-majors will automatically be sent social work major application packets at the end of the fall semester, provided they have successfully completed 45 hours at the end of that semester. Upon notification of formal acceptance to ASU, the Undergraduate Social Work office will mail the social work major application packet to the address listed on the official certificate of admission of transfer students having completed 45 hours during the previous semester or before. For this reason, students are urged to notify the Undergraduate Social Work office of any change in address. Students may also pick up social work major application packets at the Undergraduate Social Work office in West Hall 137 or request that they be mailed to their home address by calling 965-6081.

All students who are applying for fall admission must have an official certificate of admission to the University in their files by February 1. Students should allow at least four additional weeks to process their ASU application to receive their acceptance. All other application material (*i.e.*, application form, additional statement and two letters of reference) must be returned to the Admissions Office, School of Social Work, Undergraduate Program, Arizona State University, Tempe, AZ 85287 by February 15. Failure to meet these deadlines may result in the applicant having to wait for the next year's admission process. Applicants will be notified by mail of the commitee's decision within five weeks following the February 15 deadline. Those applicants who have been denied admission may request a conference to discuss the decision and obtain guidance in the development of alternative plans.

Criteria for Admission. The admissions committee, composed of faculty and student members, will evaluate all applicants on the basis of the following criteria: (1) GPA (Grade Point Average). Generally, a 2.5 cumulative grade point average is required, but consideration is given to applicants whose grades reflect a recent or constant trend of improvement. (2) Applicant's educational and career goal's compatibility with the educa-

tional objectives of the School. (3) Volunteer and/or work experience in human services. Personal life experience may be considered. (4) References. Two references are required for each applicant. These references should be from two persons who have known the applicant in a professional capacity.

Social Work

PROFESSORS:
DIEPPA (WEST HALL), ALDRIDGE, CRANMER, DALEY, MONTIEL

ASSOCIATE PROFESSORS:
BRAND, BROWN, COUDROGLOU, ENGELHARDT, FAUSEL, HILL, KETTNER, LEYBA, MAGEL, MONTERO, NICHOLS, NOWAK, RED HORSE, WOODMAN

ASSISTANT PROFESSOR:
DeGRAW

EMERITI PROFESSORS:
HARWARD, LUNDBERG

EMERITI ASSOCIATE PROFESSOR:
POLENZ

SOCIAL WORK (SWU)

SWU 271 Introduction to Social Work. (3) F, S
Analysis of contemporary social welfare services and professional social work. Designed for freshmen/sophomores considering this major. Prerequisite for all other social work courses.

291 Community Resources. (3) F,S
Purpose, structure and delivery system of community welfare agencies. Includes 40 hours observational experience in local agencies. Prerequisite: SWU 271 or concurrent enrollment.

301 Human Behavior in the Social Environment I. (3) F, S
Introduction to interrelation of bio-psycho-sociocultural systems and their effect on behavior focused on Southwestern ethnic and cultural groups. Prerequisites: SWU 271, 291, SOC 101 and a developmental psychology course.

310 Social Work Practice I - Skills. (3) F, S
Introduction to social work methods, emphasizing communicative skills: role-playing, video training, cross-cultural interviewing, communication patterns. Prerequisites: Social work major and SWU 271, 291, 301.

331 Social Policy and Services I. (3) F, S
History, philosophy and values of social welfare; function and role of social welfare in society; development of the social work, profession and practice. Prerequisites: Junior standing and POS 110; 3 hours ECN; SWU 271, 291.

402 Human Behavior in the Social Environment II. (3) F, S
Sequel completing study of life span development and behavior which forms base for social work practice. Prerequisites: senior standing and SWU 271, 291, 301.

410 Social Work Practice II - Systems. (3) F, S
Emphasizes interventive problem solving from systems perspective, incorporating traditional methodologies used with individuals, small groups and community. Prerequisites: Social Work major and SWU 271, 291, 301, 310.

411 Social Work Practice III - Settings. (3) F, S
Content focused on student's field placement (public welfare, rural, medical, etc.). Prerequisites: Social Work major and SWU 271, 291, 301, 310, 410.

412 Field Instruction I. (6) F, S
Sixteen hours a week of supervised practice in an approved placement. Prerequisites: Social Work major and SWU 271, 291, 301, 310, 410, concurrent enrollment in 411.

414 Field Instruction II. (6) F, S
Sixteen hours a week of supervised practice in an approved placement. Prerequisites: Social Work major and SWU 271, 291, 301, 310, 410, 411, 412.

420 Practice-Oriented Research. (3) F, S
Application of scientific principles to field practice, problem formulation, intervention procedures and impact assessment. Prerequisite: an approved course in data analysis techniques or equivalent.

432 Social Policy and Services II. (3) F, S
Contemporary social, political, and economic issues. Special emphasis on poverty and inequality in the Southwest. Analysis and developent of social welfare policies and programs. Prerequisites: Senior standing and SWU 271, 291, 331.

474 Ethnic/Cultural Variables in Social Work. (3) F, S
A basic conceptual approach to understanding ethnic/cultural variables of Southwestern ethnic minorities and how these factors intervene in social work practice.

Special Courses: SWU 484, 494, 498, 499, 590. (See pages 32-33.)

Master of Social Work

The Master of Social Work program prepares professional social workers for direct practice, administration, and community practice. The program puts major emphasis on preparing social workers capable of responding effectively to the needs of special populations in the Southwest - the ethnic minority groups of the region, the aged, and rural populations - in its curriculum and its practicum assignments. The M.S.W. program is accredited by the Council on Social Work Education.

Program of Study

The standard program consists of 60 hours including both classroom instruction and field practicum. It is divided into a foundation year and a specialization year. During both years, students spend two days a week in a practicum setting. The foundation curriculum is the same for all students and must be completed prior to entering the specialization year. Major conceptual frameworks used include systems theory, the dual perspective (an approach to understanding the cultural components of human behavior), and the problem-solving

process. The following are the required foundation courses:

SWG	501, 502	Human Behavior in the Social Environment I, II	6
SWG	510, 511	Direct Practice I, II	6
SWG	520	Practice Oriented Research	2
SWG	531, 532	Social Policy and Services I, II	4
SWG	580, 581	Social Work Organizational and Community Problem Solving	6
SWG	515, 516	Field Practicum I, II	8
			32

In the second (specialization) year students concentrate in either Direct Practice or Planning, Administration and Community Practice. In addition, the student chooses a specialization in Health and Mental Health, Family and Child Welfare, Rural Social Work, or Social Work with the Aged. The practicum, field research project, and two required courses (SWG 601 Human Behavior in the Social Environment III and SWG 631 Social Policy and Services III) are directly related to the specialization. The following are the specialization year courses:

Semester Hours

SWG	601	Human Behavior in the Social Environment III	2
SWG	610, 611	Direct Practice III and IV *or*	6
SWG	680, 681	SW Planning Administration and Community Practice III and IV	
SWG	613	Philosophical Issues in Social Work Practice	2
SWG	620, 621	Field Research I, II	4
SWG	631	Social Policy and Services III	2
SWG	615, 616	Advanced Practicum/Direct Practice I, II *or*	8
SWG	617, 618	Advanced Practicum/SW PACP I, II	
		Electives selected from offerings at the School of Social Work or courses offered through other departments with the approval of student's advisor.	4
			28

Academic Standing and Curriculum Sequencing. In order to remain in good academic standing, the student must maintain an overall GPA of 3.00 at the end of each semester. Most courses in the program are

sequential; successful completion of the prior course in the sequence is required to enroll in the following course. Students may not enroll in any second year required courses until all foundation courses have been successfully completed.

Southern Arizona Component. All foundation year courses, as well as the second field practicum are available in Tucson to a limited number of students. For application to the Southern Arizona Component, follow the admissions procedures outlined below.

Part-Time Program. A limited number of students are admitted each year to a planned part-time program. Students interested in this option must specifically apply to the part-time program. This program is completed in three academic years, with the first two on a part-time basis, and the final year on a full-time basis.

Advanced Standing Program

Advanced standing admissions to the graduate program may be granted to a limited number of applicants, who have completed the B.S.W. degree from a social work program accredited by the Council on Social Work Education, and who meet the general admissions requirements. In addition, the applicant must have achieved proficiency in the knowledge and practice skills covered in the foundation year curriculum. This proficiency may be demonstrated by their record of academic excellence and at least two years of full-time, paid, social work or related experience.

Non-B.S.W. candidates may be considered for advanced standing admissions provided they have all the above requirements plus at least five years of social work or related employment including administrative and supervisory experience and have demonstrated community leadership skills. Additional information specifically documenting proficiency of knowledge and skills may be required by the admissions committee.

Deadline for applying for advanced standing admission is February 1. All students in advanced standing are required to carry a full-time program. Students admitted to the advanced standing program will complete designated courses during the summer (10 semester hours) and will then enter the advanced year of study in the following Fall semester.

Individuals applying to the program who are not approved for advanced standing automatically are considered for admission to the regular two year program.

Admissions Requirements

Admission to the graduate program in social work requires completion of all admission requirements and procedures set forth by the Graduate College (see *Graduate Catalog*), and the following additional requirements: 1) test scores from the Graduate Record Examination or the Miller Analogies Test, 2) motivation to pursue professional social work education, and 3) evidence of successful work experience in human services. Successful experience in working with persons from the culture of the Southwest is desirable. All students are expected to complete a course in statistics prior to enrollment in the graduate program.

Applications to the M.S.W. program are accepted from November 1 to March 1 preceding the Fall semester to which the applicant is seeking admission. All applicants, except students applying for advanced standing, are reviewed for admission for the Fall Semester only.

Application Procedure. The following should be submitted to the Admissions Office, Graduate College, Arizona State University, Tempe, Arizona 85287: The application for admissions to the Graduate College, two transcripts from each institution where the applicant has attended previously, test scores from either the Graduate Record Examination or the Miller Analogies Test.

The following should be submitted to the Admissions Committee, Graduate Program, School of Social Work, Arizona State University, Tempe, Arizona 85287: 1) application to the Graduate Social Work Program, 2) statement of educational and career goals in sufficient detail to indicate compatibility with the educational objectives and capabilities of the School of Social Work, and 3) three letters of reference. The reference letter forms provided by the School of Social Work must be used.

Transfer Credit. Upon recommendation of the Admissions Committee, the first year of graduate study (up to 30 graduate semester hours) earned at another CSWE-accredited school of social work may be transferred toward the M.S.W. degree. A full report from

the school at which the credit was obtained is required.

A maximum of 10 graduate semester hours earned as an unclassified student in the ASU School of Social Work may be transferred. Up to four semester hours of prior graduate work in another ASU program or another university may transfer as elective credit. A combination of credit earned as an unclassified student in other programs or universities may not exceed 10 semester hours.

Consideration for acceptance of prior graduate credits must be applied for at the time of admission. The grades for all transfer credit must be a B or better.

Waiver Exams. The number of hours required to complete the M.S.W. degree ranges from 40 to 60 semester hours, with 60 credits representing the standard program. Admitted students may acquire credits toward the degree by: a) transferring in credit (see policy on transfer credit) or b) waiving up to 20 hours of foundation course work as a result of successfully passing examinations offered in August of the year of the student's initial entry in the Graduate Program. Waiver examinations are available for all foundation level courses.

With the exception of students transferring in the first year of graduate study from an accredited graduate program in social work, no student may be exempted from more than 20 credits of course work by either examination or a combination of transfer credit and examination. In the event that the student passes examinations in more than 20 credits of course work, the student will replace waived required courses with elective course work to complete the requisite 40 hours.

Financial Aid. University scholarships, fellowships, and financial aids are available as outlined in the *Graduate Catalog.* In addition a limited number of Trainee Stipends are available through the School of Social Work. The funding sources of these awards require interest and commitment to practice with specific populations such as mental health services to Chicanos and Yaqui Indians, rural residents, and Native Americans. These stipends are awarded on the basis of academic scholarship, financial need and career goals. Application for the Trainee Stipends should be submitted to the School of Social Work by March 1.

SOCIAL WORK (SWG)

SWG 501 Human Behavior in the Social Environment I. (4) F; Brand, Hall, Leyba, Red Horse, Woodman
Human behavior from birth through adolescence using dual perspective and social systems constructs and social science theory.

502 Human Behavior in the Social Environment II. (2) S; Brand, Leyba, Red Horse, Woodman
Completes study of the life cycle from adolescence through senescence within the dual perspective, social systems, and social science frameworks. Prerequisite: SWG 501.

510 Direct Practice I. (3) F; Fausel, Magel
Basic social work methods with an emphasis on the problem-solving process as it pertains to individuals, families and small groups. Prerequisite: Social Work major; concurrent enrollment in SWG 515.

511 Direct Practice II. (3) S; Fausel, Magel
Continuation of interventive techniques with individuals, families and small groups. Prerequisite: Social Work major, SWG 510, concurrent enrollment in SWG 516.

515 Field Practicum I. (4) F; Staff
Sixteen hours a week integrated practicum/seminar. Supervised practice in an approved placement. Prerequisites: Social Work major, and concurrent enrollment in SWG 510.

516 Field Practicum II. (4) S; Staff
Sixteen hours a week integrated practicum/seminar. Supervised practice in an approved placement.
Prerequisites: Social Work major, SWG 515, concurrent enrollment in SWG 511.

520 Practice-Oriented Research. (2) S; Montero, Montiel
Accelerated course in application of scientific principles to field practice, problem formulation, intervention procedures and impact assessment. Prerequisites: Social Work major and an approved course in statistics.

531 Social Policy and Services I. (2) F; Cranmer, Coudroglou, Lundberg, Nichols
Advanced conceptual, analytical and historical perspectives in social welfare institutional policies, services and the social work profession. Emphasis on women and minority issues in the Southwest.

532 Social Policy and Services II. (2) S; Cranmer, Coudroglou, Lundberg, Nichols
Political, socio-economic, ideological forces/issues affecting policy formulation. Emphasis on policy analysis and agenda-building. Attention to public policies and the issues of poverty and inequality in the Southwest.
Prerequisite: SWG 531.

580 Social Work Organizational Problem Solving. (3) F; Daley, DeGraw, Kettner, Nichols
Introduces logic, rationale and specific steps of the problem-solving process as applied at the group and organizational levels.

581 Social Work Community Problem Solving. (3) S; Daley, DeGraw, Kettner, Nichols
Stresses the technical and interactional aspects of problem solving at the community level including the professional use of self in a variety of roles. Prerequisite: SWG 580.

591 Seminar. (1-3) F, S; Staff
Courses offered in specialized areas.

601 Human Behavior in the Social Environment III. (2) F; Aldridge, Brand, Coudroglou
Descriptive and analytic study of human behavior in organizations and communities. Multiple specialized sections may be taken concurrently or repeated for credit. Prerequisites: SWG 501, 502.

610 Direct Practice III. (4) F; Fausel, Hill
Refine and integrate knowledge, skills and attitudes provided in basic social work methods.

611 Direct Practice IV. (2) S; Fausel, Hill
Continuation of 610. Multiple specialized sections may be taken concurrently or repeated for credit. Prerequisite: SWG 610.

613 Philosophical Issues in Social Work (2) S; Aldridge, Coudroglou, Hill
Major professional practice concerns, issues, societal, ethnic, cultural and professional values regarding student's specialization. Social work/social welfare institutions' philosophical assumptions, objectives and practice.
Prerequisite: Social Work major.

615, 616 Advanced Practicum/Direct Practice I, II. (4,4) F, S; Staff
Two consecutive semesters in social work practice in an approved placement related to student's specialization.
Prerequisites: Social Work major, SWG 510, 511, 515, 516, concurrent enrollment in SWG 610 and 611.

617, 618 Advanced Practicum Planning/SW Administration and Community Development I, II. (4,4) F, S; Staff
Two consecutive semesters in social work practice in an approved placement related to student's specialization.
Prerequisites: Social Work major; SWG 510, 511, 515,

516, 580, 581, concurrent enrollment in SWG 680 and 681.

620, 621 Field Research I and II. (2,2) F, S; Montero, Montiel
Individual or group projects on one of four options: A) Policy Oriented Research. B) Knowledge Assessment for Practice. C) Knowledge Building-Empirical Research on a Human Services Problem. D) Program Evaluation. Prerequisites: Social Work major and SWG 520.

631 Social Policy and Services III. (2) S; Cranmer
Advanced analysis of the history, institutions, current legislation and policy issues related to selected areas of focus (social work fields of practice). Multiple specialized sections may be taken concurrently or repeated for credit.
Prerequisites: SWG 531, 532.

664 Community Mental Health. 2) N; Staff
The seminar examines theory development in community mental health practice with individuals, groups and communities as well as the linkages among these elements.

665 Substance Abuse. (2) N; Staff
Psychological and socio-cultural determinants of substance abuse. Overview of social policies and treatment approaches.

670 Group Process in Social Work. (2) N; Hill, Magel
Application of small group theory/group dynamics knowledge to social work practice. Understanding and application of small group theory in worker/group member roles.

671 Evaluation of Human Services Programs. (2) N; Staff
Alternate models for evaluating human services programs: corrections, education, health, manpower, and welfare.
Prerequisite: SWG 620 or equivalent.

672 Psychopathology. (2) N; Staff
Concepts of personality development stress/interferences with developmental process, possible outcomes. Human pathology/interpersonal/intrapersonal dynamics. Systems supporting mental health and/or contributing to mental illness. Prerequisite: SWG 501 or approval of instructor.

673 Humanistic Concepts for Social Work Practice. (2) N; Staff
Application of perceptual/humanistic/existential concepts to social work practice. Third force psychological constructs their impact upon human services; the helping process.

680 SW Planning, Administration and Community Development III. (4) F; Kettner
Program planning and administrative knowledge and skills, including needs assessment, objective setting, program design, evaluation and fiscal management.

681 SW Planning, Administration, and Community Development IV. (2) S; Daley, Kettner
Specialized sections will stress planning practice, administrative practice and community development with Arizona's cultural groups, including practice in rural areas. Multiple specialized sections may be taken concurrently or repeated for credit.

Special Courses: SWG 584, 590, 591, 594, 598, 690. (See pages 32-33.)

Graduate College

Charles M. Woolf, Ph.D.
Dean

The functions of the Graduate College at Arizona State University are to provide the student with opportunities for study beyond the bachelor's degree and to foster the spirit of scholarship and research. Graduate programs are offered through the Graduate College by faculty who are affiliated with departments, centers, schools, colleges, and committees. The Graduate Council is responsible for establishing general policies for the development, maintenance, and review of graduate programs, and for the admission of students to these graduate programs. The Dean of the Graduate College administers these policies and promotes high quality training in all graduate programs. The Dean of the Graduate College does this in concert with deans, chairpersons, and directors of all academic units. The Appeals Board of the Graduate Council acts as the appeals body for graduate students seeking redress on academic decisions regarding their graduate program.

Graduate degrees obtained through the Graduate College are awarded upon the recommendation of the faculty offering the graduate degree programs.

A graduate degree program is defined as a specific degree title (such as M.B.A., M.S., or Ph.D.) and a major (such as Business Administration, Geology, or Mechanical Engineering). A major may consist of more than one concentration. A graduate degree program must be approved by the Arizona Board of Regents before it can be offered by the faculty at Arizona State University. Following the policy statements of the Council of Graduate Schools in the United States, graduate programs are characterized as being primarily research-oriented or professionally-oriented.

The following research-oriented graduate degrees can be obtained through the Graduate College:

Master of Arts (M.A.)
Master of Science (M.S.)
Doctor of Philosophy (Ph.D.)

Programs leading to the M.A. and M.S. degrees should give at least an introduction to research. These programs are often preparatory to Ph.D. degree programs. The Ph.D. degree is the highest university award given to candidates who have proven their ability by scholarship and original research in their chosen fields.

A major requirement for the Ph.D. degree is the submission of a dissertation. The Ph.D. dissertation should be a valuable educational experience which demonstrates the candidate's mastery of research methods and tools of the discipline. It should demonstrate the candidate's ability to address a major intellectual problem and to propose meaningful questions and hypotheses. It should be a contribution to knowledge that is worthy of publication by an established press as a book or monograph, or as one or more articles in a reputable journal.

Professional graduate programs emphasize training leading to professional practice. The degrees are awarded upon evidence that the candidate has command of a comprehensive body of knowledge and has the ability to organize and carry out significant investigations in the professional field. Professional master's degrees are usually named "Master of (Professional Field)." Professional doctor's degrees are named "Doctor of (Professional Field)." An additional graduate professional degree available through the Graduate College is Education Specialist. The professional doctor's degree is the highest university award

given in recognition of the completion of academic preparation for professional practice. The following professional graduate degrees can be obtained through the Graduate College:

Master of Accountancy
Master of Business Administration
Master of Counseling
Master of Education
Master of Environmental Planning
Master of Fine Arts
Master of Health Services Administration
Master of Music
Master of Natural Science
Master of Public Administration
Master of Quantitative Systems
Master of Science in Engineering
Master of Social Work
Master of Technology
Education Specialist
Doctor of Business Administration
Doctor of Education
Doctor of Musical Arts
Doctor of Public Administration

The faculty offering a specific graduate degree program may be affiliated with a single academic unit, such as a department, center, school, or college. An interdisciplinary graduate degree program may be offered by faculty belonging to different academic units.

For information concerning graduate degree programs offered at Arizona State University, please refer to the *Graduate Catalog.*

Admission to Graduate College

A student who has earned a baccalaureate or graduate degree granted by a college or university recognized by Arizona State University may apply for admission to the Graduate College. All decisions on admissions are made without regard to sex, creed or ethnic origin. Application forms may be obtained by writing to the Admissions Office, Graduate College.

At least two months before the first enrollment, the Graduate College should have received the application for admission and two transcripts of all undergraduate and graduate work. The faculty of the academic units (department, center, school, college, or committees) offering specific graduate degree programs may have earlier application deadlines than the Graduate College and additional admission requirements. Applicants are ad-

vised to check with individual academic units regarding application deadlines and admission requirements.

The submission of a score or scores on an academic aptitude test is strongly recommended for all applicants and is required for admission to some graduate programs. An applicant should refer to the admission requirements of a specific graduate program to determine which academic aptitude test, if any, should be taken.

The application for admission, the applicable test scores, and the transcripts are all to be sent directly to the Admissions Office, Graduate College. The transcripts are to be sent to the Admissions Office by the registrar of each college or university which the applicant previously attended. The applicant should write to the registrars concerned and then allow them time to process and mail the transcripts. A qualified applicant whose application has been filed later than the deadline may be permitted to enroll in graduate classes as a nondegree student. The student will maintain that status until all required forms and transcripts have been received and a decision regarding admission to a program has been reached by the Graduate College.

A student's official status for a semester is determined by his/her status at the end of that semester.

All documents received by the University in connection with such applications for admission become the property of Arizona State University. Under no circumstances will they be duplicated, returned to the applicant, or forwarded to any agency or other college or university. Admission documents of applicants who do not enroll in the University may be destroyed after one year.

Letters of recommendation should be sent directly to the academic unit in which the student wishes to study. In all instances, the academic unit must indicate its willingness to admit the student. All applications for admission must be approved by the Dean of the Graduate College. An academic unit may set standards higher than those established by the Graduate College and may recommend denial of a student whose academic record is superior to the minimum requirements described below.

Applicants may be admitted to a graduate program under two classifications:

Regular Admission. Applicants must be acceptable to both the Graduate College and the

academic unit in which the applicant plans to study. Among other considerations for acceptance by the Graduate College, the applicant must have a grade point average of 3.0 (4 point scale) in the last two years of work leading to the bachelor's degree. The applicant's score on an aptitude examination, such as the Graduate Record Examination, Miller Analogies Test, or the Graduate Management Admission Test, may also be considered in making decisions regarding admission. Applicants should check with the academic unit of their intended study to determine specific requirements.

Provisional Admission. Applicants may be granted provisional admission to the Graduate College if the Graduate College or academic unit in which they plan to study requires additional evidence of their qualifications for admission with regular status. No student may maintain provisional status indefinitely. Normally, final determination of status will be made by the time the student has completed 12 hours of approved graduate study. If applicants have extensive deficiencies, they may be advised to enroll in selected undergraduate courses.

Nondegree Status. An applicant with an undergraduate degree who is not pursuing a graduate degree program may apply for nondegree status in the Graduate College. Before enrolling, he/she must submit a request for registration materials to the Graduate Admissions Office.

International Student Admission. Applicants from foreign countries should write to the Admissions Office, Graduate College at least one year prior to the date they plan to begin study. They will receive the necessary instructions and application blanks which are to be completed and returned to that office. Applicants should make sure that other documents are sent at about the same time, especially transcripts from colleges and universities attended, letters of recommendation, and results of the Test of English as a Foreign Language (TOEFL).

Prospective international students should not make plans to leave their country until they have received notification of admission. Ordinarily such a statement regarding admission is required before the student can be issued a passport or visa.

Re-entry to the Graduate College. Any former graduate student who has not been in attendance at Arizona State University for

one or more semesters must obtain an application for re-entry from the Admissions Office, Graduate College. This application should be submitted at least one month prior to the beginning of the semester in which the student plans to re-enter. Official transcripts of any additional work taken elsewhere that will be used on a program of study must be sent directly to the Admissions Office, Graduate College, at Arizona State University, from the Office of the Registrar at the institution where such credit was earned. It is recommended that the returning graduate student contact the Graduate College for a review of his or her status.

Student Responsibility. It is the responsibility of the graduate student to become conversant with and observe all procedures and requirements of the Graduate College as defined in the *Graduate Catalog,* and to be familiar with the University's policy regarding student conduct as described in the section "Student Membership in the University" of the *General Catalog.* Students should be particularly informed about the general regulations concerning the degree they plan to take and any special requirements within the department or academic unit.

Registration. Graduate students register during the intervals indicated in the *Graduate Catalog* calendar. Details regarding registration procedures are given in the *Schedule of Classes.* Day and evening graduate classes, offered on or off campus, during the two regular semesters and the summer sessions are considered part of the regular program.

Auditing. Graduate students may register as auditors in one or more courses with the approval of the supervisory committee chairperson and the consent of the instructor involved. Audited courses are included in the student's load. Audit enrollment cannot be changed to credit enrollment nor credit enrollment to audit enrollment after the close of the drop-add period.

Change in Graduate Degree Program. A change from one graduate degree program to another requires readmission. After students have notified the Graduate College that they wish to apply for a new graduate degree program, the usual admission procedures will be followed.

Graduate Course Enrollment by Undergraduates. Undergraduate students may enroll in graduate courses with the approval of

their advisor, the course instructor, the chairperson of the department, and the Dean of the College offering the course. If the course is not used to meet an undergraduate graduation requirement, it may be eligible for use in a future graduate program on the same basis as work taken by a nondegree graduate student.

Course Load. The course load is determined by the supervisory committee but is not to exceed 15 semester hours of credit during each of the two regular semesters, 6 semester hours of credit during each five-week summer session, or 9 semester hours of credit during an eight-week summer session. At the graduate level, course work, whether or not formal in nature, serves mainly as a guide for independent study. Students are expected to exceed minimum requirements and to master subjects rather than simply to pass courses. All graduate students doing research, or working on theses or dissertations, taking comprehensive or final examinations, or who are using university facilities or faculty time, must be registered for a minimum of one hour of appropriate graduate level credit in the department in which they are pursuing their degree program.

Scholarship. Academic excellence is expected of students doing graduate work. A student who is not progressing satisfactorily may be withdrawn from the degree program by the Dean of the Graduate College upon the recommendation of the head of the academic unit concerned.

The grading system applicable to graduate courses is as follows:

A—Excellent (4.0)	Y—Satisfactory
B—Good (3.0)	W—Withdrawal
C—Passing (2.0)	I—Incomplete
D—No Graduate	X—Audit
Credit (1.0)*	E—Failure (0.0)**

*Cannot be applied toward a graduate degree but is included in calculation of grade point average.

**An E grade is calculated in the grade point average.

To be eligible for a degree in the Graduate College, a student must achieve a grade point average of "B" (3.0) or better in all work taken for graduate credit, exclusive of deficiencies, and in all work specifically included in the program of study. Grades below "C" cannot be used to meet the requirements for a graduate degree, although they are used to compute the grade point average. Grades on transfer work will not be included in computing grade point averages. Graduate course work reported "Incomplete", other than research applied project, thesis and dissertation, must be completed within one year of the official ending of the course. If a grade of "Incomplete" ("I") is not removed within one year, it becomes part of the student's permanent record.

Students receiving a grade of "D" or "E" must repeat the course in regular class if they wish to include it in their program of study.

The mark of "W" is given in a course whenever a student (1) officially drops from a course or officially withdraws from the University during the first six weeks of the semester; (2) officially drops a course or officially withdraws from the University after the first six weeks only if passing at the time of withdrawal. No one will be permitted to withdraw officially from the University or conduct any registration transaction in the last two weeks of the semester.

Graduate Credit Courses. Courses at the 500, 600, and 700 level are graduate credit courses; however, courses at the 400 level will apply to graduate degree requirements when appearing on an approved program of study.

Correspondence Courses. Correspondence courses cannot be used to meet the requirements for a graduate degree.

Transfer Credit. A maximum of 6 semester hours of resident graduate credit taken at other institutions may be transferred for credit toward a 30 hour master's degree. When more than 30 hours is required for the master's degree, the number of transferable hours is prorated, with 12 hours being the maximum for a 60-hour master's degree. If the courses were used for a master's degree, up to 32 semester hours may be transferred for a 60-hour master's degree, upon the recommendation of the supervisory committee and the approval of the Dean of the Graduate College. Refer to specific degree programs for additional information.

In the Education Specialist and doctoral programs, credits from recognized institutions may be transferred provided they are recommended by the supervisory committee and approved by the Dean of the Graduate College.

Transferred courses must be acceptable toward graduate degrees at the institution where the courses were completed. No courses taken for extension credit may be transferred.

Only courses with an A or B grade may be transferred. Transfer credit will not be given for courses in which a grade of Pass, Credit, or Satisfactory was received. Grades on transferred credit cannot be included in the grade point average.

Foreign Language Requirement. A specific graduate degree program may have a foreign language requirement. If a foreign language is required, students must demonstrate at least a reading knowledge in their area of study of a language which is recommended by their supervisory committee and consistent with the requirements for the graduate degree program. Normally these will be selected from French, German, Russian, or Spanish, although other languages may be recommended when there is adequate justification.

Language competency is certified by the Department of Foreign Languages only upon satisfactory performance on a foreign language examination specific to the particular graduate program in which the student is enrolled. The examinations are administered three times each year by the Department of Foreign Languages. Students planning to take the examination must register at least one month in advance of the examination date in the Graduate College. The chairperson of the supervisory committee has the responsibility to provide the Department of Foreign Languages with materials from which the examination will be prepared. The chairperson of the supervisory committee should submit or recommend relevant books and/or journals in the desired foreign language of approximately 200 pages in length. The student must pass the examination in no more than three attempts.

The Department of Foreign Languages offers elementary courses (as justified by enrollment) to assist graduate students in acquiring the language skills necessary to pass these examinations. The student should consult the Department of Foreign Languages for information on these courses.

Format for Theses and Dissertations.
Copies of the *Guide to Preparation of the Master's Thesis, Applied Project, or Doctoral Dissertation* are available in the Graduate College. A careful review of this document well in advance of the preparation of the manuscript is strongly recommended. Format evaluation of the final copy must be obtained prior to its submission to the Graduate College for the oral defense. Graduate students and their supervisory committees are encouraged

to select a style manual or journal format representative of the field of study. The Graduate College prefers to allow maximum flexibility in the format of the manuscript, but certain Graduate College and library regulations must be followed. Format evaluation is not required of master's students submitting thesis substitutes in fulfillment of their research requirement.

Graduation. Students should apply for graduation no later than the date specified in the *Graduate Catalog* calendar. All fees are payable at that time. Students applying for graduation after the deadline listed in the *Graduate Catalog* calendar will be required to pay a late fee. At the end of the semester in which they apply for graduation, students will be officially notified of any requirements for their degree which they have not yet completed. Students who do not complete by their anticipated graduation date will be required to pay a refiling fee.

Summer Session. Work taken during the Summer Sessions carries the same scholastic recognition as that taken during the regular semester. A complete schedule of offerings is available in the summer bulletins, which may be obtained from the office of the Dean of Summer Sessions.

Dates and Deadlines. The University calendar found in the current *Graduate Catalog* lists deadlines for the submission of theses and dissertations to the Graduate College, the last day to apply for graduation, and the last day to hold an oral defense of a thesis or dissertation.
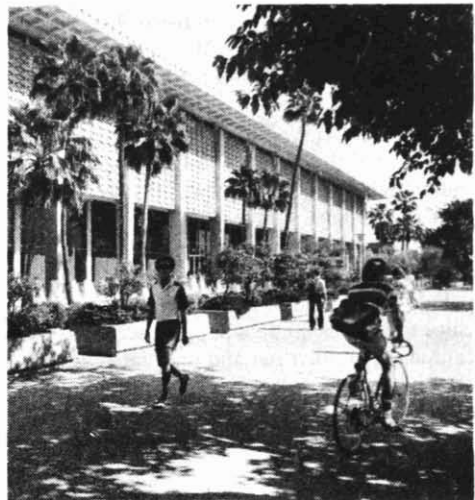
University Continuing Education and Summer Sessions

Denis J. Kigin, Ed.D.
Dean and Director

University Continuing Education

The office of University Continuing Education serves as the academic service arm of the University in providing the opportunity for off-campus continuing education. The following services are available: off-campus courses for academic credit, correspondence study, community services, non-credit courses, instructional television, international education, and assistance in the development and administration of conferences.

Off-Campus Courses

As a convenience to students, off-campus courses are organized and scheduled in locations conducive to enrollment. Principal among these locations are two classroom facilities on the west side of the Phoenix metropolitan area.

ASU/Metrocenter is located in a major shopping mall immediately adjacent to the Black Canyon Freeway between Dunlap and Peoria Avenues. Headquarters for registration for all off-campus courses is at this facility. The information phone number is 943-0306. The mailing address is: ASU/Metrocenter, 9615 Metro Parkway West, Phoenix, Arizona 85021.

The ASU/Alhambra classroom facility is located at 37th Avenue and Campbell between Indian School and Camelback Roads. The information phone number is 279-5484. The mailing address is: ASU/Alhambra, 4510 N. 37th Avenue, Phoenix, Arizona 85019.

Full-time offices are maintained at each facility to provide student support services. Off-campus upper division and graduate courses offered by most colleges on campus are available on both day and evening schedules.

The quality of instruction governing credit courses offered off campus is maintained at the same level as those courses offered on campus and is equivalent in all academic considerations. Credits earned off campus will be recorded on a student's permanent record in the same manner as those earned on campus and both will be equivalent in all academic considerations. Admission to and prerequisite requirements for a credit course must be the same whether the course is taught on or off the University campus. Identification of course content, method of instruction and evaluation, and selection and appointment of instructors for off-campus courses remain the prerogative of the appropriate academic department with subsequent approval of the Dean of the College.

The fee for off-campus courses is $36.00 per semester hour. Full-time students (students registered for 7 or more hours through on-campus registration) may register for *off-campus resident credit* courses without the payment of additional fees. Any combination of *on-campus and off-campus resident credit courses* resulting in a combined registration of 7 or more semester hours requires that the student pay full-time, in-state registration fees, or full-time out-of-state registration fees and the appropriate tuition (see pages 27-28). Full-time students who have paid registration fees and tuition (7 or more semester hours) *must also pay additional fees* if they enroll in off-campus credit courses that commence after the 21st calendar day of the start of each semester.

Correspondence Study

College credit correspondence courses offered by Arizona State University are specifically designed for the student unable to attend classes in person. They are offered for those who are seeking to fulfill degree objectives as well as for those who wish to increase their occupational, professional and intellectual skills.

Persons desiring to enroll in correspondence study should write to the Correspondence Study Office, University Continuing Education, for an enrollment form and a brochure listing the courses available. Students intending to resgister for a correspondence course, who are already enrolled for six hours or more in residence, must first obtain approval of the Dean of the College in which they are enrolled. Correspondence study courses may not be utilized to make up for the deficiency of a failing grade.

A correspondence course generally consists of eight lesson assignments for each semester hour of credit and usually entails a commensurate amount of effort as a classroom course. Eight to ten hours are normally required preparing each assignment.

Students are limited to one correspondence study course initially, with the expectation of completing a course within a calendar year. However, when one-half the lessons are completed in the initial enrollment, enrollment in a second course is possible. Students are limited to a maximum of two correspondence courses at any one time.

A maximum of 30 semester hours of credit earned in correspondence and/or by comprehensive examination may be applied toward the baccalaureate degree at Arizona State University. Correspondence courses are not applicable as graduate credit toward advanced degrees.

The fee for correspondence courses is $20.00 per semester hour of credit and is payable at the time of registration. This is an additional fee required of full-time students who have paid registration fees and tuition. Cooperating teacher credit bank hours and faculty-staff permits are not applicable to correspondence study fees.

Admission to Off-Campus and Correspondence Courses Programs. A student

may enroll in an off-campus or correspondence course without making formal application for admittance to the University or to degree candidacy. High school seniors may enroll in off-

campus or correspondence courses under the provisions as stated for Conditional Admission Prior to Graduation from High School. (See page 19.)

Community Services

The Community Services Program is designed to bring the resources of the University—its faculty, staff, students, and facilities—to bear on the problems of the disadvantaged and the community. Administered through University Continuing Education, the program is designed to assist other community agencies and individuals in developing and coordinating programs.

Instructional Television Services

Television is a convenient, effective and efficient educational delivery system. Through television, it is possible to deliver selected educational opportunities to the adult population of Arizona. Instructional Television Services uses television as an educational delivery system capable of turning homes, businesses and schools in rural and urban communities into learning environments.

Non-Credit Continuing Education

Arizona State University recognizes its responsibility for providing effective continuing education activities. These activities, coordinated through the Office of University Continuing Education, are educational in nature and in conformance with established University regulations and policies. All non-credit continuing education activities are sponsored by an academic department, college, or other approved agency of the University. Activities may be co-sponsored or conducted in cooperation with outside agencies or groups when there is internal University involvement and control and the purpose of the activity is educational.

The Office of University Continuing Education provides operating assistance, encourages program development, and coordinates all continuing education activities sponsored by University administrative units and departments.

English Skills

The English Skills Program features an intensive, non-credit course of study designed for adult international students who desire to become proficient in English as a second language for academic, professional, and/or personal reasons. Applicants must be not less than 18 years of age and must possess a high school diploma or its equivalent. All conditions

of the United States Immigration and Naturalization laws pertaining to full-time study in the United States must be met by all applicants. Beginning students are required to take an English placement test prior to the beginning of classes. Certificates of achievement are awarded on completion of the course. Admission to the program does not constitute regular admission to Arizona State University.

Beginning, intermediate, and advanced level courses provide instruction in grammar, pronunciation and speaking, listening comprehension, writing and composition, and reading and vocabulary. Academic advising and orientation to Arizona and the United States are integral parts of the program. Several program-wide social activities are scheduled each term.

The Fall and Spring Semesters are divided into two 7½-week cycles. Students may enroll for one or more cycles of study. A ten-week summer session of study is also offered. Inquiries concerning admission requirements, enrollment and fee schedules should be directed to the Dean of University Continuing Education, Academic Services Building, Room 110, Arizona State University, Tempe, Arizona 85287.

University Conference Services.

The Office of University Conference Services, coordinates on- and-off campus conferences, seminars and workshops sponsored by any administrative unit or academic department within the university. Working closely with each of the University's colleges, complete conference services and assistance to any campus group desirous of conducting an educational program or professional meeting are offered. Services include, but are not limited to, general conference planning, budgeting, site selection, promotion and publicity, hotel/motel liaison, and overall logistical support for any and all phases of the conference. The office also aids in the development of guidelines, checklists, and general operating procedures which serve to ensure coordination and smooth operation of continuing education activities sponsored by the various campus departments.

Summer Sessions

The Summer Sessions provide an opportunity for students to pursue academic work on a year-round basis. Course offerings are much the same as those of the academic year. Degree candidates, both graduate and undergraduate, as well as those seeking to enhance or to refresh their subject matter interests, will find a broad selection of courses available. All campus classes are held in air-conditioned classrooms and laboratories. Limited offerings are available in off-campus locations during the summer sessions.

The opportunity for international travel and study is available during the summer through selected study tours. These programs are directed by regular faculty members and allow students to earn graduate or undergraduate credit. The international study programs carry University credit with the approval of the academic department and college involved.

All summer programs are available to in-state residents as well as those from out of state. Professional conferences, institutes, workshops and seminars are also offered on campus during the summer.

Terms. There are three Summer Sessions; one of eight weeks and two of five weeks. The eight-week session and the first five-week session run concurrently.

Credit and Residence Requirements. Students are permitted to earn a maximum of 6 semester hours of credit each five-week session or 9 semester hours of credit in the eight-week session. With prior approval of the college, it is possible for a student to satisfy the University residence requirement by attending Summer Sessions. Students entering the University as freshmen are invited to begin their university work in the summer. They should, however, seek academic advisement before registering (see pages 20 and 22).

Undergraduate Enrollment. In general, applicants for admission are expected to present evidence of graduation from an approved four-year high school, or evidence of good standing in an accredited college. Students, 19 years of age or over, may be admitted as unclassified students without the above qualifications, but with the understanding that all University admission requirements must be satisfied before they can be admitted for a degree program (see page 20).

Graduate Study. Summer Sessions offer an excellent opportunity for baccalaureate degree holders to continue their professional development. Candidates for graduate degrees should pay particular attention to the requirements for graduate admission and study (see page 366 and the *Graduate Catalog*).

Fees and Expenses. The Summer Sessions fee is $36.00 per credit hour, which includes the student activity fee. Textbooks and supplies are available for purchase at the University Bookstore in the Memorial Union on campus. Room and board for the summer are available on campus at the prevailing rates.

Information. Requests for the Summer Sessions *Schedule of Courses* or for other information should be addressed to the Office of Summer Sessions at Arizona State University, Tempe, Arizona 85287.

Faculty, University Offices and Services

The faculty listed are involved in both graduate and undergraduate instruction. Year following name indicates first appointment. Emeriti are included.

Arizona Board of Regents

Ex Officio

Bruce E. Babbitt, B.A., M.S., J.D. .... *Governor of Arizona*
Carolyn Warner .... *Superintendent of Public Instruction*

Appointed

To January 1982	**To January 1984**	**To January 1986**
Rudy E. Campbell	Thomas Chandler, B.A., LL.B.	Esther N. Capin, B.A., M.Ed.
Dwight Patterson, B.A.	William G. Payne. B.A., M.A., M.D.	James F. McNulty Jr., LL.B.

To January 1988
William P. Reilly
Tio A. Tachias

Student Regent, To May 1981
Renee M. Marler

Charles D. Adams, LL.B. .... *Counsel to the Board*

Robert A. Huff, B.S., M.A., Ed.D. .... *Executive Director*

General Administration

J. Russell Nelson .... *President of the University; Professor of Finance*
  B.A., Pacific Union College; M.B.A., Ph.D., University of California, Los Angeles
Paige E. Mulhollan .... *Provost and Academic Vice President; Professor of History*
  B.S., B.A., M.A., University of Arkansas; Ph.D., University of Texas. Austin
George F. Hamm .... *Vice President, Student Affairs; Professor of Education*
  B.S., South Dakota State College; M.A., Ph.D., University of Wyoming
Jack G. Penick .... *Vice President, Business Affairs*
  B.S., University of Maryland; M.B.A., University of Alabama
Troy F. Crowder .... *Assistant to the President; Director, University Relations;*
  B.A., University of South Dakota;   *Associate Professor of Journalism and Telecommunication*
  M.A., University of Iowa
Guido G. Weigend .... *Dean, College of Liberal Arts; Professor of Geography*
  B.S., M.S., Ph.D., University of Chicago
Hugh Burgess .... *Dean, College of Architecture; Professor of Design History and Theory*
  B.S., University of Idaho; M.S., Columbia University
_____ .... *Dean, College of Business Administration*
Robert T. Stout .... *Dean, College of Education; Professor of Education*
  B.A., Carleton College; Ph.D., University of Chicago

C. R. Haden .... *Dean, College of Engineering and Applied Sciences;*
    B.S., Arlington State College;   *Director, School of Engineering; Director, Engineering Research Center;*
    M.S., California Institute of Technology; Ph.D., University of Texas   *Professor of Engineering*

Jules Heller .... *Dean, College of Fine Arts; Professor of Art*
    B.A., Arizona State University; M.A., Columbia University;
    Ph.D., University of Southern California

Alan A. Matheson .... *Dean, College of Law; Professor of Law*
    B.A., M.S., J.D., University of Utah

Juanita F. Murphy .... *Dean, College of Nursing; Professor of Nursing*
    A.B., Oklahoma Baptist University; M.S., Ph.D., Case Western Reserve University

Nicholas A. Henry .... *Dean, College of Public Programs; Professor of Public Affairs*
    B.A. Centre College; M.A., Pennsylvania State University; M.P.A., Ph.D., Indiana University

Ismael Dieppa .... *Dean, School of Social Work; Professor of Social Work*
    B.A., Sul Ross State College; M.S.S.W., Boston University; D.S.W., University of Southern California

Charles M. Woolf .... *Dean, Graduate College; Professor of Zoology*
    B.S., M.S., University of Utah; Ph.D., University of California, Berkeley

Denis J. Kigin .... *Dean, University Continuing Education;*
    B.S., Mankato State Teachers College;   *Director, Summer Sessions;*
    M.S., The Stout Institute; Ed.D., University of Missouri   *Professor of Industrial Technology*

Resident Faculty

Aannestad, Per (1975) .... *Assistant Professor of Astronomy/Physics*
    B.S., University of Oslo; Ph.D., University of California, Berkeley

Abraham, Willard (1953) .... *Professor of Education*
    B.S., Illinois Institute of Technology; M.Ed., Chicago Teachers College; Ph.D., Northwestern University

Acevedo, Roberto M. (1964) .... *Assistant Professor of Spanish*
    B.A., University of California, Berkeley; M.A., Ph.D., University of Arizona

Acharya, Raghunath (1976) .... *Assistant Professor of Physics*
    M.Sc., University of Delhi; Ph.D., University of Rochester

Acker, William J. (1970) .... *Associate Professor of Geography*
    B.S., Purdue University; M.S., University of Kansas; M.A., Ph.D., Syracuse University

Adams, Sheila (1979) .... *Assistant Professor of Management*
    B.S., M.B.A., University of Nevada, Reno; Ph.D., University of Washington

Adams, Vaughn P. (1968) .... *Associate Professor of Design Sciences*
    B.S., M.S., Arizona State University; Ph.D., Texas A & M University

Adelson, Roger D. (1974) .... *Associate Professor of History*
    B.A., George Washington University; M.A., Washington University;
    B.Litt., Oxford University; Ph.D., Washington University

Aguilar, John L. (1976) .... *Assistant Professor of Anthropology*
    B.A., University of California at Los Angeles; M.A., California State University at Los Angeles;
    Ph.D., University of California, San Diego

Ahern, Maureen V. (1972) .... *Associate Professor of Spanish*
    B.A., University of New Hampshire; Bachiller, Doctor en Letras, Universidad Nacional Mayor de San Marcos (Peru)

Ahmadzadeh, Akbar (1966) .... *Associate Professor of Physics*
    B.A., Ph.D., University of California, Berkeley

Aickin, Mikel G. (1976) .... *Assistant Professor of Mathematics*
    B.Sc., Ph.C., Ph.D., University of Washington

Akers, Lex A. (1980) .... *Associate Professor of Engineering*
    B.S.E.E., M.S.E.E., Ph.D., Texas Tech University

Akins, William H. (1975) .... *Associate Professor of Theatre;*
    B.A., Duke University; M.A., Ph.D., University of Denver   *Chair, Department of Theatre*

Alarcón, Justo S. (1968) .... *Associate Professor of Spanish*
    B.A., M.A. (Theol.), Serafica (Spain); M.A. (Sociology), Laval University (Canada);
    M.A. (Spanish), Arizona State University; Ph.D., University of Arizona

Albert, Marjorie A. (1974) .... *Assistant Professor of Nursing*
    B.S.N., Arizona State University; M.S.N., Texas Woman's University

Alcock, John (1972) .... *Professor of Zoology*
    B.A., Amherst College; Ph.D., Harvard University

Aldrich, Frank T. (1969) .... *Associate Professor of Geography*
    B.A., University of Texas; M.S., Ph.D., Oregon State University

Aldridge, Gordon (1978) .... *Professor of Social Work*
    B.A., M.A., M.S.W., University of Toronto; Ph.D., University of Michigan

Alexander, Robert J. (1975) .... *Assistant Professor of German*
    B.A., Macalester College; M.A., Ph.D., University of Wisconsin, Madison

Alisky, Marvin (1957) .... *Professor of Political Science*
    B.A., M.J., Ph.D., University of Texas

Allen, Theodore Jr. (1959) .... *Professor of Engineering*
    B.S.M.E., M.S.M.E., Texas A & M University

Altheide, David L. (1973) .... *Associate Professor of Sociology*
    B.A., Central Washington State College; M.A., University of Washington;
    Ph.D., University of California, San Diego

Altman, Michael L. (1972) .... *Professor of Law*
    A.B., Bowdoin College; LL.B., Boston College; LL.M., Harvard University

Alvarado, Ronald H. (1974) .... *Professor of Zoology; Chair, Department of Zoology*
    B.A., University of California, Riverside; M.S., Ph.D., Washington State University

Anderson, Bruce A. (1966) .... *Professor of Mathematics*
    B.A., M.S., Ph.D., University of Iowa

Anderson, Douglas A. (1979) .... *Assistant Professor of Journalism and Telecommunication*
    B.A., Hastings College (Neb.); M.S., Kearney State College (Neb.); Ph.D., Southern Illinois University

Anderson, Gary (1975) .... *Associate Professor of Education*
    B.S., M.Ed., Edinboro State College; Ph.D., University of Pittsburgh

Anderson, Mary R. (1974) .... *Associate Professor of Engineering*
    B.A., Hope College; M.S., Ph.D., University of Iowa

Anderson, Melvin S. (1967) .... *Associate Professor Emeritus of Real Estate*
    B.S., M.S., Oklahoma State University; Ed.D., University of Arkansas

Anderson, Paul M. (1980) .... *Invitational Professor of Engineering*
    B.S., M.S., Ph.D.; Iowa State University

Andress, Barbara L. (1972) .... *Professor of Music*
    B.A., M.A., Arizona State University

Appleton, Nicholas R. (1972) .... *Assistant Professor of Education*
    B.A., San Francisco State College; M.A., San Fernando Valley State College; Ed.D., University of Massachusetts

Aranda, Luis (1975) .... *Associate Professor of Administrative Services;*
    B.M., M.Ed., University of Arizona; J.D., Arizona State University   *Director, Small Business Institute*

Archer, Jerome W. (1963) .... *Professor Emeritus of English*
    B.A., M.A., Marquette University; Ph.D., Northwestern University

Arciniega, G. Miguel (1979) .... *Assistant Professor of Counselor Education*
    B.S., M.A., New Mexico State University; Ph.D., University of Arizona

Argulewicz, Edward N. (1980) .... *Assistant Professor of Education*
    B.A., Fordham University; M.Ed., Edinboro State College; Ph.D., University of Georgia

Armstrong, Robert L. (1967) .... *Professor of Education*
    B.A., State Teachers College of Iowa; M.S., University of Iowa; Ed.D., University of Arizona

Arner, Douglas G. (1959) .... *Professor of Philosophy*
    B.S., Creighton University; M.A., Ph.D., University of Michigan

Arnold, William E. (1973) .... *Professor of Communication*
    B.S., M.A., Northern Illinois University; Ph.D., Pennsylvania State University;
    Post Doctoral Fellow in Psychology, Florida State University

Aronson, Jerome M. (1966) .... *Professor of Botany*
  B.A., Ph.D., University of California, Berkeley
Arrington, C. Edward (1980) .... *Assistant Professor of Accounting*
  B.A., M.A., University of Southern Mississippi; D.B.A., Florida State University
Arterian Furnish, Hannah (1979) .... *Associate Professor of Law*
  B.A., Elmira College; J.D., University of Iowa
Ashe, Robert W. (1955) .... *Professor Emeritus of Education*
  A.B., M.A. in Ed., Arizona State University; Ed.D., University of Southern California
Ashoor, Samy H. (1980) .... *Associate Professor of Agriculture*
  B.S., University of Cairo; M.S., University of California, Davis; Ph.D., University of Wisconsin
Atsumi, Takayori P. (1968) .... *Professor of Music*
  B.F.A., Kunitachi Music College (Japan); M.M., New England Conservatory of Music
Autenrieth, Bertha (1946) .... *Professor Emeritus of Music*
  B.M., New England Conservatory; M.M., University of Michigan
Autore, Donald D. (1959) .... *Associate Professor of Engineering*
  B.S.E., University of Michigan; M.S.E., Arizona State University
Avery, James P. (1960) .... *Professor of Engineering*
  B.S.M.E., M.S.E.M., University of Michigan; Ph.D., Purdue University
Ax, Leland S. (1959) .... *Associate Professor Emeritus of Engineering*
  B.S.E., B.S.R.E., Tri-State College; M.S., Kansas State College
Axelrod, Morris (1972) .... *Professor of Sociology*
  B.A., Ph.D., University of Michigan
Axford, Roger W. (1975) .... *Associate Professor of Education*
  B.A., Nebraska Wesleyan University; M.A., Ph.D., University of Chicago

Backhaus, Ralph A. (1977) .... *Assistant Professor of Agriculture*
  B.S., Rutgers University; M.S., Ph.D., University of California
Backus, Charles E. (1968) .... *Professor of Engineering; Assistant Dean,*
  B.S.M.E., Ohio University; M.S., Ph.D., University of Arizona   *College of Engineering and Applied Sciences*
Baffi, Charles R. (1979) .... *Assistant Professor of Health Science*
  B.A., St. John's University; M.S., City University of New York; Ph.D., University of Maryland
Bagwell, Marilyn (1972) .... *Assistant Professor of Nursing*
  B.S.N., University of California, Los Angeles; M.A., Arizona State University;
  M.C.H., University of California
Bahr, Donald M. (1967) .... *Professor of Anthropology*
  A.B., M.A., Ph.D., Harvard University
Bailey, James E. (1974) .... *Associate Professor of Engineering*
  B.S.I.E., M.S.I.E., Ph.D., Wayne State University
Baker, Georgianne R. (1971) .... *Associate Professor of Home Economics*
  B.S., Marygrove College; M.S., Ohio State University; Ph.D., Michigan State University
Baker, Virgil R. (1966) .... *Professor Emeritus of Geography*
  B.S., M.S., University of Nebraska; Ph.D., University of Utah
Baldini, Pier Raimondo (1978) .... *Assistant Professor of Italian*
  B.A., San Francisco State University; M.A., University of British Columbia;
  Ph.D., University of California, Los Angeles
Bardewyck, Loretta A. (1957) .... *Professor Emeritus of Nursing*
  P.H.N., B.S., University of Minnesota; M.S., Cornell University
Bardrick, Richard A. (1956) .... *Associate Professor Emeritus of Psychology*
  A.B., Ph.D., University of California, Los Angeles
Barkin, Florence (1976) .... *Assistant Professor of Spanish*
  B.A., State University of New York, Albany; M.A., Ph.D., State University of New York, Buffalo
Barkley, Margaret V. (1963) .... *Professor Emeritus of Home Economics*
  B.S., Millikin University; M.S., Ed.D., University of Illinois

Barkson, Joseph A. (1958) .... *Professor Emeritus of Engineering*
    B.S.E.E., University of Michigan; M.S., Ph.D., University of Illinois
Barlow, Richard B. (1964) .... *Professor of History*
    B.A., M.A., Ph.D., University of Pennsylvania
Baroody, Wilson G. (1957) .... *Assistant Professor of English*
    B.A., Grand Canyon College; M.A., University of Arizona
Barrera, Manuel (1977) .... *Assistant Professor of Psychology*
    B.S., Wisconsin State University; M.A., Ph.D., University of Oregon
Barrett, Thomas W. (1950) .... *Professor Emeritus of Agriculture*
    B.S., Brigham Young University; M.S., Ph.D., Cornell University
Bartel, Carl R. (1968) .... *Professor of Industrial Technical Education; Assistant Dean,*
    B.S., M.S., Kansas State College of Pittsburg;   *College of Engineering and Applied Sciences*
    Ed.D., University of Missouri, Columbia
Bartz, Donna R. (1968) .... *Assistant Professor of Theatre*
    B.F.A., M.A., University of Colorado
Bassford, Gerald (1969) .... *Associate Professor of Management*
    B.S., M.S., University of Wyoming; D.B.A., Indiana University
Batalden, Stephen K. (1976) .... *Assistant Professor of History*
    B.A., Augsburg College; M.A., Ph.D., University of Minnesota
Batchelor, Harold W. (1943) .... *Professor Emeritus of Library Science*
    B.A., University of Oregon; B.S. in L.S., M.S., University of Illinois
Baty, Wayne M. (1962) .... *Professor of Administrative Services*
    B.S. in Ed., Southwest Missouri State College; M.A., Northwestern University;
    Ph.D., University of Southern California
Baumann, Victor H. (1964) .... *Professor Emeritus of Education*
    B.A., Grinnell College; M.A., Northwestern University; Ed.D., University of Southern California
Beakley, George C. Jr. (1956) .... *Professor of Engineering; Associate Dean,*
    B.S.M.E., Texas Tech University;   *College of Engineering and Applied Sciences*
    M.S.M.E., University of Texas; Ph.D., Oklahoma State University; P.E.
Becker, R. James (1965) .... *Professor of Public Affairs*
    B.S., M.A., Bradley University; Ph.D., University of Illinois
Becker, Walter G. (1955) .... *Associate Professor Emeritus of Finance*
    A.B., M.A., Loyola University; Ph.D., State University of Iowa; CFA
Beckman, James R. (1980) .... *Associate Professor of Engineering*
    B.S., M.S., University of Wisconsin; Ph.D., University of Arizona
Bedient, Jack D. (1963) .... *Associate Professor of Mathematics*
    A.B., Albion College; M.B.S., Ed.D., University of Colorado
Bedworth, David D. (1963) .... *Professor of Engineering*
    B.S.I.E., Lamar College of Technology; M.S.I.E., Ph.D., Purdue University
Bell, James W. (1966) .... *Professor of Education*
    A.B., Washburn University; M.Ed., Ed.D., University of Kansas
Bell, John E. (1965) .... *Professor of Education; Chair, Department of Secondary Education*
    B.S., University of Nebraska; M.A., Ed.D., University of Wyoming
Bell, LoAnn (1980) .... *Instructor of Nursing*
    B.S., University of Wisconsin; M.S., University of Minnesota
Bell, Mary E. (1970) .... *Associate Professor Emeritus of Education*
    B.S., Indiana State Teachers College; M.S., Butler University; Ed.D., Indiana University
Bellamy, Lynn (1976) .... *Associate Professor of Engineering;*
    B.S., Texas A & M; M.S., Ph.D., Tulane University   *Assistant Vice President, Computer Sciences*
Belok, Michael V. (1959) .... *Professor of Education*
    B.S., Indiana University; M.A., Arizona State University; Ph.D., University of Southern California
Beltramini, Richard H. (1980) .... *Assistant Professor of Marketing and Advertising*
    B.S., M.B.A., University of Illinois; Ph.D., University of Texas, Austin

Bender, Bert A. (1971) .... *Associate Professor of English*
    B.A., University of Washington; Ph.D., University of California, Irvine

Bender, Gordon L. (1953) .... *Professor Emeritus of Zoology*
    B.S., Iowa State College; M.S., University of Wisconsin; Ph.D., University of Illinois

Benedict, Joel A. (1946) .... *Professor Emeritus of Education*
    B.A., M.A., Arizona State University; Ed.D., Stanford University

Benin, David B. (1970) .... *Associate Professor of Physics*
    A.B., Cornell University; M.A., Ph.D., University of Rochester

Bennett, ElDean (1970) .... *Professor of Journalism and Telecommunication;*
    B.A., Brigham Young University;   *Chair, Department of Journalism and Telecommunication*
    M.A., Ph.D., Michigan State University

Benzinger, Robert P. (1970) .... *Associate Professor of Design Sciences*
    B.S.M.E., University of Wisconsin; M.A.E., Chrysler Institute of Engineering

Berch, Michael A. (1969) .... *Professor of Law*
    B.A., J.D , Columbia University

Berman, David R. (1966) .... *Associate Professor of Political Science*
    B.A. Rockford College; M.A., Ph.D., American University

Berman, Neil S. (1964) .... *Professor of Engineering*
    B.S., University of Wisconsin; M.S., M.A., Ph.D., University of Texas

Bertelsen, Wendle R. (1964) .... *Assistant Professor of Architecture*
    B. Arch., University of Michigan

Bertke, Eldridge M. (1958) .... *Professor of Zoology*
    B.S., M.S., Ph.D., University of Wisconsin

Bessom, Richard M. (1968) .... *Associate Professor of Marketing*
    A.B., Cornell University; M.B.A., Stanford University; Ph.D., University of Washington

Betz, M. Austin (1974) .... *Assistant Professor of Education*
    B.S., Lock Haven State College; M.Ed., Pennsylvania State University;
    M.A.T., Brown University; M.A., Ph.D., University of Illinois

Betz, Mathew J. III (1961) .... *Professor of Engineering; Assistant Academic Vice President*
    B.S., M.S., Ph.D., Northwestern University

Beyard-Taylor, Karen C. (1975) .... *Assistant Professor of Education*
    A.B., Wellesley College; M.Ed., University of Denver; Ph.D., Arizona State University

Bickford, William B. (1966) .... *Professor of Engineering*
    B.S., M.S., Kansas State University; Ph.D., University of Illinois

Bieber, Allan L. (1963) .... *Professor of Chemistry*
    B.S., M.S., North Dakota State University; Ph.D., Oregon State University

Bininger, Robert J. (1962) .... *Professor of Spanish; Associate Dean, College of Liberal Arts*
    B.A., M.A., Ph.D., Ohio State University

Birge, Edward A. (1972) .... *Associate Professor of Microbiology*
    B.A., Ph.D., University of Wisconsin, Madison

Birk, James P. (1973) .... *Associate Professor of Chemistry*
    B.A., St. John's University; Ph.D., Iowa State University

Bitter, Gary G. (1970) .... *Professor of Education*
    B.S., Kansas State University; M.A., Kansas State Teachers College; Ph.D., University of Denver

Blackburn, Jack B. (1972) .... *Professor of Engineering*
    B.S.C.E., Oklahoma University; M.S.C.E, Ph.D., Purdue University

Blackham, Garth J. (1962) .... *Professor of Counselor Education*
    B.S., M.S., Utah State University; Ph.D., Cornell University

Blackledge, Vernon O. (1969) .... *Professor of Engineering*
    B.S.E.E., University of Illinois; M.S.E.E., University of Santa Clara; Ph.D., Arizona State University

Blaesser, Willard W. (1968) .... *Professor of Counselor Education*
    B.S., M.A., University of Wisconsin, Madison; Ed.D., George Washington University

Blakemore, Arthur E. (1979) .... *Assistant Professor of Economics*
    B.A., M.A., University of Detroit; Ph.D., Southern Illinois University

Blasko, Vincent J. (1980) .... *Assistant Professor of Advertising*
    B.S., M.B.A., Arizona State University; Ph.D., University of Texas, Austin

Blewett, Laura J. (1964) .... *Assistant Professor of Nursing*
    B.S., University of Minnesota; M.S.N., Case-Western Reserve University

Boetto, Laurel B. (1956) .... *Assistant Professor Emeritus of Education*
    B.A. in Ed., M.A. in Ed., Arizona State University

Bogart, Quentin J. (1970) .... *Associate Professor of Education*
    B.A., M.S., Fort Hays State College; Ph.D., University of Texas, Austin

Boggs, Lohnie J. (1959-65;1966) .... *Professor of Administrative Services;*
    B.S., M.A., Ph.D., Ohio State University   *Chair, Department of Administrative Services*

Bohlander, George W. (1977) .... *Assistant Professor of Management*
    B.A., San Francisco State College; M.B.A., University of Southern California;
    Ph.D., University of California, Los Angeles

Bohlman, Herbert M. (1964) .... *Associate Professor of Administrative Services*
    B.S. in B.A., Drake University; M.B.A., J.D., Indiana University

Boissoneau, Robert (1980) .... *Professor of Health Services Administration*
    B.A., Eastern Michigan University; M.H.A., Medical College of Virginia; Ph.D., Ohio State University

Bontrager, O. R. (1962) .... *Professor Emeritus of Education*
    B.S., M.A., Ph.D., State University of Iowa

Booth, James R. (1980) .... *Assistant Professor of Finance*
    B.S., M.A., University of Alabama

Borgo, Philip E. (1967) .... *Associate Professor of Engineering*
    B.S.C.E., University of Cincinnati; M.S., Ohio State University

Bortner, M.A. (1979) .... *Assistant Professor of Criminal Justice*
    B.A., Edinboro State College; M.A., Ohio University; Ph.D., Washington University, St. Louis

Boster, Franklin (1977) .... *Assistant Professor of Communication*
    B.A., M.A., Southern Illinois University; Ph.D., Michigan State University

Bowers, Charles O. (1948) .... *Associate Professor Emeritus of Music*
    B.S. in Ed., Southeast Missouri State College; M.M., D.M.A., Eastman School of Music

Bowman, Russell K. (1956) .... *Professor Emeritus of Romance Languages*
    A.B., A.M., Ph.D., Columbia University

Boyd, Gertrude A. (1958) .... *Professor Emeritus of Education*
    A.B., M.S., Florida State University; Ed.D., Colorado State College

Boyd, James H. (1976) .... *Assistant Professor of Accounting*
    B.B.A., Texas Christian University; M.S., Northeastern University; Ph.D., University of Texas, Austin; C.P.A., Texas

Boyer, Jay M. (1976) .... *Assistant Professor of English*
    B.A., St. Louis University; M.A., Ph.D., State University of New York, Buffalo

Boyes, William J. (1974) .... *Associate Professor of Economics*
    B.S., Idaho State University; Ph.D., Claremont Graduate School

Boyle, Bernard M. (1969) .... *Professor of Planning;*
    B. Arch., University of Sydney (Australia);   *Chair, Department of Planning*
    M.Arch., M.A., Ph.D., Yale University

Brack, O M, Jr. (1973) .... *Professor of English*
    B.A., M.A., Baylor University; Ph.D., University of Texas, Austin

Brada, Josef C. (1978) .... *Associate Professor of Economics*
    B.S., M.A., Tufts University; Ph.D., University of Minnesota

Brady, Ward W. (1973) .... *Associate Professor of Agriculture*
    B.S., M.S., Ph.D., Colorado State University

Bramoweth, Ellen (1975) .... *Assistant Professor of Nursing*
    B.S., University of Arizona; M.S., Texas Woman's University

Buseck, Peter R. (1963) .... *Professor of Chemistry and Geology*
    B.A., Antioch College; M.A., Ph.D., Columbia University
Bush, Donald J. (1975) .... *Associate Professor of Architecture*
    B.S., Arizona State University; M.A., University of Notre Dame; Ph.D., University of New Mexico
Bustoz, Joaquin (1975) .... *Professor of Mathematics*
    B.A., M.A., Ph.D., Arizona State University
Butler, Jay Q. (1972) .... *Assistant Professor of Real Estate*
    B.B.A., M.B.A., University of New Mexico; Ph.D., University of Washington
Byrd, Barbara J. (1980) .... *Instructor of Nursing*
    B.S.N., Indiana University; M.N., Emory University

Cabianca, William A. (1967) .... *Professor of Counselor Education;*
    B.Ed., Gonzaga University;   *Chair, Department of Counselor Education*
    M.Ed., Ph.D., Washington State University
Cahen, Leonard S. (1979) .... *Professor of Education; Associate Dean, College of Education*
    A.B., San Francisco State University; M.Ed., West Texas State College; Ph.D., Stanford University
Callarman, Thomas E. (1980) .... *Assistant Professor of Management*
    B.B.A., West Texas State University; M.B.A., Arizona State University; Ph.D., Purdue University
Canright, James E. (1964) .... *Professor of Botany*
    B.A., Miami University; A.M., Ph.D., Harvard University
Carlsen, Paul A. (1978) .... *Assistant Professor of Technology*
    B.A.E., M.N.S., Ed.D., Arizona State University
Carlson, Ingeborg L. (1964) .... *Professor of German*
    Abitur, Hölderlinschule, Heidelberg; Vorsemester, University of Heidelberg;
    cand.phil., University of Heidelberg; Dr. phil., University of Erlangen-Nuremberg
Carney, James D. (1967) .... *Professor of Philosophy*
    M.A., Roosevelt University; Ph.D., University of Nebraska, Lincoln
Carpenter, R. W. (1980) .... *Professor of Solid State Science/Engineering*
    B.S., M.S., Ph.D., University of California, Berkeley
Carr, Alice Rose (1955) .... *Associate Professor Emeritus of Mathematics*
    A.B., St. Mary's College; M.A., Ohio University
Carroll, Christina (1966) .... *Professor of Music*

Carroll, James L. (1976) .... *Assistant Professor of Education*
    B.A., Bethel College; Ph.D., University of Minnesota
Carroll, Kevin K. (1975) .... *Assistant Professor of History*
    B.A., Canisius College; M.A., Ph.D., Harvard University
Carver, George L. (1965) .... *Associate Professor of Classical Languages*
    B.A., M.A., University of Texas; S.T.B., St. Mary's Seminary, Baltimore; Ph.D., St. Louis University
Case, James L. (1969) .... *Associate Professor of Communication*
    B.S., Weber State College; M.S., Ph.D., University of Utah
Castle, Gordon B. (1962) .... *Professor Emeritus of Zoology*
    B.A., Wabash College; M.A., Ph.D., University of California, Berkeley
Castle, Peggy (1971) .... *Professor of Music*
    M.A., A.R.M.C.M., Royal Manchester College of Music, U.K.
Cavalliere, William A. (1946) .... *Assistant Professor Emeritus of Technology*
    B.A. in Ed., M.A. in Ed., Arizona State University
Cavender, Gray (1977) .... *Assistant Professor of Criminal Justice*
    B.S., J.D., University of Tennessee; M.S., Middle Tennessee State University; Ph.D., Florida State University
Cayer, Joseph N. (1980) .... *Associate Professor of Public Affairs*
    B.A., M.P.A., University of Colorado; Ph.D., University of Massachusetts
Cazier, Mont A. (1962) .... *Professor of Zoology*
    B.S., Ph.D., University of California, Berkeley

Cesta, John R. (1975) .... *Assistant Professor of Finance*
    B.S., Capital University, Columbus, Ohio; M.B.A., Ph.D., Florida State University

Chalquest, Richard R. (1971) .... *Professor of Agriculture; Director, Division of Agriculture*
    B.S., D.V.M., Washington State University; M.S., Ph.D., Cornell University

Chandler, Douglas E. (1980) .... *Assistant Professor of Zoology*
    B.S., University of Rochester; M.A., Johns Hopkins School of Medicine;
    Ph.D., University of California, San Francisco

Chartier, George M. (1970) .... *Associate Professor of Psychology*
    B.S., University of Illinois; M.A., Ph.D., University of Oregon

Chasey, Eugene F. (1965) .... *Associate Professor of Education*
    B.S., Northwestern State College; M.A., Colorado State College; Ed.D., University of Wyoming

Chassin, Laurie (1977) .... *Assistant Professor of Psychology*
    B.A., Brown University; M.A., Ph.D., Columbia University

Cheatham, Glenn W. (1975) .... *Professor of Leisure Studies; Chair, Department of Leisure Studies*
    B.A., M.S., San Francisco State University; Ph.D., University of Minnesota

Chen, Stanley S. (1967) .... *Professor of Engineering*
    Diploma, Taipei Institute of Technology (China); M.S., Ohio University; Ph.D., University of Wisconsin, Madison

Childers, Bruce K. (1974) .... *Associate Professor of Administrative Services*
    B.B.A., North Texas State University; M.B.A., J.D., Texas Tech University

Chlistowa, Xenia (1980) .... *Assistant Professor of Dance*

Chou, Ju-Hsi (1975) .... *Professor of Art*
    B.A., University of Kentucky; M.A., Ph.D., Princeton University

Christensen, George (1975) .... *Assistant Professor of Architecture*
    B. Arch., Illinois Institute of Technology

Christiansen, Kent M (1966) .... *Associate Professor of Education; Director of Student Services*
    B.S., M.S., Brigham Young University; Ph.D., Michigan State University

Christine, Ray O. (1958) .... *Associate Professor of Education*
    A.B., A.M., Northern Colorado University; Ed.D., Arizona State University

Chubrich, Robert E. (1971) .... *Associate Professor of Communication*
    B.A., Grinnell College; M.A., Indiana University; Ph.D., State University of New York, Buffalo

Church, Kathleen K. (1969) .... *Professor of Zoology*
    B.S., M.A., University of Utah; Ph.D., University of California, Berkeley

Churchill, William D. (1966) .... *Associate Professor of Education;*
    A.B., Colgate University;   *Counselor, University Counseling Service*
    M.Ed., Alfred University; Ed.D., University of Rochester

Cialdini, Robert B. (1971) .... *Professor of Psychology*
    B.S., University of Wisconsin; M.A., Ph.D., University of North Carolina

Clark, Geoffrey A. (1971) .... *Associate Professor of Anthropology*
    B.A., M.A., University of Arizona; Ph.D., University of Chicago

Clark, William Dennis (1976) .... *Assistant Professor of Botany*
    B.A., Sacramento State College; Ph.D., University of Texas

Cleary, Edward W. (1967) .... *Professor Emeritus of Law*
    A.B., Illinois College; J.D., University of Illinois; J.S.D., Yale University

Clement, Ronald W. (1977) .... *Assistant Professor of Management*
    B.S., General Motors Institute; M.B.A., Ph.D., Michigan State University

Clothier, Ronald R. (1955) .... *Associate Professor Emeritus of Zoology*
    A.B., Fresno State College; M.A., Montana State University; Ph.D., University of New Mexico

Cluff, Gordon L. (1963) .... *Professor of Communication*
    B.A., Arizona State University; M.S., Ph.D., Southern Illinois University

Cobas, José A. (1975) .... *Associate Professor of Sociology*
    B.A., Maryville College; M.A., University of Tennessee, Knoxville; Ph.D., University of Texas, Austin

Cochran, Douglas L. (1968) .... *Associate Professor of Management*
    B.S., Ohio State University; M.B.A., Harvard University; Ph.D., University of Oregon

Cochran, John A. (1962) .... *Professor of Economics*
    A.B., Drake University; A.M., Ph.D., Harvard University

Cochran, Judith A. (1979) .... *Assistant Professor of Administrative Serivces*
    B.A., Westmont College; M.S.Ed., Ed.D., Northern Illinois University

Cohen, David (1967) .... *Professor of Music*
    B.S., M.S., Juilliard School of Music; D.M.A., University of Southern California

Cohen, Herbert G. (1977) .... *Assistant Professor of Education*
    B.S., Muhlenberg College; M.A., Hofstra University; Ph.D., University of Iowa

Cohn, Sanford J. (1979) .... *Assistant Professor of Education*
    B.A., M.Ed., Ph.D., Johns Hopkins University

Colby, Arthur L. (1965) .... *Assistant Professor of English*
    B.A., University of Massachusetts; M.A., Ph.D., University of North Carolina

Cole, Gerald A. (1958) .... *Professor Emeritus of Zoology*
    A.B., Middlebury College; M.S., St. Lawrence University; Ph.D., University of Minnesota

Collins, James P. (1975) .... *Assistant Professor of Zoology*
    B.S., Manhattan College; M.S., Ph.D., University of Michigan

Collofello, James S. (1979 .... *Assistant Professor of Computer Science*
    A.A., Joliet Junior College; B.S., M.S., Northern Illinois University; Ph.D., Northwestern University

Comeaux, Malcolm L. (1969) .... *Associate Professor of Geography*
    B.A., University of Southwestern Louisiana; M.A., Southern Illinois University; Ph.D., Louisiana State University

Cone, Barbara K. (1979) .... *Assistant Professor of Speech and Hearing Science*
    B.A., M.A., University of California; Ph.D., University of Texas

Coney, Kenneth A. (1973) .... *Associate Professor of Marketing; Assistant Dean, Graduate College*
    B.A., M.B.A., Washington State University; Ph.D., University of Oregon

Conlin, David A. (1948) .... *Professor Emeritus of English*
    A.B., Syracuse University; Ph.D., Yale University

Conley, Herbert A. (1980) .... *Assistant Professor of Marketing*
    B.A., M.B.A., Ph.D., University of Washington

Connell, Constance C. (1975) .... *Assistant Professor of Nursing*
    B.S.N., Boston College; M.S., University of Nevada

Cook, Jeffrey (1961) .... *Professor of Planning*
    B. Arch., University of Manitoba (Canada); M. Arch., Pratt Institute

Cook, Phil A. (1963) .... *Professor of Education*
    B.A., Southwestern State College; M.A., Colorado State College of Education; Ed.D., University of Kansas

Cook, Suzanne M. (1974) .... *Associate Professor of Management*
    B.B.A., M.B.A., D.B.A., Texas Tech University

Cooper, Dale S., Captain (1980) .... *Assistant Professor of Aerospace Studies*
    B.A., Arizona State University; M.A. Boston University

Cooperrider, Neil K. (1973) .... *Professor of Engineering*
    B.S.M.E., M.S.M.E., Ph.D., Stanford University

Corder, Brice W. (1971) .... *Associate Professor of Health Science; Assistant Dean,*
    B.A., Lynchburg College; M.Ed., Ed.D., Temple University   *Pre-Health Professions, College of Liberal Arts*

Cosand, Walter A. (1976) .... *Assistant Professor of Music*
    B.M., M.M., University of Rochester

Couch, Sanford C. (1962) .... *Professor of Russian*
    B.A., M.A., Ph.D., University of Wisconsin, Madison

Coudroglou, Aliki (1971) .... *Associate Professor of Social Work*
    B.A., College of St. Benedict; M.S.W., University of Minnesota; D.S.W., Columbia University

Cowley, John M. (1969) .... *Galvin Professor of Physics*
    B.S., M.S., D.Sc., University of Adelaide (Australia); Ph.D., Massachusetts Institute of Technology

Cox, Frank E. (1972) .... *Professor of Technology; Director, Division of Technology*
    B.S.M.E., Purdue University; M.S.I.E., Arizona State University

Cox, Steven R. (1970) .... *Associate Professor of Economics*
    B.S., University of Wisconsin, Madison; M.A., Ph.D., University of Michigan

Craft, John E. (1973) .... *Associate Professor of Journalism and Telecommunication*
    B.F.A., M.A., Ph.D., Ohio University

Cranmer, William H. (1963) .... *Professor Emeritus of Social Work*
    B.A., University of Akron; M.S., Case Western Reserve University

Crawford, John E. (1980) .... *Assistant Professor of Communication*
    B.A., Nebraska Wesleyan University; M.A., Sacramento State College; Ph.D., University of Southern California

Creath, J. Richard (1974) .... *Assistant Professor of Philosophy*
    B.A., Knox College; M.A. (Phil.), M.A. (Hist./Phil.Sci.), Ph.D., University of Pittsburgh

Creighton, Judith M. (1967) .... *Assistant Professor of Home Economics*
    B.S., University of Arizona; M.S., M.C., Arizona State University

Croft, Lee B. (1973) .... *Associate Professor of Russian*
    B.S., Arizona State University; M.A., University of Arizona; Ph.D., Cornell University

Cronin, John R. (1966) .... *Professor of Chemistry*
    B.A., College of Wooster; Ph.D., University of Colorado

Crouch, Beulah (1953) .... *Assistant Professor Emeritus of Education*
    B.A. in Ed., M.A. in Ed., Arizona State University

Crowder, Troy F. (1970) .... *Associate Professor of Journalism and Telecommunication;*
    B.A., University of South Dakota;   *Assistant to the President; Director, University Relations*
    M.A., University of Iowa

Cummings, Lawrence T. (1970) .... *Associate Professor of Counselor Education;*
    B.A., M.A., Arizona State University;   *Director, University Counseling Service*
    Ed.D., University of California, Los Angeles

Cummings, Susan N. (1964) .... *Associate Professor of Education*
    B.S., University of Chicago; M.A. in Ed., Ph.D., Arizona State University

Curran, Mark J. (1968) .... *Associate Professor of Spanish and Portuguese*
    B.S., Rockhurst College; Ph.D., St. Louis University

Daane, Calvin J. (1963) .... *Professor of Counselor Education*
    B.S., University of Wisconsin; M.A., Columbia University; Ed.D., Indiana University

Dagger, Richard K. (1976) .... *Assistant Professor of Political Science*
    B.A., University of Missouri; Ph.D., University of Minnesota

Dahl, Jeannine (1977) .... *Assistant Professor of Nursing*
    B.S.N., University of Kansas; M.A., Ed.D., University of Colorado

Dahl, Richard C. (1966) .... *Professor of Law; Director, Law Library*
    B.A., B.L.S., University of California; LL.B., Catholic University

Daley, Michael (1978) .... *Professor of Social Work*
    B.S., Spring Hill College; M.S.W., St. Louis University; M.S., University of Pittsburgh; D.S.W., Tulane University

Dalgleish, Donald D. (1962) .... *Associate Professor of Political Science*
    B.A., Carleton College; A.M., Columbia University; Ph.D., University of Colorado

D'Alonzo, Bruno J. (1976) .... *Associate Professor of Education*
    B.S., Ohio State University; M.S., West Virginia University; Ph.D., Bowling Green State University

D'Andrea, Frank L. (1972) .... *Associate Professor Emeritus of Music*
    B.A., M.A., Ed.D., Columbia University

D'Angelo, Frank J. (1970) .... *Professor of English*
    B.A., Loyola University, New Orleans; M.A., Tulane University; Ph.D., University of Nebraska, Lincoln

Daniel, Norman E. (1970) .... *Associate Professor of Transportation*
    B.S., M.S., University of Tennessee, Knoxville; Ph.D., Indiana University

Dannenfeldt, Karl H. (1956) .... *Professor of History*
    A.B., Valparaiso University; M.A., Indiana University; Ph.D., University of Chicago

Darst, Paul W. (1976) .... *Assistant Professor of Physical Education*
    B.S., M.S., Akron University; Ph.D., Ohio State University

Datesman, Susan K. (1979) .... *Assistant Professor of Criminal Justice*
    B.A., Kutztown State College; M.A., Ph.D., University of Delaware
Dauten, Joel J. (1960) .... *Professor of Finance*
    B.S., M.S., Washington University; Ph.D., University of Iowa
Davey, William G. (1976) .... *Assistant Professor of Communication*
    B.A., Pennsylvania State University; M.A., Columbia University; Ph.D., Indiana University
Davidson, Joseph K. (1973) .... *Professor of Engineering*
    B.M.E., M.Sc., Ph.D., Ohio State University
Davis, Joseph M. (1975) .... *Assistant Professor of Real Estate*
    B.S., University of South Carolina; M.B.A., Texas A & I University; Ph.D., University of Georgia
Davis, Keith (1958) .... *Professor Emeritus of Management*
    B.B.A., M.B.A., University of Texas; Ph.D., Ohio State University
Davis, Robert E. (1959) .... *Professor of Communication*
    B.A., M.A., Ph.D., University of Illinois
Davis, Sandford S. (1953) .... *Professor Emeritus of Education*
    A.B., B.S., Central Missouri State College; A.M., University of Missouri, Kansas City; Ed.D., University of Colorado
Deach, Dorothy F. (1967) .... *Professor Emeritus of Physical Education*
    B.S., M.S., University of Illinois; Ph.D., University of Michigan
Dean, Arthur G. (1971) .... *Associate Professor of Engineering*
    B.A., M.S., Texas Tech University; Ph.D., Texas A & M University
Debenport, Sylvia (1978) .... *Assistant Professor of Music*
    B.M.E., B.M., M.M., Indiana University
Decker, John P. (1963) .... *Professor Emeritus of Engineering*
    B.S., University of Idaho; M.A., Ph.D., Duke University
DeGraw, Richard (1977) .... *Assistant Professor of Social Work*
    B.A., Westminster College; M.Div., Princeton Theological Seminary; M.S.W., Rutgers University
DeLong, Kimberly J. (1979) .... *Assistant Professor of Theatre*
    B.A., Eastern Washington State College; M.F.A., Cornell University
De Marinis, Rick M. (1980) .... *Assistant Professor of English*
    B.A., M.A., University of Montana
Demassa, Thomas A. (1966) .... *Professor of Engineering*
    B.S.E.E., M.S.E.E., Ph.D., University of Michigan
de Matties, Nicholas (1974) .... *Associate Professor of Art*
    B.A., Long Beach State University; M.S., Illinois Institute of Technology
Demeke, Howard J. (1962) .... *Associate Professor Emeritus of Education*
    A.B., San Francisco State College; M.S., Ed.D., University of Southern California
DeSerpa, Allan C. (1975) .... *Associate Professor of Economics*
    B.A., University of Santa Clara; Ph.D., University of California, Santa Barbara
Dezelsky, Thomas L. (1968) .... *Associate Professor of Health Science*
    B.S., Central Michigan University; M.A., University of Michigan; H.S.D., Indiana University
Dibbern, John D., (1978) .... *Assistant Professor of History*
    B.A., University of North Dakota; M.A., Ph.D., Stanford University
Dieppa, Ismael (1976) .... *Professor of Social Work; Dean, School of Social Work*
    B.A., Sul Rose State College; M.S.W., Boston University; M.P.H., University of California;
    D.S.W., University of Southern California
Dietz, Robert (1977) .... *Professor of Geology*
    B.S., M.S., Ph.D., University of Illinois
Ditsworth, Richard L. (1959) .... *Professor of Engineering*
    B.S., M.S., Iowa State College; Ph.D., Michigan State University
Dittert, Alfred E. Jr. (1967) .... *Professor of Anthropology*
    B.A., M.A., University of New Mexico; Ph.D., University of Arizona
Doan, Jerry (1979) .... *Associate Professor of Music*
    B.M.E., M.M., North Texas State University; D.M.A., University of Michigan

Doane, Winifred W. (1977) .... *Professor of Zoology*
  B.A., Hunter College of the City of New York; M.S., University of Wisconsin; Ph.D., Yale University

Dobkin, William E. (1970) .... *Associate Professor of Theatre*
  A.B., Eastern Michigan University; M.A., University of Colorado; Ph.D., Indiana University

Doebler, Bettie Anne (1971) .... *Professor of Humanities*
  B.A., M.A., Duke University; Ph.D., University of Wisconsin, Madison

Doebler, John W. (1970) .... *Professor of English*
  B.A., Duke University; M.A., Ph.D., University of Wisconsin, Madison

Donelson, Kenneth L. (1965) .... *Professor of English*
  B.A., M.A., Ph.D., University of Iowa

Donovan, Jan (1980) .... *Assistant Professor of Administrative Services*
  B.S., J.D., M.B.A., University of Arizona

Donnelly, Aaron V. (1962) .... *Professor Emeritus of Engineering*
  B.S.E.E., M.S., University of Iowa; M.A., Columbia University; Ph.D., University of Iowa

Dorman, Michael F. (1976) .... *Associate Professor of Communication;*
  B.S., University of Washington; M.A., Hollins College;   *Chair, Department of Speech and Hearing Science*
  Ph.D., University of Connecticut

Dorson, William J. (1966) .... *Professor of Engineering*
  B.Ch.E., M.Ch.E., Rensselaer Polytechnic Institute; Ph.D., University of Cincinnati

Douglas, Joan S. (1980) .... *Assistant Professor of Nursing*
  B.S., Stanford University; M.P.H., University of North Carolina

Downing, George D. Jr. (1964) .... *Professor Emeritus of Marketing*
  B.S.E.E., Iowa State University; D.B.A., Michigan State University

Doyle, Donald P. (1962) .... *Professor of Theatre*
  B.A., Arizona State University; M.A., Northwestern University; Ph.D., University of Minnesota

Doyle, Roy P. (1959) .... *Professor of Education*
  B.A. in Ed., Arizona State University; M.A., Ed.D., Columbia University

Drake, Jackson M. (1974) .... *Assistant Professor of Education;*
  B.S., M.S., Southern Illinois University;   *Director of Arizona Educational Information System;*
  Ed.D., Columbia University   *Director of Field Services*

Dresskell, Nadine (1946) .... *Professor Emeritus of Music*
  B.S., Bowling Green State University; M.A., Columbia University

Driscoll, Michael F. (1971) .... *Associate Professor of Mathematics*
  B.A., St. John's University; M.S., Ph.D., University of Arizona

Dubie, Norman (1978) .... *Associate Professor of English*
  B.A., Goddard College; M.F.A., University of Iowa

Dudek, Leona M. (1960) .... *Assistant Professor Emeritus of Education*
  B.Ed., National College of Education; M.A. in Ed., Arizona State University

Duffy, Dennis M. (1977) .... *Assistant Professor of Engineering*
  B.S., M.S., Ph.D., University of Arizona

Dundas, Mary Jane (1975) .... *Associate Professor of Administrative Services*
  B.A., California State University, Long Beach; J.D., Loyola University, Los Angeles

Durrenberger, Robert W. (1971) .... *Professor of Geography*
  B.S., Moorhead State College; B.S., California Institute of Technology; M.S., University of Wisconsin, Madison;
  Ph.D., University of California, Los Angeles

Dycus, Augustus M. (1959) .... *Associate Professor Emeritus of Botany*
  B.S., Akron University; Ph.D., Cornell University

Eck, Roger D. (1970) .... *Associate Professor of Quantitative Systems*
  B.S.Ch.E., Clarkson College of Technology; M.B.A., University of New Mexico; Ph.D., Tulane University

Eckert, Thomas W. (1971) .... *Associate Professor of Art*
  B.A., M.F.A., Arizona State University

Edelsky, Carole (1976) .... *Assistant Professor of Education*
    B.S., University of Cincinnati; Ph.D., University of New Mexico
Eder, James F. Jr. (1975) .... *Associate Professor of Anthropology*
    B.S., California Institute of Technology; M.A., Ph.D., University of California, Santa Barbara
Edwards, John (1964) .... *Professor of Education; Assistant Dean, University Continuing Education*
    B.S., Ball State University; M.A., Ed.D., Arizona State University
Edwards, Mark R. (1978) .... *Assistant Professor of Agriculture*
    B.S.M.E., U.S. Naval Academy; M.B.A., D.B.A., Arizona State University
Edwards, Marvin J. (1959) .... *Assistant Professor of Technology*
    B.S., M.A. in Ed., Arizona State University
Eeds, Maryann H. (1975) .... *Associate Professor of Education*
    B.S., California State University, Sacramento; Ph.D., University of Oregon
Effland, Richard W. (1967) .... *Professor of Law*
    A.B., LL.B., University of Wisconsin; LL.M., Columbia University
Eisenberg, Nancy H. (1976) .... *Associate Professor of Psychology*
    B.A., University of Michigan; M.A., Ph.D., University of California, Berkeley
Ekmanis, Rolf (1963) .... *Professor of Russian*
    B.A., M.A., University of Wisconsin, Madison; Ph.D., Indiana University
Ellis, John C. (1957) .... *Associate Professor of English*
    B.A., M.A., Ph.D., University of Oregon
Ellis, Robert H. (1962) .... *Associate Professor of Journalism and Telecommunication;*
    B.A., Arizona State University; M.A., Case Western Reserve University   *General Manager, KAET-TV*
Ellman, Ira Mark (1978) .... *Associate Professor of Law*
    B.A., Reed College; M.A., University of Illinois; J.D., Boalt Hall School of Law, University of California, Berkeley
Ellner, Anthony Jr. (1960) .... *Professor of Architecture*
    B.A., City University of New York; M.A., Columbia University; M. Arch., Yale University
Ellsworth, Lola M. (1938) .... *Professor Emeritus of Home Economics*
    B.S., Brigham Young University; M.A., Columbia University
Elmore, James W. (1949) .... *Professor of Planning*
    A.B., University of Nebraska; M.S. in Arch., Columbia University
Emery, Raymond C. (1962) .... *Associate Professor Emeritus of English*
    B.A., M.A., University of Wyoming; Ed.D., Stanford University
Engelhardt, Florence P. (1965) .... *Associate Professor of Social Work*
    B.A., College of Mount Saint Vincent; M.S.S., Fordham University
Engelhardt, Jon M. (1972) .... *Associate Professor of Education*
    B.A., M.A., Arizona State University; Ph.D., University of Texas, Austin
English, William S. (1962) .... *Professor of Music*
    B.M., Washburn University; M.A., Ph.D., George Peabody College
Eribes, Richard A. (1976) .... *Assistant Professor of Public Affairs;*
    B.A., M.A., Ph.D., University of Southern California   *Director, Center for Urban Studies*
Erno, Richard B. (1957-62; 1963) .... *Professor of English*
    B.A., Michigan State University; M.A., University of Denver; Ph.D., University of Minnesota
Escudero, Mary J. (1948) .... *Professor Emeritus of Spanish*
    A.B., San Diego State College; M.A., Claremont College; Diplome, Institute de Phonetique-University of Paris;
    Ph.D., Cornell University
Eubank, Randall (1979) .... *Assistant Professor of Mathematics*
    B.S., M.S. (Agri.Econ.), New Mexico State University; M.S., Ph.D., Texas A&M University
Evaneshko, Veronica (1977) .... *Associate Professor of Nursing*
    B.S.N., M.A., Ph.D., University of Arizona
Evans, Donovan L. (1966) .... *Professor of Engineering*
    B.S.M.E., University of Cincinnati; Ph.D., Northwestern University
Evans, John X. (1964) .... *Professor of English*
    B.A., Holy Cross College; M.A., Ph.D., Yale University

Evans, Lynwood J. (1978) .... *Professor of Law; Director, Civil Clinic*
    B.A., St. Benedict's College; J.D., University of Missouri
Eveland, Charles L. (1974) .... *Professor of Health Services Administration;*
    B.S., University of Maryland;   *Director, Center for Health Services Administration*
    M.H.A., Baylor University; Ph.D., University of Michigan
Eyring, LeRoy (1961) .... *Professor of Chemistry*
    B.S., University of Arizona; Ph.D., University of California, Berkeley

Faas, Larry A. (1967) .... *Professor of Education*
    B.S., Iowa State University; M.A., Colorado State College; Ed.D., Utah State University
Faeth, Stanley H. (1980) .... *Assistant Professor of Zoology*
    B.S., M.S., University of Cincinnati; Ph.D., Florida State University
Fairburn, Sandra J. (1976) .... *Instructor of Nursing*
    B.S.N., University of Alabama; M.N., University of Washington
Faltz, Leonard M. (1979) .... *Assistant Professor of English*
    B.S., City College of New York; M.A., Harvard University; Ph.D., University of California, Berkeley
Fancher, Joanna E. (1976) .... *Assistant Professor of Nursing*
    A.B., Houghton College; M.N., Case Western Reserve University; M.A., Columbia University
Farber, Bernard (1971) .... *Professor of Sociology*
    A.B., Roosevelt University; A.M., Ph.D., University of Chicago
Farmer, Frank D. (1970) .... *Assistant Professor of Mathematics*
    B.A., M.A., University of California, Riverside; Ph.D., University of Washington
Farness, Sherly F. (1969) .... *Assistant Professor of Art*
    B.A., M.A., Michigan State University
Farrar, Roger D. (1974) .... *Associate Professor of Education*
    B.A., M.S., Kearney State College; Ed.D., University of Nebraska
Farris, Martin T. (1957) .... *Professor of Transportation*
    B.A., M.A., University of Montana; Ph.D., Ohio State University
Faulkner, Thelma Ray (1980) .... *Professor of Dance*
    B.A., Oklahoma College for Liberal Arts; M.A., Ph.D., Texas Woman's University
Fausel, Donald F. (1969) .... *Associate Professor of Social Work*
    A.B., S.T.B., S.T.L., St. Mary's University; M.S.W., Fordham University; D.S.W., Columbia University
Fearon, Harold E. (1961) .... *Professor of Management; Chair, Department of Management*
    B.S., M.B.A., Indiana University; Ph.D., Michigan State University
Fehr, Fred S. (1971) .... *Associate Professor of Psychology*
    B.S., University of Wisconsin; M.A., Ph.D., Washington University
Feldstein, Alan (1970) .... *Professor of Mathematics*
    B.A., Arizona State University; Ph.D., University of California, Los Angeles
Feller, Carolyn M. (1972) .... *Assistant Professor of Nursing*
    B.S.N., M.S., Arizona State University
Fellows, Rushia G. (1977) .... *Assistant Professor of Architecture;*
    B.S., Arizona State University   *Director, Design History and Theory*
Fenske, Robert H. (1974) .... *Professor of Education*
    B.S., M.S., Ph.D., University of Wisconsin
Ferrell, Wilfred A. (1959) .... *Professor of English*
    B.A., M.A., Ph.D., University of Texas
Ferry, John M. (1977) .... *Associate Professor of Geology*
    B.S., M.S., Stanford University; Ph.D., Harvard University
Filsinger, Erik E. (1978) .... *Assistant Professor of Home Economics*
    B.S., University of Massachusetts; M.T.S., Drew University; M.A., Ph.D., Pennsylvania State University
Finch, A. Joyce (1965) .... *Assistant Professor of Nursing*
    B.S.N., Augustana College; M.S., University of Colorado

Gilbert, Elizabeth V. (1979) .... *Instructor of Nursing*
    B.S., Union College; M.S., Loma Linda University

Gill, George A. (1966) .... *Assistant Professor of Education*
    B.S., M.A., Arizona State University

Gill, Sam D. (1975) .... *Assistant Professor of Religious Studies*
    B.S., M.S., Wichita State University; M.A., Ph.D., University of Chicago

Gillingwater, Denis (1973) .... *Associate Professor of Art*
    B.F.A., M.F.A., University of Cincinnati

Gilsdorf, Jeanette W. (1979) .... *Assistant Professor of Administrative Services*
    A.B., Creighton University, Omaha; M.A., Ph.D., University of Nebraska, Lincoln

Gisolo, Margaret (1954) .... *Professor Emeritus of Dance*
    B.S., Indiana State Teachers College; M.A., New York University

Glanzman, Dennis L. (1977) .... *Assistant Professor of Psychology*
    B.A., M.A., Ph.D., University of California, Irvine

Glaunsinger, William S. (1972) .... *Associate Professor of Chemistry*
    B.S., Miami University; Ph.D., Cornell University

Gober, Patricia A. (1975) .... *Associate Professor of Geography*
    B.S., University of Wisconsin, Whitewater; M.S., Ph.D., Ohio State University

Goheen, Douglas-Scott (1965) .... *Associate Professor of Theatre*
    B.A., College of William and Mary; M.F.A., Yale University; Ph.D., University of Denver

Gold, Victor J. (1980) .... *Associate Professor of Law*
    B.A., J.D., University of California, Los Angeles

Goldstein, Elliott S. (1974) .... *Associate Professor of Zoology*
    B.S., University of Hartford; M.S., Ph.D., University of Minnesota

Goldstein, Myron (1963) .... *Professor of Mathematics*
    B.S., M.A., Ph.D., University of California, Los Angeles

Golubitsky, Martin (1979) .... *Professor of Mathematics*
    A.B., A.M., University of Pennsylvania; Ph.D., Massachusetts Institute of Technology

Goo, Benjamin (1955) .... *Professor of Art*
    B.F.A., University of Iowa; M.F.A., Cranbrook Academy of Art

Gooding, Elmer R. (1967) .... *Professor of Economics; Assistant Provost*
    B.S., McPherson College; M.A., Ph.D., University of Kansas

Gordon, Leonard (1967) .... *Professor of Sociology; Chair, Department of Sociology*
    B.A., Wayne State University; A.M., University of Michigan; Ph.D., Wayne State University

Gordon, Richard S. (1980) .... *Professor of Agriculture*
    A.B., University of Rochester; M.A., Harvard University; Ph.D., Massachusetts Institute of Technology

Gosse, Darrel I. .... *Invitational Practitioner of Accounting*
    B.B.A., M.A., University of Iowa; C.P.A., Illinois

Gourley, David R. (1967) .... *Associate Professor of Marketing*
    B.S., Miami University; M.B.A., University of Toledo; D.B.A., Indiana University

Goyer, Robert S. (1981) .... *Professor of Communication; Chair, Department of Communication*
    B.A., DePauw University; M.A., Miami University; Ph.D., Ohio State University

Grace, Edward E. (1963) .... *Professor of Mathematics*
    B.S., Ph.D., University of North Carolina

Grady, Thomas K. (1978) .... *Associate Professor of Technology*
    B.A., B.S., M.S.E.E., University of Colorado

Graf, William L. (1978) .... *Associate Professor of Geography*
    B.A., M.S., Ph.D., University of Wisconsin, Madison

Graham, Denny L. (1974) .... *Associate Professor of Technology*
    B.S., Ohio State University; M.S., Denver University; Ph.D., Purdue University

Grant, Richard E. (1980) .... *Assistant Professor of Nursing*
    B.S., University of Washington; M.Ed., Whitworth College; Ph.D., Washington State University

Greathouse, Betty M. (1972) .... *Associate Professor of Education*
    B.A., M.A., Ph.D., Arizona State University

Greeley, Ronald (1977) .... *Professor of Geology*
    B.S., M.S., Mississippi State University; Ph.D., University of Missouri, Rolla

Green, Gary I. (1980) .... *Assistant Professor of Quantitative Systems*
    B.A., University of Colorado; M.B.A., Seattle University; Ph.D., University of Washington

Green, James L. (1967) .... *Associate Professor of English*
    B.A., M.A., University of Kansas; Ph.D., University of Nevada

Green, Mary E. (1967) .... *Associate Professor of English*
    B.A., Queens College, New York; M.A., St. John's University, New York; Ph.D., University of Chicago

Greene, Jeffrey, Captain (1980) .... *Assistant Professor of Military Science*
    B.S., United States Military Academy; M.B.A., Arizona State University

Greene, Mildred S. (1966) .... *Associate Professor of English*
    A.B., Wellesley College; M.A.T., Radcliffe College; M.A., University of Massachusetts;
    Ph.D., University of New Mexico

Greenwood, Michael J. (1973) .... *Professor of Economics*
    B.S., DePaul University; M.A., Ph.D., Northwestern University

Grecy, George W. (1969) .... *Professor of Leisure Studies*
    B.A., M.A., Purdue University; Ph.D., University of Michigan

Gregory, David (1979) .... *Assistant Professor of Dance*
    B.M., M.M., University of Michigan

Gregory, Donna U. (1976) .... *Assistant Professor of Humanities*
    B.A., University of Washington; M.A., Boston University; Ph.D., University of Utah

Grier, Marvin (1957) .... *Assistant Professor of Physical Education;*
    B.S., Wisconsin State College, La Crosse; M.A., New York University   *Supervisor, Swimming Pool*

Griffith, LeRoy H. (1958) .... *Professor of Education*
    B.S. in Ed., M.S. in Ed., Drake University; Ph.D., University of Iowa

Griffith, Tommy F. (1979) .... *Assistant Professor of Transportation*
    B.S.M.E., University of Kansas; M.B.A., New York University; D.B.A., Indiana University

Grigsby, J. Eugene (1966) .... *Professor of Art*
    A.B., Morehouse College; M.A., Ohio State University; Ph.D., New York University

Grinder, Robert E. (1973) .... *Professor of Education*
    B.S., University of California; Ed.D., Harvard University

Grissom, Donald E. (1980) .... *Instructor of Counselor Education*
    M.S., University of Akron

Grobe, Edwin P. (1957) .... *Professor of French*
    A.B., William Jewell College; M.A., Ph.D., Indiana University

Gross, Douglas R. (1968) .... *Associate Professor of Counselor Education*
    B.A., M.A., Western Michigan University; Ph.D., University of Wisconsin, Madison

Grossman, Louis H. (1966) .... *Professor of Management*
    A.B., University of Michigan; M.B.A., Ph.D., Michigan State University

Gruzinska, Aleksandra (1973) .... *Assistant Professor of French*
    Lycée Francais, Barcelona, Spain; B.A., M.A., State University of New York, Buffalo;
    Ph.D., Pennsylvania State University

Gryder, Robert (1959-63; 1964) .... *Professor of Administrative Services*
    B.A., Northwestern State College; M.Ed., Louisiana State University; Ed.D., University of North Dakota

Guilbeau, Eric J. (1977) .... *Associate Professor of Engineering*
    B.S. in Ch.E., M.S., in Ch.E., Ph.D. in Ch.E., Louisiana Tech University

Guillot, Elizabeth E. (1964) .... *Professor Emeritus of Sociology*
    B.S., Simmons College; M.A., Ph.D., University of Pennsylvania

Guinouard, Donald E. (1966) .... *Professor of Counselor Education; Counselor,*
    B.S., M.S., Montana State College; Ed.D., Washington State University   *University Counseling Service*

Guleserian, Theodore (1971) .... *Associate Professor of Philosophy*
    B.A., University of California, Riverside; Ph.D., Yale University

Gully, Anthony Lacy (1972) .... *Associate Professor of Art*
    B.A., University of California, Riverside; M.A., University of California, Berkeley; Ph.D., Stanford University

Guntermann, Gail (1977) .... *Assistant Professor of Spanish*
    B.S., University of Montana; M.A., University of New Mexico; Ph.D., Ohio State University

Gurnee, Herbert (1943) .... *Professor Emeritus of Psychology*
    A.B., M.A., Wesleyan University; Ph.D., Harvard University

Gust, J. Devans (1975) .... *Assistant Professor of Chemistry*
    B.S., Stanford University; M.S., Ph.D., Princeton University

Gwinner, Robert F. (1970) .... *Professor of Marketing*
    B.S., University of Southern Mississippi; M.B.A., Ph.D., University of Arkansas

Haberman, Donald C. (1967) .... *Associate Professor of English*
    B.A., Rutgers, The State University; M.A., Ph.D., Yale University

Haberman, Lidia W. (1967) .... *Instructor in Latin*
    B.A., Bryn Mawr College; M.A., Yale University

Hackbarth, Glen A. (1976) .... *Assistant Professor of Music*
    B.M., University of Wisconsin, Madison; M.M., D.M.A., University of Illinois

Haden, Clovis R. (1978) .... *Professor of Engineering; Dean, College of Engineering and*
    B.S., Arlington State College;   *Applied Sciences; Director, School of Engineering*
    M.S., California Institute of Technology; Ph.D., University of Texas

Hadley, Neil F. (1966) .... *Professor of Zoology*
    B.A., Eastern Michigan University; Ph.D., University of Colorado

Haefer, J. Richard (1976) .... *Assistant Professor of Music*
    B.M., Ohio State University; M.M., University of Arizona

Haggerson, Nelson L. (1961-63; 1964) .... *Professor of Education*
    B.A., Vanderbilt University; M.S. in Ed., New Mexico Western College; Ph.D., Claremont Graduate School

Hahn, Arthur W. (1962) .... *Professor of Art*
    B.F.A., California School of Fine Arts; M.A., San Francisco State University

Hajicek, James (1976) .... *Assistant Professor of Art*
    B.F.A., Kansas City Art Institute; M.F.A., University of New Mexico

Hakac, John (1966) .... *Associate Professor of English*
    A.B., Centre College; M.A., Ph.D., University of Texas

Hakim, Ramzi S. (1978) .... *Assistant Professor of Quantitative Systems*
    B.S.E.E., American University of Beirut; M.S., M.B.A., University of Houston

Hale, John Douglas (1956) .... *Professor of Art*
    B.F.A., M.F.A., University of Southern California; Ph.D., Ohio State University

Haley, Arthur J. (1976) .... *Assistant Professor of Leisure Studies*
    B.A., Stonehill College; M.Ed., Springfield College; Ph.D., Ohio State University

Hall, John S. (1973) .... *Assistant Professor of Public Affairs; Director of Research and Publications*
    B.A., M.A., San Diego State University; Ph.D., University of Oregon

Hall, Thomas E. (1975) .... *Professor of Art*
    B.F.A., Kansas City Art Institute; M.F.A., Drake University

Hamilton, Robert (1980) .... *Professor of Music*
    B.M., Indiana University; M.M., Catholic University

Hamm, George F. (1962) .... *Professor of Counselor Education; Vice President, Student Affairs*
    B.S., South Dakota State College; M.A., Ph.D., University of Wyoming

Hanna, Albert L. (1967) .... *Associate Professor of Music*
    B.M., College of Music of Cincinnati; Ph.D., Indiana University

Hansche, Brian A. (1978) .... *Assistant Professor of Computer Science*
    B.S., University of New Mexico; M.S., Ph.D., University of Illinois

Hansen, Lawrence A. (1979) .... *Assistant Professor in Engineering*
  B.S.C.E., Portland State University; M.S.C.E., Oregon State University; Ph.D., Stanford University
Hanson, Hugh (1948) .... *Professor Emeritus of Zoology*
  B.S., Kansas State Teachers College; M.S., Ph.D., University of Illinois
Hanson, Roland C. (1966) .... *Professor of Physics*
  B.S., Michigan College of Mining and Technology; M.S., Ph.D., University of Illinois
Happel, Stephen K. (1975) .... *Assistant Professor of Economics*
  B.A., University of Missouri; M.A., Ph.D., Duke University
Hardert, Ronald A. (1966) .... *Associate Professor of Sociology*
  A.B., M.A., University of Cincinnati; Ph.D., Indiana University
Hardt, Annanelle (1968) .... *Associate Professor of Education*
  B.A., Southwestern University; A.M., Cornell University; Ph.D., University of Texas
Haried, Andrew A. (1969) .... *Professor of Accounting*
  B.A., Hastings College; M.A.S., Ph.D., University of Illinois; C.P.A., Illinois, North Carolina and Arizona
Haring, L. Lloyd (1959) .... *Professor of Geography*
  B.S. in Ed., M.S., Kansas State Teachers College; Ph.D., University of Iowa
Haring, Marilyn J. (1980) .... *Assistant Professor of Counselor Education*
  B.A.Ed., M.A.Ed., Ph.D., Arizona State University
Harris, Brice (1962) .... *Professor Emeritus of English*
  M.A., Vanderbilt University; Ph.D., Harvard University
Harris, Jerry D. (1972) .... *Associate Professor of Education*
  B.S., Illinois State University; Ph.D., University of Minnesota
Harris, Joseph (1963) .... *Professor of Chemistry; Associate Chair, Department of Chemistry*
  B.S., University of Maryland; M.A., Ph.D., Johns Hopkins University
Harris, Kathryn M. (1966) .... *Instructor in English*
  B.A., M.A., Arizona State University
Harris, Mark (1980) .... *Professor of English, Director of Creative Writing Program*
  B.A., M.A., University of Denver; Ph.D., University of Minnesota
Harris, Walter (1980) .... *Assistant Professor of Music*
  B.S., Knoxville College; M.M., Ph.D., Michigan State University
Harris, William H. (1960) .... *Professor of Marketing*
  B.S., University of Denver; M.B.A., Ph.D., Ohio State University
Harter, Tom J. (1937) .... *Professor Emeritus of Art*
  B.A. in Ed., Arizona State University; M.F.A., University of Oregon
Hartwell, L. Kay (1975) .... *Associate Professor of Education*
  B.S., M.A., Murray State University; Ph.D., Southern Illinois University
Hartwigsen, Gail L. (1979) .... *Assistant Professor of Home Economics*
  B.A., Glassboro State College; M.A., University of Connecticut, Storrs; Ph.D., Michigan State University
Harward, Naomi (1956) .... *Professor Emeritus of Sociology*
  B.D., Garrett Biblical Institute; B.A., Northwestern University;
  M.A., (Rel. Ed.), M.A., (Social Welfare), University of Chicago
Hasbrouck, Frank F. (1962) .... *Associate Professor of Zoology*
  B.A., Ph.D., University of Illinois
Hassett, Matthew J. (1966) .... *Associate Professor of Mathematics*
  B.A., Fordham University; M.S., Ph.D., Rutgers, The State University
Hastings, Vernon L. (1973) .... *Professor of Construction; Director, Division of Construction*
  B.S.M.E., University of Nebraska; M.S.I.E., Oklahoma A & M University
Hauenstein, Marjorie B. (1980) .... *Instructor of Nursing*
  B.S., University of Cincinnati; M.S., Arizona State University
Hawley, John B. (1957) .... *Assistant Professor Emeritus of Engineering*
  B.S., E.M.E.T., Colorado School of Mines
Haygood, Robert C. (1970) .... *Professor of Psychology*
  B.S., University of Illinois, Urbana; M.S., Ph.D., University of Utah

Haynes, Peter (1975) .... *Professor of Criminal Justice*
    B.S., University of Southampton, England; M.A., Ph.D., University of Toronto

Hazel, Jeffrey R. (1975) .... *Associate Professor of Zoology*
    B.A., College of Wooster; M.S., Ph.D., University of Illinois

Heier, William D. (1966) .... *Professor of Management*
    B.S., University of Maryland; M.A., George Washington University; Ph.D., American University

Heimann, Robert A. (1952) .... *Professor of Counselor Education*
    B.S., Wisconsin State College; M.S., Ph.D., University of Wisconsin, Madison

Heller, Jules (1976) .... *Professor of Art; Dean, College of Fine Arts*
    B.A., Arizona State University; M.A., Columbia University; Ph.D., University of Southern California

Helms, Loyce Randel (1976) .... *Associate Professor of English*
    B.A., University of California, Riverside; Ph.D., University of Washington

Helmstadter, G. C. (1959) .... *Professor of Education*
    B.S., M.S., Iowa State University; Ph.D., University of Minnesota

Helton, Jon C. (1973) .... *Associate Professor of Mathematics*
    B.S., Southwest Texas State College; M.A., Ph.D., University of Texas, Austin

Henderson, Glenn V. Jr. (1980) .... *Associate Professor of Finance*
    B.B.A., Western Michigan University; M.B.A., D.B.A., Florida State University

Hendrickson, Lester E. (1968) .... *Associate Professor of Engineering*
    B.S., M.S., Michigan Technological University; Ph.D., University of Illinois

Hendrickson, William L. (1976) .... *Associate Professor of French*
    B.A., Arizona State University; M.A., University of Kansas; Ph.D., Princeton University

Henkel, Ray (1966) .... *Assistant Professor of Geography*
    B.S., Arizona State University; M.S., Ph.D., University of Wisconsin, Madison

Hennington, Jo Ann (1975) .... *Associate Professor of Administrative Services;*
    B.A., M.B.A., Ed.D., Arizona State University   *Assistant Dean, College of Business Administration*

Henry, Nicholas L. (1975) .... *Professor of Public Affairs; Dean, College of Public Programs*
    B.A., Centre College; M.A., Pennsylvania State University; M.P.A., Ph.D., Indiana University

Henson, Dorothy A. (1974) .... *Assistant Professor of Nursing*
    B.S., Whitworth College; M.A., West Virginia College of Graduate Studies

Henze, Lura F. (1966) .... *Professor Emeritus of Sociology*
    B.A., M.A., Arizona State University

Herman, George R. (1956) .... *Associate Professor of English*
    B.S., M.A., University of Kansas

Hernandez, Armand P. (1974) .... *Associate Professor of Criminal Justice*
    B.A., M.A., San Jose State University; Ed.D., University of Southern California

Hershauer, James C. (1969) .... *Professor of Quantitative Systems*
    B.S., Purdue University; M.B.A., D.B.A., Indiana University

Hershberger, Robert G. (1969) .... *Professor of Architecture*
    A.B., Stanford University; B. Arch., University of Utah; M.Arch., Ph.D., University of Pennsylvania

Hestenes, David O. (1966) .... *Professor of Physics*
    B.A., Pacific Lutheran College; M.A., Ph.D., University of California, Los Angeles

Hicks, Dorothy J. (1975) .... *Associate Professor of Nursing*
    B.S.N.E., University of Texas; M.N., University of Washington

Higgins, Norman C. (1968) .... *Professor of Education; Chair, Department of Educational*
    B.S., Central Missouri State College; M.S., Ph.D., Syracuse University   *Technology and Library Science*

Higgins, Thomas Ernest (1977) .... *Assistant Professor of Engineering*
    B.S.C.E., M.S.E.H.E., Ph.D., University of Notre Dame

Higgins, Walter T. Jr. (1967) .... *Professor of Engineering*
    B.E.E., Manhattan College; M.S., Ph.D., University of Arizona

Hill, Bernard (1966) .... *Associate Professor of Social Work*
    B.S.S., City College of New York, M.S.W., Tulane University

Hill, John Kent (1978) .... *Assistant Professor of Economics*
   B.A., Wake Forest University; Ph.D., Rice University

Hill, Louis A. Jr. (1958) .... *Professor of Engineering; Chair, Department of Civil Engineering*
   B.A., B.S.C.E., M.S.C.E., Oklahoma State University; Ph.D., Case Western Reserve University

Hines, Harold C. (1952) .... *Associate Professor of Music*
   B.S., M.S., University of Illinois

Hink, Heinz R. (1958) .... *Professor of Political Science*
   LL.B., University of Berlin (Germany); M.A., Ph.D., University of Washington

Hinshaw, Donald A. (1966) .... *Associate Professor of Architecture*
   B. Arch., University of Notre Dame

Hirata, Ernest T. (1974) .... *Assistant Professor of Technology*
   B.A., San Diego State College; Ed.D., Arizona State University

Hirleman, Edwin D. Jr. (1977) .... *Assistant Professor of Engineering*
   B.S.M.E., M.S.M.E., Ph.D., Purdue University

Hirsch, Robert (1974) .... *Associate Professor of Communication*
   B.S., Portland State University; M.S., Ph.D., Southern Illinois University

Hoeft, Thea M. (1979) .... *Assistant Professor of Leisure Studies*
   B.S., University of Wisconsin; M.S., University of Utah; Ed.D., Virginia Polytechnic Institute

Hoffer, Warren W. (1972) .... *Associate Professor of Music*
   . B.M., M.M., University of Wisconsin, Madison

Hoffman, Dennis L. (1979) .... *Assistant Professor of Economics*
   B.S., Grand Valley State Colleges; M.A., Ph.D., Michigan State University

Hogan, Timothy D. (1970) .... *Associate Professor of Economics*
   A.B., University of California, Berkeley; M.A., University of California, Davis; Ph.D., Virginia Polytechnic Institute

Holbrook, Amy K. (1975) .... *Assistant Professor of Music*
   B.A., M.A., Mills College; C.Phil., University of Washington

Holloway, John R. (1969) .... *Professor of Chemistry and Geology*
   B.S., University of Oregon; Ph.D., Pennsylvania State University

Holmes, Jack E. (1972) .... *Professor of Political Science*
   A.B., M.A., University of Wyoming; Ph.D., University of Chicago

Homa, Donald L. (1975) .... *Associate Professor of Psychology*
   B.S., University of Iowa; M.S., Ph.D., University of Wisconsin

Hoover, Eric John (1977) .... *Associate Professor of Music*
   B.S., Duquesne University; M.M., Catholic University of America

Hoover, Helene M. (1957) .... *Professor of Home Economics*
   B.S., M.S., Louisiana State University; Ed.D., Oklahoma State University

Hoover, Kenneth H. (1956) .... *Professor of Education*
   B.S., M.A., Louisiana State University; Ed.D., University of Washington

Hopper, William, Captain (1980) .... *Assistant Professor of Military Science*
   B.A., Arizona State University

Horacek, Louise A. (1977) .... *Instructor of Nursing*
   B.S.N., St. Louis University; M.S., Akron University

Horwath, Peter (1973) .... *Professor of German*
   Abitur, Realgymnasium Landshut; B.A., M.A., Indiana University; Ph.D., University of Michigan

Hoult, Thomas Ford (1964) .... *Professor of Sociology*
   A.B., University of Illinois; M.A., Whittier College; Ph.D., University of Southern California

Howell, Kenneth W. (1976) .... *Associate Professor of Education*
   B.A., M.A., Arizona State University; Ph.D., University of Oregon

Howells, Edmund G. (1960) .... *Assistant Professor of Philosophy*
   B.A., University of Utah; M.A. (Phil.), University of Michigan; M.A. (English), Middlebury College;
   Ph.D., Stanford University

Howery, Betty I. (1975) .... *Associate Professor Emeritus of Music*
   B.S. in Ed., M.Mus.Ed., ED.S., University of Kansas

Hoy, Frank P. (1978) .... *Associate Professor of Journalism and Telecommunication*
  B.A., George Washington University; M A , American University
Hoyt, Charles D. Jr. (1962) .... *Professor Emeritus of Engineering*
  B.S., M.S., Ph.D , Purdue University
Hubbard, Paul G. (1950) .... *Professor of History; Associate Dean, College of Liberal Arts*
  A.B., Wabash College; M.A., Ph.D , University of Illinois
Hudelson, Sarah (1975) .... *Associate Professor of Education*
  B A , College of Wooster, M A., Ph D , University of Texas, Austin
Hudson, John W. (1964) .... *Professor of Sociology*
  B S , M A , Ph D , Ohio State University
Huey, Ben M. (1979) .... *Associate Professor of Computer Science*
  B.S., Harding College; M.S., Ph.D., University of Arizona
Hug, Ann C. (1976) . ... *Instructor of Nursing*
  B.S.N., Indiana State University, M S , University of Arizona
Hughes, Terry H. (1980) .... *Assistant Professor of Quantitative Systems*
  B.S., M S., Mississippi State University, Ph D , Texas A & M University
Huizingh, William (1959) .... *Professor of Accounting*
  B.S.B.A , M.B A., University of Denver; Ph D., University of Michigan; C.P.A., Arizona and Colorado
Humphrey, Ted (1966) .... *Associate Professor of Philosophy;*
  A.B , M.A , University of California, Riverside;   *Chair, Department of Philosophy and Humanities*
  Ph.D., University of California, San Diego
Hunnicutt, Harold B (1962) . ... *Professor of Education, Assistant Provost for Research;*
  B S , Ed.M , Ed.D., University of Oklahoma   *Director, Grants and Contracts*
Hunter, Betty A. (1966) .. .. *Assistant Professor of Home Economics*
  B S , M Ed , University of North Carolina, Greensboro
Huntington, Virginia R. (1962) .... *Associate Professor Emeritus of Accounting*
  B.A., M B A , Univers ty of Kansas, Ph D , University of Texas; C.P A , Missouri and Arizona
Hurston, Clifford J. (1975) . ... *Assistant Professor of Administrative Services*
  B S , M.S , Tennessee State University, Ed D , Arizona State Univers ty
Huskey, Sybil (1979) .... *Assistant Professor of Dance*
  B.F A., M.F.A., University of Utah
Huston, Gerald D (1962) .... *Associate Professor of Quantitative Systems*
  B S.C , M.A., Ph.D., University of Iowa
Hutt, Roger W. (1975) .... *Associate Professor of Administrative Services, Assistant Dean,*
  B S , M B A , Ohio State University; Ph D , Michigan State University   *College of Business Administration*

Ihrig, Edwin (1979) .. .. *Associate Professor of Mathematics*
  B.S , M A , University of Maryland, Ph.D., University of Toronto
Imdieke, Leroy F. (1968) .... *Professor of Accounting*
  B.S , Valley City State College, M A., University of North Dakota, Ph D , Un versity of Illinois, C P A , Illinois
Inman, Thomas H. (1975) .... *Professor of Administrative Services; Director,*
  B S , M A , George Peabody College, Ed.D., Northern Illinois University   *Center for Executive Development*
Inskeep, Gordon C. (1968) ... . *Professor of Management*
  B.Ch.E , Ohio State University, Ph D., Columbia University
Ismail, Mourad E. (1979) .... *Associate Professor of Mathematics*
  B S , Cairo University, M S , Ph.D., University of Alberta

Jacks, Mary L. (1955) .... *Associate Professor of Administrative Services*
  B.A , M.A., Arizona State University, C P S , Arizona
Jackson, Donald W. Jr. (1972) .... *Professor of Marketing, Acting Director, Bureau*
  B.A., Albion College; M B.A., Ph D , Michigan State University   *of Business and Economic Research*
Jackson, Marvin R. Jr. (1962) .... *Professor of Economics*
  B S., M A , University of Colorado; Ph D., University of California, Berkeley

Jacob, Richard J. (1963) .... *Professor of Physics*
    B.S , Ph D , University of Utah

Jacobowitz, Ronald (1970) .... *Professor of Mathematics*
    B.A , City College of New York, M.S., University of Chicago; Ph D , Princeton University

Jacobs, H. Donald (1972) .... *Associate Professor of Education*
    B A Ed., M A. Ed., Central Washington State College, D Ed , University of Oregon

Jacobson, Arthur (1956) ... . *Professor of Art*
    B.S., M S., University of Wisconsin, Madison

Jacobson, Dean L. (1974) .... *Professor of Engineering*
    B.S , M.S , University of Notre Dame, Ph D , University of California, Los Angeles

Jain, Nemi C. (1976) .... *Associate Professor of Communication*
    B.S , M S , Agra University, Ph D., Michigan State University

Jakob, John.H. (1960) ... . *Associate Professor of Architecture*
    B. Arch., Ohio State University; M S Arch , Columb a University

Jankowski, Daniel F. (1964) .. .. *Professor of Engineering*
    B S.E , M.S E , Ph D , University of Michigan

Janssen, James G. (1968) ... . *Associate Professor of English*
    B A , M A , Marquette University; Ph D , Un versity of Wisconsin, Madison

Jasper, Marcia A. (1976) .... *Assistant Professor of Nursing*
    B.S.N , St. Olaf College; M.S., Arizona State University

Jay, Bill (1974) .... *Associate Professor of Art*
    B A , Berkshire College of Art, England; M.A , University of New Mexico

Jelinek, James J. (1953) .... *Professor Emeritus of Education*
    B S., University of Illinois; M.A , Northwestern Univers ty, Ed.D , Indiana University

Jenkins, William (1979) .... *Associate Professor of Art*
    B.A , St Lawrence University; M.F A , State University of New York at Buffalo

Jennings, Marianne G. (1977) .... *Associate Professor of Administrative Services*
    B S , J.D., Brigham Young University

Jo, Yung-Hwan (1966)   .... *Professor of Political Science, Director, Center for Asian Studies*
    B A , Lincoln Memorial University; M A., University of Tennessee, Knoxville; Ph D , American Un versity

Johnson, Alan P. (1967) .... *Associate Professor of English*
    B.A., Amherst College, M.A , University of Michigan, Ph D., University of M nnesota

Johnson, David N. (1969) .... *Professor Emeritus of Music*
    B M., Trinity University; M.M., Ph D., Syracuse University

Johnson, Douglas A. (1974) .... *Associate Professor of Accounting*
    B.B.A., Ph.D., University of Texas; C P.A., Texas

Johnson, John M. (1972) .... *Associate Professor of Sociology*
    B A., Indiana University; M A., San Diego State College, Ph.D , University of California, San Diego

Johnson, Rosemary (1959) .... *Professor of Nursing*
    B.S., M.P.H., University of Minnesota

Johnson, Roy M. (1952-53; 1955) .... *Professor of Microbiology*
    A.B., M.S., University of Chicago; Ph D., University of New Mexico

Jones, Austin E. (1968) .... *Professor of Psychology*
    A.B., University of Illinois; M.S., Purdue University; Ph.D , University of Rochester

Jones, Daisy M. (1963) .... *Professor Emeritus of Education*
    B.S., M.S., Indiana State University; Ed.D , Indiana University

Jones, Marion K. (1970) .... *Associate Professor of Dance*
    B.A., Wayne State University; M A., Arizona State University

Jorgl, H. Peter (1979) .... *Associate Professor of Engineering*
    Dipl.-Ing. (IE) Tech., Dipl.-Ing. (ME) Tech , University Graz; M.S. (ME), Rensselaer Polytechnic Institute;
    Dr.-Ing. (ME) Ruhr University

Judd, B. Ira (1937) .... *Professor Emeritus of Agriculture*
    B.S., M.S., Utah State University; Ph.D., University of Nebraska, Lincoln

Justus, Jerry T. (1968) .... *Associate Professor of Zoology*
    B.A., Franklin College; M.A., Ph.D., Indiana University
Juvet, Richard S. Jr. (1970) .... *Professor of Chemistry*
    B.S., Ph.D., University of California, Los Angeles

Kader, David (1979) .... *Associate Professor of Law; Associate Dean, College of Law*
    B.A., California State University, Fresno; J.D., University of Washington; LL.M., University of London
Kagy, Virginia L. (1947) .... *Professor Emeritus of Home Economics*
    B.A., Drake University; M.S., Iowa State University; Ph.D., Johns Hopkins University
Kahn, B. Winston (1966) .... *Associate Professor of History*
    B.A., National Taiwan University (China); M.A., University of Minnesota; Ph.D., University of Pennsylvania
Kaida, Tamarra (1980) .... *Assistant Professor of Art*
    B.A., Goddard College; M.F.A., State University of New York at Buffalo
Kajikawa, William M. (1937) .... *Associate Professor Emeritus of Physical Education*
    B.A., M.A., Arizona State University
Kakar, Rajesh K. (1978) .... *Assistant Professor of Quantitative Systems*
    M.S., B.S., University of Delhi; D.B.A., Texas Tech University
Kamins, Martin P. (1970) .... *Associate Professor of Education*
    B.Ed., University of Miami; M.S., Florida State University; Ed.D., Wayne State University
Kaminsky, Elijah Ben-Zion (1962) .... *Professor of Political Science*
    A.B., A.M., Ph.D., Harvard University
Kanneman, Thomas A. (1970) .... *Professor of Technology; Chair, Department of Electronic Technology*
    B.S.E.E., University of Wisconsin; M.S.E.E., University of New Mexico; Ph.D., University of Wisconsin, Madison
Karjala, Dennis S. (1978) .... *Associate Professor of Law*
    B.S.E., Princeton University; Ph.D., M.S., University of Illinois; J.D., University of California
Karnes, Thomas L. (1968) .... *Professor of History; Chair, Department of History*
    A.B., Colorado University; A.M., Ph.D., Stanford University
Karnig, Albert K. (1978) .... *Professor of Public Affairs; Director, Center for Public Affairs*
    B.A., Augustana College; M.A., Ph.D., University of Illinois
Kaufman, Herbert M. (1973) .... *Professor of Economics*
    B.A., State University of New York, Binghamton; Ph.D., Pennsylvania State University
Kaufman, Irving (1965) .... *Professor of Engineering*
    B.E., Vanderbilt University; M.S., Ph.D., University of Illinois
Kaufman, Lucile B. (1951) .... *Assistant Professor Emeritus of Engineering*
    B.S.M.E., M.S., University of Colorado
Kaufmann, William B. (1968) .... *Associate Professor of Physics*
    A.B., M.A., Ph.D., University of California, Berkeley
Kaye, David (1976) .... *Professor of Law*
    B.S., Massachusetts Institute of Technology; M.A., Harvard University; J.D., Yale University
Kazmier, Leonard J. (1965) .... *Professor of Quantitative Systems*
    A.B., M.A., Wayne State University; Ph.D., Ohio State University
Kearney, James R. III (1968) .... *Associate Professor of History*
    B.A., Pomona College; M.A., Washington University; Ph.D., University of Wisconsin, Madison
Keating, Thomas (1972) .... *Assistant Professor of Political Science*
    B.A., M.A., California State University, Sacramento; M.P.A., Ph.D., Indiana University
Keck, Charles H., Colonel (1980) .... *Professor of Aerospace Studies;*
    B.B.A., University of Hawaii; M.B.A., University of Georgia   *Chair, Department of Aerospace Studies*
Kehl, Delmar G. (1965) .... *Professor of English*
    B.A., Bob Jones University; M.S., University of Wisconsin, Madison; Ph.D., University of Southern California
Keim, Robert T. (1979) .... *Assistant Professor of Quantitative Systems*
    B.S., M.B.A., Ph.D., University of Pittsburgh
Keith, Marlow F. (1946) .... *Assistant Professor Emeritus of Technology*
    B.A. in Ed., M.A. in Ed., Arizona State University

Kelley, Donald G. (1980) .... *Assistant Professor of Technology*
    B.S., M.S., Arizona State University

Kelly, John B. (1963) .... *Professor of Mathematics*
    B.A., Columbia University; Ph.D., Massachusetts Institute of Technology

Kelly, Richard W. (1965) .... *Professor of Engineering;*
    B.S.E., M.S.E., Ph.D., University of Iowa   *Chair, Department of Electrical and Computer Engineering*

Kennedy, Thomas D. (1974) .... *Professor of Criminal Justice*
    B.A., Tulane University; M.A., Ph.D., Louisiana State University

Kenrick, Douglas T. (1980) .... *Assistant Professor of Psychology*
    B.A., Dowling College; M.A., Ph.D., Arizona State University

Kerr, Nancy J. (1968) .... *Professor of Education*
    B.S., University of Illinois; M.A., Ph.D., University of Houston

Kettner, Peter M. (1979) .... *Associate Professor of Social Work*
    B.A., Valparaiso University; M.S.W., George Warren Brown School of Social Work, Washington University;
    D.S.W., University of Southern California

Kevane, Clement J. (1956) .... *Professor of Physics*
    B.S., Ph.D., Iowa State University

Keyfitz, Barbara (1979) .... *Assistant Professor of Mathematics*
    B.S., University of Toronto; M.S., Ph.D., New York University, Courant Institute

Kiesow, Milton A. (1957) .... *Professor of Education*
    B.S., University of Wisconsin; M.A., Ph.D., University of Nebraska, Lincoln

Kigin, Denis J. (1958-65; 1967) .... *Professor of Technology; Dean, University Continuing Education;*
    B.S., Mankato State University; M.S., University of Wisconsin, Stout;   *Director, Summer Sessions*
    Ed.D., University of Missouri, Columbia

Killeen, Peter R. (1969) .... *Professor of Psychology; Chair, Department of Psychology*
    B.A., Michigan State University; Ph.D., Harvard University

Kim, Joochul (1980) .... *Assistant Professor of Planning*
    B.A., University of California, Berkeley; M.U.P., Ph.D., University of Michigan

Kimball, Wayne (1978) .... *Associate Professor of Art*
    B.A., Southern Utah State College; M.F.A., University of Arizona

Kimler, Stephen J. (1967) .... *Associate Professor Emeritus of Education*
    B.Ed., Milwaukee State Teachers College; M.Ed., Marquette University; Ed.D., Arizona State University

Kingsbury, Warren T. (1964) .... *Professor Emeritus of Education*
    A.B., Central College, Fayette, Missouri; A.M., University of Missouri; Ed.D., New York University

Kingston, Jerry L. (1969) .... *Associate Professor of Economics*
    B.A., Wayne State University; M.S., Colorado State University; Ph.D., Pennsylvania State University

Kisielewski, Robert V. (1978) .... *Assistant Professor of Technology*
    B.S.M.E., M.S.M.E., University of Wisconsin

Klann, Margaret L. (1945) .... *Associate Professor Emeritus of Physical Education*
    B.S., University of Illinois; M.A., University of Northern Colorado

Kleinfeld, Gerald R. (1962) .... *Professor of History*
    B.A., New York University; M.A., University of Michigan; Ph.D., New York University

Kliewer, Darleen (1975) .... *Associate Professor of Music*
    B.M.E., Bethany College; M.M., Wichita State University

Klock, John W. (1960) .... *Professor of Engineering*
    B.E., University of Southern California; M.S., Ph.D., University of California, Berkeley

Knaupp, Jonathan E. (1970) .... *Associate Professor of Education*
    B.S., Oregon State University; M.A., Ph.D., University of Illinois

Knauth, L. Paul (1979) .... *Associate Professor of Geology*
    B.A., University of Chicago; Ph.D., California Institute of Technology

Kniep, Willard M. (1975) .... *Associate Professor of Education*
    B.S., Concordia Teachers College; M.A., Ph.D., University of Minnesota

Knight, Leland W. (1978) .... *Associate Professor of Design Sciences*
    B.P.A., Art Center College of Design; M.F.A., Stanford University

Knowlton, John F. (1964) .... *Associate Professor of Spanish*
    B.A., Lewis and Clark College; M.A., Ph.D., University of Oregon

Knox, Robert L. (1963) .... *Professor of Economics*
    B.S., M.S., Oklahoma State University; Ph.D., University of North Carolina

Knudsen, Frances S. (1964) .... *Assistant Professor of Nursing*
    B.S., University of Arizona; M.S., University of Colorado

Koonce, Frank W. (1978) .... *Instructor of Music*
    B.M., North Carolina School of the Arts; M.M., Southern Methodist University

Kotrozo, Carol A. (1972) .... *Associate Professor of Philosophy and Humanities*
    B.A., Pomona College; M.A., Ph.D., University of California, Los Angeles

Kraemer, Richard A. (1978) .... *Assistant Professor of Technology*
    B.S., Arizona State University; B.S., M.S., Massachusetts Institute of Technology

Krahenbuhl, Gary S. (1973) .... *Professor of Physical Education; Chair, Department of Health*
    B.S., M.S., Northern Illinois University; Ed.D., University of Northern Colorado   *and Physical Education*

Kreitner, Robert J. III (1975) .... *Associate Professor of Management*
    B.S., M.B.A., University of Nebraska, Omaha; Ph.D., University of Nebraska, Lincoln

Krenkel, John H. (1947) .... *Professor Emeritus of History*
    B.S. in Ed., University of Illinois; M.A., Claremont Graduate School; Ph.D., University of Illinois

Krinsley, David (1976) .... *Professor of Geology; Chair, Department of Geology*
    Ph.B., S.B., S.M., Ph.D., University of Chicago

Krivanek, Ondrej (1980) .... *Assistant Professor, Solid State Science/Physics*
    B.Sc., Leeds University; Ph.D., Cambridge University

Kroelinger, Michael D. (1980) .... *Associate Professor of Design Sciences*
    B.S., University of Alabama; M.S., Ph.D., University of Tennessee

Kronengold, Eric A. (1970) .... *Assistant Professor of Art*
    B.A., M.A., San Francisco State University

Krus, David J. (1975) .... *Associate Professor of Education; Director, University Testing Services*
    B.A., M.A., Charles University; Ph.D., University of Minnesota

Kudla, Ronald J. (1977) .... *Assistant Professor of Finance*
    B.S.M.E., Pennsylvania State University; M.B.A., Ph.D., University of Pittsburgh

Kuester, James L. (1969) .... *Professor of Engineering*
    B.S., University of Texas; M.E., Ph.D., Texas A & M University

Kuiper, Hendrik J. (1971) .... *Associate Professor of Mathematics*
    B.S., University of Wisconsin, Milwaukee; M.S. (Physics), M.A. (Math),
    Ph.D., University of Wisconsin, Madison

Kulhavy, Raymond W. (1971) .... *Professor of Education*
    A.B., M.A., California State College, San Diego; Ph.D., University of Illinois

Kupka, Timothy J. (1979) .... *Assistant Professor of Theatre*
    B.S., St. Cloud State University; M.F.A., University of Iowa

Kur, C. Edward (1978) .... *Assistant Professor of Management*
    B.S., M.S., University of Missouri

Kurth, Chestine L. (1974) .... *Assistant Professor of Nursing*
    B.S.N., University of Kansas; M.S.N., University of California, San Francisco

Kurtz, Lynn C. (1967) .... *Associate Professor of Mathematics*
    B.S., South Dakota School of Mines and Technology; M.S., Ph.D., University of Utah

Kyrala, Ali (1960-62; 1964) .... *Professor of Physics*
    B.S., Massachusetts Institute of Technology; M.S., Stanford University; S.M., Harvard University;
    D.S., Technische Hochschule Wien (Austria)

Ladman, Jerry R. (1967) .... *Professor of Economics; Director, Center for Latin American Studies*
    B.S., Ph.D., Iowa State University

Laetz, Hans G. (1964) .... *Assistant Professor*
  A.B., University of California, Berkeley; A.M., Ph.D., Stanford University
Lai, Richard T. (1973) .... *Associate Professor c*
  A.B., M.F.A. in Arch., Princeton University; Ph.D., University of Pennsylvania
Lake, Robert L. (1958) .... *Assistant Professor of M*
  B.S., South Dakota School of Mines and Technology; M.A., Arizona State University
Lamberts, Jacob J. (1960) .... *Professor Emeritus*
  B.A., Calvin College; M.A., Ph.D., University of Michigan
Lamke, Leanne K. (1979) .... *Assistant Professor of Home*
  B.A., University of North Dakota; M.S., Ph.D., Texas Tech University
Lamm, Robert C. (1959) .... *Professor of*
  B.M., University of Louisville; M.M., University of Arizona; Ph.D., Indiana University
Lance, Robert E. (1960) .... *Assistant Professor of Journalism and Telecom*
  B.S., Kent State University; M.S., Northwestern University
Landeira, Ricardo L. (1962) .... *Professor Emeritus*
  Bachiller Universitario, Universidad de Santiago (Spain); Maestro Nacional, Escuela Normal de Santiago (
  Ph.D., University of Colorado
Landers, E. James (1960) .... *Professor*
  B.A., M.S., University of Wyoming; Ph.D., New York University
Laner, Mary R. (1976) .... *Associate Professor of*
  B.A., University of Chicago; M.A., University of New Mexico;
  Ph.D., Virginia Polytechnic Institute and State University
Lange, Jane L. (1978) .... *Instructor*
  B.S.N., Viterbo College; M.P.H., University of North Carolina
Lanyon, Richard I. (1975) .... *Professor of J*
  B.E., University of Adelaide (Australia); M.A., Ph.D., University of Iowa
Larimer, John W. (1969) .... *Professor*
  B.A., M.S., Ph.D., Lehigh University
Larson, George W. (1972) .... *Assistant Professor c*
  B.S.L.A., Utah State University; M.S.L.A., University of Wisconsin
Lawler, Eugene D. (1967) .... *Associate Professor of Engineering Comn*
  B.S., Northern State College, South Dakota; M.A., Arizona State University
Lawson, Anton E. (1977) .... *Assistant Professor of Science Educati*
  B.S., University of Arizona; M.A., University of Oregon; Ph.D., University of Oklahoma
Leathers, Chester R. (1957) .... *Associate Professor of M*
  B.S., Eastern Illinois University; M.S., Ph.D., University of Michigan
Lee, Idelle B. (1962) .... *Assistant Professor Emeritus of*
  B.A., University of Wisconsin; M.A., Arizona State University
Lee, Stephen E. (1969) .... *Profes*
  B.A., LL.B., University of Minnesota
Lehrer, Leonard (1977) .... *Professor of Art; Director, Sci*
  B.F.A., Philadelphia College of Art; M.F.A., University of Pennsylvania
Leigh, Frederic A. (1979) .... *Assistant Professor of Journalism and Telecom*
  B.A., University of South Dakota; M.A., University of Iowa
Leonard, Donald J. (1974) .... *Assistant Professor of Administrati*
  B.S., M.B.A., Ni..., St., ...

Lessard, Elizabeth C. (1969) .... *Associate Professor of Dance; Chair, Department of Dance*
    B.S., Georgia College; M.A., Ph.D., Texas Woman's University
Levan, Frederick D. (1965) .... *Associate Professor of Education*
    B.S., M.Ed., Pennsylvania State University; Ed.D., Oklahoma State University
Levine, Gustav (1967) .... *Associate Professor of Psychology*
    B.A., M.A., City University of New York; Ph.D., Columbia University
Levy, Leo B. (1959) .... *Professor of English*
    A.B., M.A., Ph.D., University of California, Berkeley
Lewis, Joseph Perley (1972) .... *Assistant Professor of Administrative Services*
    B.A., University of Arizona; J.D., University of Colorado
Lewis, Kathleen J. (1978) .... *Assistant Professor of Home Economics*
    B.S., University of Wisconsin; M.S., Ph.D., University of Minnesota
Lewis, Maurice S. (1954) .... *Professor Emeritus of Education*
    B.S. in Ed., M.S. in Ed., Drake University; Ed.D., University of Northern Colorado
Lewis, Robert A. (1977) .... *Professor of Home Economics; Director, Center for Family Studies*
    B.A., University of Wisconsin; M.Div., Moravian Theological Seminary; M.A., Ph.D., University of Minnesota
Lewis, William E. (1965) .... *Associate Professor of Computer Science; Acting Chair,*
    B.S.E., Johns Hopkins University; M.S., Ph.D., Northwestern University   *Department of Computer Science*
Leyba, Raul L. (1970) .... *Associate Professor of Social Work*
    B.A., New Mexico Western University; M.S.W., University of Denver
Lightfoot, Marjorie J. (1964) .... *Professor of English*
    B.A., Brown University; M.A., Ph.D., Northwestern University
Limbert, Douglas A. (1976) .... *Assistant Professor of Engineering*
    S.B., S.M., Ph.D., Massachusetts Institute of Technology
Lin, Sheng H. (1965) .... *Professor of Chemistry*
    B.S., M.S., National Taiwan University (China); Ph.D., University of Utah
Linder, Darwyn E. (1972) .... *Professor of Psychology*
    B.A., Macalester College; Ph.D., University of Minnesota
Linderman, Earl W. (1966) .... *Professor of Art*
    B.S., New York State College for Teachers, Buffalo; M.Ed., Ed.D., Pennsylvania State University
Lindholm, Ernest (1971) .... *Associate Professor of Psychology*
    B.A., University of California, Berkeley; M.S., Ph.D., University of Wisconsin, Madison
Lindsay, Stuart M. (1978) .... *Assistant Professor of Physics*
    B.Sc., Ph.D., University of Manchester, England
Lindstrom, Frederick B. (1953) .... *Professor of Sociology; Chair, Department of Sociology*
    A.B., A.M., Ph.D., University of Chicago
Liskovec, Richard F. (1958) .... *Assistant Professor of Mathematics*
    B.S., M.A., Kent State University
Littrell, Joseph J. (1958) .... *Professor of Technology*
    A.B., Peru State Teachers College, Nebraska; M.A., University of Minnesota; Ed.D., University of Missouri, Columbia
Liu, Chui H. (1965) .... *Professor of Chemistry*
    B.A., Ph.D., University of Illinois
Liu, Marjory Bong-Ray (1973) .... *Associate Professor of Humanities*
    B.M., Alverno College; M.M., University of Southern California; C.Phil, Ph.D., University of California, Los Angeles
Lockwood, Ralph G. (1972) .... *Associate Professor of Music*
    B.M., Baldwin Wallace College; M.M., New England Conservatory of Music
Loewenberg, Robert J. (1972) .... *Associate Professor of History*
    B.A., Columbia University; Ph.D., Yale University
Logan, Earl Jr. (1963) .... *Professor of Engineering*
    B.S., M.S., Texas A & M University; Ph.D., Purdue University
Lohr, Dennis E. (1979) .... *Assistant Professor of Chemistry*
    B.S., Beloit College; Ph.D., University of North Carolina

Lombardi, Eugene P. (1957) .... *Professor of Music*
    B.Mus.Ed., Westminster College; M.A., Columbia University; Ed.S., George Peabody College

LoPresti, Ronald (1964) .... *Professor of Music Theory and Composition*
    B.M., M.M., Eastman School of Music

Losse, Deborah N. (1973) .... *Associate Professor of French*
    B.A., Connecticut College; M.A., Ph.D., University of North Carolina, Chapel Hill

Lounsbury, John F. (1969) .... *Professor of Geography*
    B.S., M.S., University of Illinois; Ph.D., Northwestern University

Lovell, Robert E. (1972) .... *Associate Professor of Computer Science*
    B.S.E., University of Michigan; M.S., Ph.D., University of Arizona

Low, Stuart A. (1979) .... *Assistant Professor of Economics*
    B.S., M.S., Ph.D., University of Illinois

Lowe, John W. (1956) .... *Associate Professor of Economics*
    B.S., Arizona State University; M.S., University of Wisconsin, Madison; Ph.D., University of Florida

Lowe, Robert W. (1966) .... *Professor Emeritus of Romance Languages*
    M.A., Columbia University; Doctorat, University of Paris

Lowenstein, Milton D. (1959) .... *Professor Emeritus of Architecture*
    B.A., M.A., Columbia University

Lowenthal, Gary T. (1976) .... *Professor of Law*
    A.B., Harvard College; J.D., University of Chicago

Lu, Pao (1964) .... *Professor of Physics*
    B.S., National Taiwan University (China); M.S., National Tsing Hua University (China); Ph.D., Iowa State University

Luchsinger, Wayne W. (1966) .... *Professor of Chemistry*
    B.S., M.S., Ph.D., University of Minnesota

Luckingham, Bradford F. (1971) .... *Associate Professor of History*
    B.S., Northern Arizona University; M.A., University of Missouri, Columbia; Ph.D., University of California, Davis

Ludlow, Elizabeth A. (1972) .... *Assistant Professor of Nursing*
    B.S.N., University of New Mexico; M.S., Arizona State University

Ludwig, Ann (1979) .... *Assistant Professor of Dance*
    B.S., North Dakota State University; M.S., University of Kansas

Luenow, Paul F. Jr. (1958) .... *Associate Professor of Spanish*
    B.A., M.A., University of Washington; Ph.D., University of New Mexico

Lundberg, Horace W. (1962) .... *Professor Emeritus of Social Work*
    B.S., M.S., University of Utah; M.S.W., University of California, Berkeley; Ph.D., University of Minnesota

Lundgren, Harry R. (1962) .... *Professor of Engineering*
    B.S.C.E., Purdue University; M.S., Arizona State University; Ph.D., Oklahoma State University

Lundin, Robert F. (1962) .... *Professor of Geology*
    B.A., Augustana College; M.S., Ph.D., University of Illinois

Lyle, Mary G. (1959) .... *Assistant Professor Emeritus of English*
    B.A., University of Iowa; M.A., University of South Dakota

Lynch, David H. (1976) .... *Associate Professor of Administrative Services*
    A.A., Thornton Junior College; B.S., University of Illinois; M.S., Ed.D., Northern Illinois University

Lytle, Robert G. (1972) .... *Associate Professor Emeritus of Agriculture*
    B.S., Western Kentucky University; M.S., Arizona State University

MacKinnon, Stephen R. (1971) .... *Associate Professor of History*
    B.A., M.A., Yale University; Ph.D., University of California, Davis

Mackulak, Gerald T. (1980) .... *Assistant Professor of Engineering*
    B.S.I.E., M.S.I.E., Ph.D., Purdue University

Maddy, Kenneth H. (1980) .... *Associate Professor of Agriculture*
    B.S., Pennsylvania State University; M.S., University of Wisconsin; Ph.D., Pennsylvania State University

Magel, Donald (1978) .... *Associate Professor of Social Work*
    A.B., Sacramento State College; M.S.W., University of California, Berkeley; Ph.D., University of Pittsburgh

Magenta, Muriel (1968) .... *Professor of Art*
  B.A., Queens College, New York; M.A., M.F.A., Ph.D., Arizona State University

Magers, William D. (1971) .... *Associate Professor of Music*
  B.A., Santa Barbara College; M.M., D.M.A., University of Southern California

Malin, Michael C. (1979) .... *Assistant Professor of Geology*
  A.B., University of California, Berkeley; Ph.D., California Institute of Technology

Malone, Charles F. (1966) .... *Professor of Education*
  B.S., Kansas State Teachers College; M.Ed., Ed.D., University of Kansas

Manera, Elizabeth S. (1967) .... *Assistant Professor of Education*
  B.S., M.A., Towson State College; Ed.D., Arizona State University

Mankin, Lawrence D. (1973) .... *Associate Professor of Public Affairs; Assistant Dean, Graduate College*
  B.B.A., City College of New York; Ph.D., University of Illinois

Manning, Duane (1951) .... *Professor of Education*
  B.A., M.A., Ball State University; Ed.D., Indiana University

Mansell, Dorothy Moira (1975) .... *Professor of Nursing*
  B.S.N.E., St. Mary College; M.S.N., University of Oregon; Ph.D., University of Washington

Marcus, Melvin G. (1974) .... *Professor of Geography*
  B.A., University of Miami, Florida; M.A., University of Colorado; Ph.D., University of Chicago

Marthaler, Ann E. (1977) .... *Assistant Professor of Nursing*
  B.S., Alverno College; M.N., University of Washington

Martin, John F. Jr. (1966) .... *Associate Professor of Anthropology*
  B.A., Beloit College; M.A., Ph.D., University of Chicago

Martin, Linda J. (1980) .... *Assistant Professor of Finance*
  B.A., University of Louisville; M.S., University of Kansas; M.B.A., D.B.A., Louisiana Technological University

Martin, Richard (1975) .... *Assistant Professor of Religious Studies*
  B.A., University of Montana; B.D., University of Dubuque;
  Th.M., Princeton Theological Seminary; Ph.D., New York University

Martinez, Quino E. (1957) .... *Professor of Spanish*
  B.S., New Mexico Western College; M.A., George Peabody College; Ph.D., University of North Carolina

Marzke, Robert F. (1969) .... *Assistant Professor of Physics*
  A.B., Princeton University; Ph.D., Columbia University

Mason, Bruce B. (1960) .... *Professor of Political Science*
  B.S., North Texas State College; M.A., Texas Christian University; Ph.D., University of Texas

Mason, Marybeth M. (1980) .... *Invitational/Teacher of English*
  B.A.E., Arizona State University

Matheson, Alan A. (1967) .... *Professor of Law; Dean, College of Law*
  B.A., M.S., J.D., University of Utah

Matson, John H. (1978) .... *Assistant Professor of Technology*
  B.S. in Ed., M.S., Illinois State University

Matthias, Judson S. (1967) .... *Associate Professor of Engineering*
  B.S., U.S. Military Academy; M.S., Oregon State University; Ph.D., Purdue University

Mayer, Albert J. (1968) .... *Professor of Sociology*
  A.B., A.M., Ph.D., University of Chicago

Mayer, Michael (1978) .... *Assistant Professor of Communication*
  B.A., M.A., University of Wyoming; Ph.D., University of Kansas

Mazen, S. David (1970) .... *Associate Professor of Counselor Education*
  B.A., Whitworth College; M.Ed., Eastern Washington State College; Ed.D., Washington State University

McCarter, Joan H. (1961) .... *Assistant Professor of Mathematics*
  B.S., M.A., University of Arizona

McCleary, Richard D. (1978) .... *Assistant Professor of Criminal Justice*
  B.S., University of Wisconsin, Milwaukee; M.A., Ph.D., Northwestern University

McClellan, Muriel S. (1980) .... *Assistant Professor of Nursing*
  B.S.N., Arizona State University; M.N., University of California, Los Angeles; Ph.D., Arizona State University

McCoy, Kathleen M. (1976) .... *Assistant Professor of Education*
    B.S., M.S., Portland State University; Ph.D., University of Oregon

McCready, Richard R. (1960) .... *Professor Emeritus of Quantitative Systems*
    B.S., Valley City State Teachers College; M.A., Ed.D., University of Northern Colorado

McCurdy, Lyle B. (1973) .... *Associate Professor of Technology*
    B.S., M.S., Arizona State University

McDonald, John N. (1969) .... *Associate Professor of Mathematics*
    A.B., Kings College; M.S., Ph.D., Rutgers, The State University

McDowell, John M. (1978) .... *Assistant Professor of Economics*
    B.A., M.A., University of California, Los Angeles

McEwen, Douglas R. (1969) .... *Professor of Music; Director of Choirs*
    B.S., Bowling Green State University; M.M., Indiana University; Ed.D., University of Northern Colorado

McFarland, Elaine H. (1973) .... *Associate Professor Emeritus of Health Science*
    B.A., Marietta College; M.N., Case Western Reserve University

McGaughey, Robert W. (1971) .... *Professor of Zoology*
    B.A., Augustana College; M.A., University of Colorado; Ph.D., Boston University

McGaw, Dickinson L. (1968) .... *Associate Professor of Political Science*
    A.B., A.M., Ph.D., Indiana University

McGowan, Patrick J. (1979) .... *Professor of Political Science; Chair, Department of Political Science*
    B.A., University of the South; M.A., Johns Hopkins University; Ph.D., Northwestern University

McGrath, G.D. (1950) .... *Professor Emeritus of Education*
    A.B., Findlay College; M.A., University of Michigan; Ph.D., University of Colorado

McGuire, Charles (1979) .... *Assistant Professor of Administrative Services*
    B.S.B.A., J.D., University of North Dakota

McHenry, Albert L. (1978) .... *Associate Professor of Technology*
    B.S., Southern University; M.S., Ph.D., Arizona State University

McHughes, Janet L. (1980) .... *Associate Professor of Communication*
    B.S., M.A., Ph.D., Northwestern University

McIsaac, Marina Stock (1980) .... *Assistant Professor of Education*
    B.A., Pomona College; M.A., Ph.D., University of Wisconsin

McKeeman, Vicki L. (1979) .... *Assistant Professor of Physical Education*
    B.S., Ball State University; M.S., Indiana State University; Ph.D., University of Utah

McKenzie, Patrick Bruce (1970) .... *Associate Professor of Accounting*
    B.S., M.S., Kansas State University; Ph.D., Michigan State University; C.P.A., Kansas

McKlveen, John W. (1974) .... *Associate Professor of Engineering*
    B.S., United States Naval Academy; M.E.N.E., Ph.D., University of Virginia

McLeod, Lois L. (1976) .... *Associate Professor of Music*
    A.A., Stephens College

McMahon, Douglas (1978) .... *Assistant Professor of Mathematics*
    B.S., M.S., Ph.D., Case Western Reserve University

McNeill, Barry W. (1976) .... *Assistant Professor of Engineering*
    B.S., M.S., Ph.D., Stanford University

McPherson, Mary B. (1979) .... *Assistant Professor of Sociology*
    B.A., Vanderbilt University; M.A., Ph.D., University of Nebraska

McPheters, Lee R. (1976) .... *Professor of Economics*
    A.B., San Francisco State University; Ph.D., Virginia Polytechnic Institute

McTaggert, W. Donald (1971) .... *Professor of Geography; Chair, Department of Geography*
    B.A., M.A., University of St. Andrews (Scotland); Ph.D., Australian National University

McWhirter, J. Jeffries (1970) .... *Professor of Counselor Education*
    B.A., St. Martin's College; M.Ed., Oregon State University; M.Ed., Ph.D., University of Oregon

Meister, Arnold G. (1957) .... *Professor Emeritus of Physics*
    B.S., Central YMCA College; Ph.D., Illinois Institute of Technology

Melichar, Dudley W. (1974) .... *Assistant Professor of Criminal Justice; Assistant Dean for*
    B.S., M.S. in Ed., South Dakota State University;   *Student Services, College of Public Programs*
    Ed.D., Arizona State University

Melvin, Michael (1980) .... *Assistant Professor of Economics*
    B.B.A., University of Houston; M.A., San Diego State University; Ph.D., University of California, Los Angeles

Melvin, Nancy (1975) .... *Assistant Professor of Nursing*
    B.S., M.A., University of Nebraska

Mendez, Jose A. (1980) .... *Assistant Professor of Economics*
    B.A., M.A., University of Texas, Austin; M.A., Ph.D., Southern Methodist University

Mendleson, Jack (1967) .... *Associate Professor of Management*
    B.S., Butler University; M.B.A., Indiana University; D.B.A., Michigan State University

Menke, Robert F. (1947) .... *Professor of Education; Director, Career Services*
    B.S., Oshkosh State College; M.A. in Ed., Ph.D., Northwestern University

Merbs, Charles F. (1973) .... *Professor of Anthropology*
    B.S., M.S., Ph.D., University of Wisconsin, Madison

Merrill, Bruce D. (1971) .... *Assistant Professor of Political Science*
    B.A., Southern Oregon College; M.A., Brigham Young University; Ph.D., University of Michigan

Mescon, Timothy S. (1979) .... *Assistant Professor of Management*
    B.A., Tulane University; M.B.A., Southern Methodist University; Ph.D., University of Georgia

Metcalf, V. Alonzo (1971) .... *Professor of Economics*
    B.S., M.S., University of Arkansas; Ph.D., University of Missouri, Columbia

Metha, Arlene (1973) .... *Associate Professor of Education*
    B.A., Arizona State University; M.A., Ohio State University; Ph.D., University of Southern California

Metos, Thomas H. (1965) .... *Professor of Education*
    B.S., M.S., Ph.D., University of Utah

Metz, John (1980) .... *Assistant Professor of Music*
    B.A., M.M., Syracuse University; D.M.A., The Juilliard School

Metzger, Darryl E. (1963) .... *Professor of Engineering; Chair,*
    B.S.M.E., M.S.M.E., Ph.D., Stanford University   *Mechanical and Energy Systems Engineering*

Meyer, Bonnie J. F. (1976) .... *Associate Professor of Education*
    B.A., Washington State University; M.S., Ph.D., Cornell University

Meyer, Janice Catherine (1977) .... *Assistant Professor of Music*
    B.M.E., M.M.E., University of Wisconsin; M.M., Western Michigan

Meyerson, Lee (1962) .... *Professor of Psychology*
    A.B., Lafayette College; A.M., University of California, Los Angeles; Ph.D., Stanford University

Michels, LeMoyne F. (1963) .... *Professor of Construction*
    B.S., U.S. Military Academy

Miller, Barbara K. (1976) .... *Instructor of Nursing*
    B.S.N., M.S.Ed., University of Akron

Miller, Brian P. (1976) .... *Assistant Professor of Education; Coordinator, Community Education*
    B.S., M.A., Central Michigan University; Ed.D., Western Michigan University

Miller, Fred L. (1971) .... *Professor of Physical Education*
    B.S., University of the Pacific; M.S., University of Southern California; P.E.D., Indiana University

Miller, Paul T. (1947) .... *Professor Emeritus of Geology*
    B.A., Simpson College; M.S., Ph.D., University of Iowa

Miller, Peter J. (1972) .... *Associate Professor of Quantitative Systems*
    B.S.M.E., Stanford University; M.B.A., San Diego State University; D.B.A., University of Washington

Miller, Robert W. (1969) .... *Associate Professor of Music*
    B.A., M.A., Arizona State University; Ph.D., Michigan State University

Miller, Victor J. (1958) .... *Professor of Agriculture*
    B.S., M.S., Ph.D., University of Illinois

Miller, William Edgar (1966) .... *Associate Professor of Counselor Education;*
    B.M.E., Ed.D., University of Kansas   *Counselor, University Counseling Service*

Milner, Joe W. (1967) .... *Professor of Journalism and Telecommunication*
    B.A., East Texas State University; M.A., University of Oklahoma; Ed.D., University of Wyoming

Milton, Doris A. (1980) .... *Assistant Professor of Nursing*
    B.S.N., Fairleigh Dickinson University; M.S., New York University

Minckley, Wendell L. (1963) .... *Professor of Zoology*
    B.S., Kansas State University; M.A., University of Kansas; Ph.D., University of Louisville

Mings, Robert C. (1971) .... *Associate Professor of Geography*
    B.S., M.A.T., Indiana University; Ph.D., Ohio State University

Minter, Marshall R. Jr. (1965) .... *Associate Professor of Technology*
    B.S.M.E., Purdue University; M.S.M.E., University of Arizona

Misner, Robert L. (1975) .... *Professor of Law*
    B.A., University of San Francisco; J.D., University of Chicago

Mitchell, Frederic F. (1961) .... *Professor of Education*
    B.A., M.A., University of Arizona; Ph.D., Columbia University

Moeller, Therald (1969) .... *Professor of Chemistry*
    B.S., Oregon State College; Ph.D., University of Wisconsin, Madison

Mokwa, Michael P. (1979) .... *Assistant Professor of Marketing*
    B.B.A., M.B.A., Ph.D., University of Houston

Montanari, John R. (1980) .... *Assistant Professor of Management*
    B.S., University of Dayton; M.B.A., University of New Mexico; D.B.A., University of Colorado

Monte, Woodrow (1979) .... *Assistant Professor of Home Economics*
    B.S., New Mexico Institute of Mining and Technology; M.S., Ph.D., Colorado State University

Montero, Darrel (1979) .... *Associate Professor of Social Work*
    B.A., California State University; M.A., Ph.D., University of California

Montiel, Miguel (1974) .... *Professor of Social Work*
    B.S., University of Arizona; M.S.W., Arizona State University; D.S.W., University of California, Berkeley

Monts, Elizabeth A. (1973) .... *Professor of Home Economics*
    B.S., Eastern Illinois University; M.S., University of Wisconsin; Ph.D., Texas Woman's University

Monty, Dewey E. Jr. (1969) .... *Professor of Agriculture; Director, Laboratory Animal Care Program*
    B.S., Colorado State University; M.S., University of California, Davis;
    D.V.M., Colorado State University; Ph.D., Utah State University

Moody, E. Grant (1951) .... *Professor of Agriculture*
    B.S., University of Arizona; M.S., Kansas State University; Ph.D., Purdue University

Moor, William C. (1968) .... *Associate Professor of Engineering*
    B.S., M.S., Washington University; Ph.D., Northwestern University

Moore, Byron C. (1968) .... *Professor of Education*
    A.B., Monmouth College; M.Ed., Ed.D., University of Arizona

Moore, Carleton B. (1961) .... *Professor of Chemistry and Geology; Director,*
    B.S., Alfred University; Ph.D., California Institute of Technology   *Center for Meteorite Studies*

Moore, J. Douglas (1969) .... *Associate Professor of Mathematics*
    B.S., M.S., Idaho State University; Ph.D., Syracuse University

Moore, Thomas A. (1976) .... *Assistant Professor of Chemistry*
    B.A., Ph.D.; Texas Tech University

Moorhead, Gregory (1978) .... *Assistant Professor of Management*
    B.S.I.E., M.B.A., Ph.D., University of Houston

Morales, Ralph Jr. (1978) .... *Assistant Professor of Home Economics*
    B.S., A.D.A., M.S., Loma Linda University; Ph.D., Kansas State University

Moran, Dennis V. (1964) .... *Associate Professor of English*
    A.B., University of Notre Dame; B.A., M.A., Oxford University; Ph.D., Stanford University

Morehart, Thomas B. (1975) .... *Assistant Professor of Insurance*
    B.S., New Mexico State University; M.S., Colorado State University; Ph.D., Georgia State University; C.P.C.U.

Morgan, Joseph B. (1980) .... *Assistant Professor of Military Science*
    B.S., University of Tampa; M.S., University of Southern California

Morgan, Owen W. (1968) .... *Professor of Home Economics*
    B.A., Grinnell College; M.A., University of Nebraska, Omaha; Ph.D., University of Nebraska, Lincoln

Morgan, Miriam J. (1965) .... *Instructor of French*
    Licence-ès-Lettres, University of Paris, France; M.A. (French, Spanish), Arizona State University

Morris, Donald H. (1962) .... *Professor of Anthropology*
    B.A., Arizona State University; M.A., Ph.D., University of Arizona

Morris, John P. (1968) .... *Professor of Law*
    A.B., J.D., Northwestern University

Moulton, Gerald L. (1967) .... *Professor of Education*
    B.A., Hamline University; M.Ed., Ed.D., University of Oregon

Mowrer, Donald E. (1965) .... *Professor of Communication*
    B.A., M.A., Florida State University; Ph.D., Arizona State University

Moyer, Joan E. (1971) .... *Professor of Education*
    B.S., Kutztown State College; M.Ed., Pennsylvania State University; Ph.D., University of Maryland

Muhlenkamp, Ann F. (1973) .... *Professor of Nursing*
    B.S., M.S., Marquette University; Ph.D., University of Kansas

Mulhollan, Paige E. (1978) .... *Professor of History; Provost*
    B.S., B.A., M.A., University of Arkansas;   *and Academic Vice President*
    Ph.D., University of Texas, Austin

Mumma, Stanley A. (1976) .... *Professor of Planning*
    B.S.M.E., University of Cincinnati; M.S., Ph.D., University of Illinois

Munch, Theodore W. (1959) ....,... *Professor of Science Education/ Physics*
    B.S. in Ed., B.S. (Bacteriology), Ohio State University;
    M.A. in Ed., Colorado State University; Ed.D., Stanford University

Munk, Morton E. (1961) .... *Professor of Chemistry; Chair, Department of Chemistry*
    B.S., Northwestern University; M.S., University of Miami; Ph.D., Wayne State University

Murchison, John T. Jr., Colonel (1980) .... *Professor of Military Science*
    B.S., United States Military Academy; M.A., Columbia University

Murphy, Juanita F. (1971) .... *Professor of Nursing; Dean, College of Nursing*
    A.B., Oklahoma Baptist University; M.S., Ph.D., Case Western Reserve University

Murphy, Nina L. (1924) .... *Professor Emeritus of Physical Education*
    B.S., University of Arizona; M.A., University of Southern California

Murranka, Patricia A. (1977) .... *Assistant Professor of Administrative Services*
    B.A., Trenton State College; M.A., Rider College

Murray, Roger N. (1968) .... *Associate Professor of English*
    B.A., B.S., Moorhead State Teachers College; M.A., Stanford University; Ph.D., University of Iowa

Musheno, Michael C. (1977) .... *Associate Professor of Criminal Justice;*
    B.A., Lycoming College; M.A., Ph.D., American University   *Director, Center of Criminal Justice*

Mushkatel, Alvin H. (1980) .... *Associate Professor of Public Affairs*
    B.A., Ohio State University; M.S., Ph.D., University of Oregon

Myers, Louis M. (1937) .... *Professor Emeritus of English*
    B.A., St. Stephen's College; M.A., Columbia University; Ph.D., University of California, Berkeley

Myler, Charles E. Jr. (1968) .... *Associate Professor of Real Estate*
    B.B.A., Loyola University; M.B.A., Harvard University; Ph.D., University of Florida

Nagasawa, Richard H. (1969) .... *Associate Professor of Sociology*
    B.A., University of Hawaii; M.A., Ph.D., University of Washington

Nash, Leanne T. (1971) .... *Associate Professor of Anthropology*
    B.A., University of California, Davis; M.A., Ph.D., University of California, Berkeley

Nash, Thomas H. III (1971) .... *Associate Professor of Botany*
    B.S., Duke University; M.S., Ph.D., Rutgers, The State University

Navrotsky, Alexandra (1969) .... *Professor of Chemistry and Geology*
    B.S., M.S., Ph.D., University of Chicago

Nebeker, Helen E. (1958) .... *Professor of English*
  B.A., M.A., Arizona State University

Neitzel, G. Paul (1979) .... *Assistant Professor of Engineering*
  B.S., Rollins College; M.S., Ph.D., Johns Hopkins University

Nelsen, Edward A. (1975) .... *Associate Professor of Education; Associate*
  B.S., University of Wisconsin, Madison; Ph.D., Stanford University   *Director, I.D. Payne Laboratory*

Nelson, G. Lynn (1973) .... *Assistant Professor of English*
  B.A., Kearney State College; Ph.D., University of Nebraska, Lincoln

Nelson, Harold D. (1967) .... *Professor of Engineering*
  B.S., South Dakota School of Mines and Technology; M.S., Kansas State University; Ph.D., Arizona State University

Nelson, J. Russell (1981) .... *President of the University; Professor of Finance*
  B.A., Pacific Union College; M.B.A., Ph.D., University of California, Los Angeles

Nelson, John C. (1967) .... *Associate Professor of Education*
  B.S., M.A., Arizona State University; Ph.D., George Peabody College

Nelson, Nelda F. (1978) .... *Instructor in Nursing*
  B.S.N., Murray State University; M.S.N., University of Virginia, Charlottesville

Nering, Evar D. (1969) .... *Professor of Mathematics*
  A.B., Indiana University; A.M., Ph.D., Princeton University

Ney, James W. (1969) .... *Professor of English*
  B.A., M.A., Wheaton College; Ph.D., University of Michigan

Nichols, Ann W. (1970) .... *Associate Professor of Social Work*
  A.B., Stanford University; M.S.W., Columbia University

Nichols, Catherine G. (1952) .... *Professor Emeritus of Counselor Education*
  A.B., M.A., University of Kentucky; Ph.D., Columbia University

Nielsen, Michael J. (1969) .... *Associate Professor of Design Sciences*
  B.P.D., North Carolina State University; M.A., Stanford University

Nielson, Gregory M. (1970) .... *Associate Professor of Mathematics*
  B.S., M.A., Ph.D., University of Utah

Niemeir, Wilma M. (1959) .... *Assistant Professor Emeritus of Mathematics*
  B.A., New Mexico Highlands University; M.S., University of Wyoming

Nigam, Bishan Perkash (1964) .... *Professor of Physics*
  B.S., M.S., University of Delhi (India); Ph.D., University of Rochester

Nigg, Joanne (1979) .... *Assistant Professor of Sociology*
  B.A., California State University; M.A., Ph.D., University of California, Los Angeles

Nilsen, Aileen P. (1975) .... *Associate Professor of Education*
  B.A., Brigham Young University; M.Ed., American University; Ph.D., University of Iowa

Nilsen, Don L. F. (1973) .... *Professor of English*
  B.A., Brigham Young University; M.A., American University; Ph.D., University of Michigan

Noble, Frank C. (1971) .... *Professor of Counselor Education*
  B.S., Northern Illinois University; M.Ed., Ed.D., University of Illinois

North, Larry W. (1980) .... *Associate Professor of Nursing*
  B.A., Hastings College; M.S., University of Colorado; Ph.D., University of Arizona

Northey, William T. (1959) .... *Professor of Microbiology*
  B.A., University of Minnesota; M.A., Ph.D., University of Kansas

Norton, M. Scott (1973) .... *Professor of Education*
  B.S., M.E., Ed.D., University of Nebraska

Nowak, Mary Jane (1976) .... *Associate Professor of Social Work*
  Ph.B., Marquette University; M.S.S.W., University of Wisconsin; Ph.D., Catholic University of America

Nutaitis, Raymond J. (1975) .... *Assistant Professor of Music*
  B.S., Wilkes College; M.M., Eastman School of Music

Nutt, Merle C. (1956) .... *Professor Emeritus of Engineering*
  B.S., Illinois Institute of Technology; M.A., University of Iowa; LL.D., Illinois Wesleyan University

O'Bannon, Charles E. (1964) .... *Professor of Engineering*
    B.S.C.E., University of New Mexico; M.S., Harvard University; Ph.D., Oklahoma State University

O'Beirne, Donald E. (1959) .... *Professor of Education*
    B.E., Whitewater State Teachers College; M.A., Ed.D., Northwestern University

Ober, B. Scot (1978) .... *Assistant Professor of Administrative Services*
    B.S., M.A., East Carolina University; Ph.D., Ohio State University

O'Brien, Carmen A. (1959) .... *Associate Professor Emeritus of Education*
    B.A. in Ed., M.A. in Ed., Arizona State University

O'Connell, John J. (1975) .... *Associate Professor of Insurance*
    B.A., Western Washington State College; M.S., University of Oregon; Ph.D., Ohio State University; C.P.C.U.

O'Connor, Elinor J. (1970) .... *Assistant Professor Emeritus of Home Economics*
    B.S., College of St. Catherine; M.S., University of Iowa

O'Dell, Michael A. (1980) .... *Assistant Professor of Accounting*
    B.S., M.B.A., University of California, Los Angeles; Ph.D., University of Texas; C.P.A., Colorado

Odenkirk, James E. (1967) .... *Professor of Physical Education*
    B.S., M.A., Ohio State University; Ed.D., Columbia University

Officer, David T. (1979) .... *Assistant Professor of Finance*
    B.A., Hendrix College; M.B.A., Ph.D., University of Arkansas

O'Grady, E. Pearse (1977) .... *Associate Professor in Engineering*
    B.S.E.E., St. Louis University; M.S., Ph.D., University of Arizona

Ohmart, Robert D. (1970) .... *Associate Professor of Zoology*
    B.S., M.S., New Mexico State University; Ph.D., University of Arizona

Ojala, William T. (1971) .... *Associate Professor of English; Director of Freshman English*
    B.A., M.A., University of Minnesota; Ph.D., Florida State University

O'Keeffe, Michael (1963) .... *Professor of Chemistry*
    B.S., Ph.D., University of Bristol (England)

Okun, Morris A. (1976) .... *Assistant Professor of Education*
    B.A., Brooklyn College; M.S., Ph.D., Pennsylvania State University

O'Leary, Timothy J. (1978) .... *Assistant Professor of Quantitative Systems*
    B.S., Westminster College; M.B.A., D.B.A., Kent State University

Olivas, Louis (1979) .... *Assistant Professor of Administrative Services*
    B.A., M.A., Ed.D., Arizona State University

Oliver, Robert S. (1963) .... *Professor of Architecture*
    A.B., M.A., University of California, Berkeley; M.F.A., Instituto Allende (Mexico)

Olmsted, Cameron B. (1956) .... *Associate Professor Emeritus of Education*
    B.A. in Ed., M.A. in Ed., Arizona State University; Ed.D., University of Northern Colorado

Olney, Claude W. (1967) .... *Associate Professor of Administrative Services*
    B.S., J.D., Marquette University

Olsen, Larry K. (1977) .... *Associate Professor of Health Science*
    B.S., M.A.T., Lewis and Clark College; M.P.H., University of California, Berkeley;
    Dr.P.H., University of California, Los Angeles

Olson, Grace P. (1977) .... *Instructor of Nursing*
    B.S.N., M.S., Arizona State University

O'Neil, Michael J. (1979) .... *Assistant Professor of Criminal Justice*
    B.A., M.A., Brown University; Ph.D., Northwestern University

Ong, Shirley G. (1978) .... *Instructor of Nursing*
    B.S.N., M.S.N., Indiana University

Osborn, Marianne (1972) .... *Assistant Professor of Nursing*
    B.S.N., Arizona State University; M.S.N., University of Colorado

Osenburg, Frederic C. (1946) .... *Professor Emeritus of English*
    A.B., M.A., University of Michigan; Ph.D., University of Illinois

Osterhoudt, Robert G. (1976) .... *Professor of Physical Education*
    B.S., M.S., Pennsylvania State University; Ph.D., University of Illinois

Ostrom, Lonnie L. (1973) .... *Professor of Marketing; Assistant Dean,*
   B.B.A., University of Wisconsin;   *College of Business Administration*
   M.S., Southern Illinois University; Ph.D., University of Alabama

Overman, Glenn D. (1956) .... *Professor of Marketing*
   B.S., Central State College; M.S., Oklahoma State University; D.B.A., Indiana University

Owen, John E. (1964) .... *Professor of Sociology*
   B.A., Duke University; A.M., Ph.D., University of Southern California

Packer, Merle A. (1959) .... *Associate Professor of Physical Education;*
   B.A., M.A., Arizona State University;   *Badminton Coach, Intercollegiate Athletics*
   Ed.D., University of Northern Colorado

Page, John B. (1969) .... *Associate Professor of Physics*
   B.S., Ph.D., University of Utah

Palais, Joseph C. (1964) .... *Professor of Engineering*
   B.S.E.E., University of Arizona; M.S.E., Ph.D., University of Michigan

Pangrazi, Robert P. (1973)` .... *Associate Professor of Physical Education*
   B.A., M.S., Ph.D., Washington State University

Pany, Kurt J. (1978) .... *Assistant Professor of Accounting*
   B.S.B.A., University of Arizona; M.B.A., University of Minnesota; Ph.D., University of Illinois; C.P.A., Arizona

Pardini, Louis J. (1967) .... *Associate Professor of Technology*
   B.A., A.M., Idaho State University; Ed.D., University of Northern Colorado

Parker, L. Mayland (1955) .... *Professor of Geography*
   B.S., Brigham Young University; M.S., University of Utah; Ph.D., Cornell University

Parkinson, Stanley R. (1971) .... *Associate Professor of Psychology*
   A.B., University of California, Berkeley; M.A., Ph.D., University of California, Davis

Parrish, Berta (1978) .... *Assistant Professor of Education*
   B.A., M.A., Ed.D., Arizona State University

Parrish, H. Wayne (1967) .... *Assistant Professor of Education*
   A.B., San Diego State College; M.Ed., Ed.D., University of Oregon

Parsons, Michael L. (1967) .... *Professor of Chemistry*
   B.A., M.S., Kansas State College; Ph.D., University of Florida

Pasqualetti, Martin J. (1977) .... *Assistant Professor of Geography*
   B.A., University of California, Berkeley; M.A., Louisiana State University; Ph.D., University of California, Riverside

Pastin, Mark (1980) .... *Professor of Philosophy*
   B.A., University of Pittsburgh; A.M., Ph.D., Harvard University

Patten, Duncan T. (1965) .... *Professor of Botany*
   B.A., Amherst College; M.S., University of Massachusetts; Ph.D., Duke University

Patterson, John D. (1967) .... *Professor of Engineering*
   B.S.E.E., M.S., Ph.D., University of California, Berkeley

Patterson, Robert A. (1957) .... *Professor of Zoology*
   B.S., University of Michigan; Ph.D., Ohio State University

Patti, Charles H. (1974) .... *Associate Professor of Advertising*
   A.B., M.S., Ph.D., University of Illinois

Paulsen, George E. (1959) .... *Professor of History*
   B.A., Hobart College; M.A., Rutgers, The State University; Ph.D., Ohio State University

Peck, George B. (1957) .... *Assistant Professor of Mathematics*
   B.S., Arizona State University; M.S., University of Illinois

Pedrick, Willard H. (1966) .... *Professor of Law*
   B.A., Parsons College; J.D., Northwestern University

Peek, George A. Jr. (1964) .... *Professor Emeritus of Political Science*
   B.A., M.A., Ph.D., University of Virginia

Perril, Lester S. (1957) .... *Professor Emeritus of Education*
B.A., Ohio Wesleyan University; M.A., Ohio State University;
Ph.D., University of North Carolina

Perrill, Norman K. (1966) .... *Professor of Communication*
B.S., M.A., Northwestern University; Ph.D., University of Southern California

Peterman, Gordon G. (1966) .... *Professor of Construction*
B.S.C.E., University of Iowa

Peters, Diane (1980) .... *Instructor in Nursing*
B.A., M.S., University of Florida

Peters, Kathleen A. (1967) .... *Assistant Professor of Home Economics*
B.S., M.S., Kansas State University

Peterson, Clifford J. (1974) .... *Associate Professor of English*
B.A., University of Montana; M.A., Arizona State University;
Ph.D., University of Washington

Peterson, Edward R. (1977) .... *Assistant Professor of Technology*
B.S.E.E., Fairleigh Dickenson University; M.S.E.E., Arizona State University

Peterson, John R. (1963) .... *Professor of Architecture*
B.A., St. Olaf College; B. Arch., University of Minnesota; M. Arch., Harvard University

Peterson, Paul T. (1979) .... *Assistant Professor of Real Estate*
B.S., Brigham Young University; M.B.A., University of Utah

Peterson, Ralph (1976) .... *Assistant Professor of Education*
B.A., Eastern Washington State College; M.A., Ed.D., Columbia University

Peterson, Samuel (1976) .... *Assistant Professor of Art*
B.A., Dartmouth University; M.A., New York University

Pettit, George R. (1964) .... *Professor of Chemistry*
B.S., Washington State University; M.S., Ph.D., Wayne State University

Péwé, Troy L. (1965) .... *Professor of Geology*
A.B., Augustana College; M.S., University of Iowa; Ph.D., Stanford University

Pfuhl, Erdwin H. Jr. (1968) .... *Associate Professor of Sociology*
A.B., Whitman College; A.M., University of Idaho; Ph.D., Washington State University

Pheanis, David C. (1975) .... *Assistant Professor of Computer Science*
B.S., Case Western Reserve University; M.S., Ph.D., Arizona State University

Philippakis, Andreas S. (1967) .... *Professor of Quantitative Systems;*
B.S., Gannon College;   *Chair, Department of Quantitative Systems*
M.B.A., Ph.D., University of Wisconsin, Madison

Phillips, William W. (1958) .... *Associate Professor of History*
Ph.B., M.A., University of North Dakota; Ph.D., University of Missouri, Columbia

Pian, Richard H. J. (1959) .... *Professor of Engineering*
B.S.C.E., Kung Shang University (China); M.S.E., Ph.D., Cornell University

Piercey, Dorothy J. (1968) .... *Associate Professor of Education*
B.A., College of St. Francis; M.A., Arizona State University; Ph.D., University of Arizona

Pike, Norma J. (1964) .... *Assistant Professor of Physical Education*
B.S., M.S., University of Southern California

Pile, James (1971) .... *Associate Professor of Art*
B.F.A., M.F.A., University of Nebraska, Omaha

Pimentel, David (1973) .... *Assistant Professor of Art*
B.S. Ed., Massachusetts College of Art; M.F.A., Rochester Institute of Technology

Pinkava, Donald J. (1964) .... *Professor of Botany*
B.S., M.S., Ph.D., Ohio State University

Pitt, H. Ronald (1975) .... *Assistant Professor of Accounting*
B.S., University of Montana; M.S., Ph.D., Oklahoma State University; C.P.A., Oklahoma

Pittman, Anne M. (1952) .... *Professor of Physical Education*
B.S., University of Texas; M.A., New York University; Ed.D., Stanford University

Plantz, Don V. (1960) .... *Professor of Economics*
B.S., M.B.A., University of Kansas; Ph.D., Indiana University

Plog, Frederick T. (1975) .... *Professor of Anthropology;*
B.A., Northwestern University; *Chair, Department of Anthropology*
M.A., Ph.D., University of Chicago

Plummer, Ramona F. (1957) .... *Associate Professor of Health Science*
B.S., M.A., University of Alabama

Podlich, William F. (1949) .... *Professor of Education*
B.S., Maryland State Teachers College; Ph.D., University of Iowa

Poe, Jerry B. (1974) .... *Professor of Finance; Chair, Department of Finance*
B.A., Drury College; M.B.A., Washington University; D.B.A., Harvard University

Pohl, Norval F. (1978) .... *Associate Professor of Quantitative Systems; Assistant Dean,*
B.S., M.B.A., California State University, Fresno; *College of Business Administration*
D.B.A., Arizona State University

Polenz, G. Donald (1967) .... *Associate Professor Emeritus of Social Work*
B.A., Wartburg College; M.A., University of Utah; D.S.W., University of Southern California

Portnoff, Collice H. (1945) .... *Professor Emeritus of English*
A.B., M.A., University of California, Berkeley; F.A.A.R., M.A., American Academy in Rome (Italy);
Ph.D., Stanford University

Powers, Doris C. (1960) .... *Associate Professor Emeritus of English*
B.A., Wellesley College; M.A., Occidental College; Ph.D., University of California, Berkeley

Prather, Elizabeth (1978) .... *Associate Professor of Communication*
B.S., University of Nebraska; M.A., Ph.D., University of Iowa

Prehm, Herbert J. (1977) .... *Professor of Education;*
B.S., Concordia Teacher's College; *Chair, Department of Special Education*
M.S., Ph.D., University of Wisconsin, Madison

Price, Thornton W. (1961) .... *Professor of Engineering*
B.S., University of Illinois; M.S., Lehigh University; Ph.D., University of Illinois

Prieto, Alfonso G. (1974) .... *Associate Professor of Education*
B.A., University of New Mexico; M.S.S.W., Ph.D., University of Missouri

Prust, Zenas A. (1959) .... *Professor of Technology; Chair, Department of Industrial Technology*
B.S., University of Wisconsin, Stout; M.A., University of Minnesota; Ed.D., University of Northern Colorado

Pulaski, Charles (1980) .... *Professor of Law*
B.A., LL.B., Yale University

Putnik, Edwin V. (1962) .... *Associate Professor Emeritus of Music*
B.A., Northwestern University; M.M., Eastman School of Music

Quesada, Eugene R. (1973) .... *Assistant Professor of Design Sciences*
B.A., Arizona State University

Rabiner, Donald N. (1979) .... *Assistant Professor of Art*
B.A., Hamilton College; M.A., Ph.D., University of Kansas

Raccach, Moshe (1980) .... *Assistant Professor of Agriculture*
B.Sc., M.Sc., The Hebrew University, Israel; Ph.D., Cornell University

Rader, Martha (1975) .... *Associate Professor of Administrative Services*
B.S., M.B.E., University of Mississippi; Ph.D., Kansas State University

Rader, Rosemary (1976) .... *Assistant Professor of Religious Studies*
B.A., College of St. Catherine; M.A., University of Minnesota; Ph.D., Stanford University

Radke, Judith J. (1960) .... *Associate Professor of French*
B.S., M.A., University of Wisconsin, Madison; Ph.D., University of Colorado

Ragan, Donal M. (1967) .... *Professor of Geology*
B.A., Occidental College; M.S., University of Southern California; Ph.D., University of Washington

Ralston, Mack A. (1956) .... *Professor of Education*
B.S., M.S., Indiana State University; Ed.D., Indiana University

Randall, Virginia R. (1962) .... *Associate Professor of English*
B.A., College of New Rochelle; M.A., Arizona State University; Ph.D., Occidental College

Rangel, Arturo (1979) .... *Assistant Professor of Social Work*
B.A., University of Texas, Austin; M.A., Ph.D., University of Michigan

Rankin, Robert L. (1971) .... *Associate Professor of Engineering*
B.S., University of Texas, El Paso; Ph.D., Rice University

Rannells, Jessie M. (1939) .... *Professor Emeritus of Home Economics*
B.S., Iowa State University; M.S., Cornell University; Ph.D., University of Wisconsin

Rapp, James R. (1962) .... *Professor of Architecture*
B. Arch., University of Detroit; M.S. Arch., Columbia University

Rasmussen, David I. (1963) .... *Professor of Zoology*
B.S., M.S., University of Utah; Ph.D., University of Michigan

Rasmussen, Robert D. (1949) .... *Associate Professor of Agriculture*
B.S., Iowa State University; M.S., Washington State University

Ratterree, Jack L. (1964) .... *Associate Professor of Music*
B.M., Curtis Institute of Music; M.A., American University

Rausch, Jack D. (1965) .... *Associate Professor of Music*
B.S., M.A., Ohio State University

Rave, Wallace J. (1967) .... *Associate Professor of Music*
B.S., Illinois State University; M.M., Ph.D., University of Illinois

Rawls, William S. (1974) .... *Professor of Physics*
B.S., Murray State College; M.S., Tulane University; Ph.D., Iowa State University

Ray, William J. (1968) .... *Professor of Education*
B.S., M.S., State University of New York, Buffalo; Ed.D., Wayne State University

Reader, Mark (1967) .... *Associate Professor of Political Science*
A.B., A.M., Ph.D., University of Michigan

Reck, Ross R. (1975) .... *Assistant Professor of Management*
B.A., Ph.D., Michigan State University

Reckers, M.J. Philip (1980) .... *Associate Professor of Accounting*
B.S., Quincy College; M.B.A., Washington University; Ph.D., University of Illinois

Red Horse, John (1979) .... *Associate Professor of Social Work*
A.B., University of the Pacific; M.S.W., University of California; Ph.D., University of Minnesota

Redican, Kerry J. (1978) ....:...................... *Assistant Professor of Health Science*
B.A., California State University, Long Beach; M.S.P.H., University of California, Los Angeles;
Ph.D., University of Illinois

Reed, William H. (1968) .... *Associate Professor of Technology;*
B.S., University of Oklahoma;   *Chair, Department of Aeronautical Technology*
M.S., Arizona State University

Reeves, Henry C. (1969) .... *Professor of Microbiology*
B.S., Franklin and Marshall College; M.A., Ph.D., Vanderbilt University

Reich, John W. (1965) .... *Professor of Psychology*
B.A., M.S., University of Oklahoma; Ph.D., University of Colorado

Reif, William E. (1970) .... *Professor of Management*
B.B.A., M.A., Ph.D., University of Iowa

Reiman, Etsuko Obata (1978) .... *Assistant Professor of Japanese*
B.A., Keio University, Japan; M.A., Seton Hall University; M.A., Ph.D., University of Wisconsin, Madison

Reinard, John C. (1975) .... *Associate Professor of Communication*
B.A., M.A., California State University, Fullerton; Ph.D., University of Southern California

Rein'l, Robert L. (1961) .... *Professor Emeritus of Philosophy*
A.B., A.M., Ph.D., Harvard University

Reiser, Castle O. (1958) .... *Professor Emeritus of Engineering*
    B.S., Colorado State University; Pet. E., Colorado School of Mines; Ph.D., University of Wisconsin, Madison

Reiss, Peter W. (1976) .... *Assistant Professor of Administrative Services*
    B.S., J.D., Marquette University; M.A., Arizona State University

Reneau, J. Hal (1975) .... *Associate Professor of Accounting*
    B.B.A., M.S., Texas Tech University; Ph.D., University of Missouri, Columbia

Reuter, Vincent G. (1961) .... *Professor of Management*
    B.S.C., M.A., Ph.D., University of Iowa

Reynolds, Robert D. (1970) .... *Associate Professor of Music*
    B.M., Texas Christian University; M.M., University of Texas; Ph.D., Ohio State University

Reznikoff, Shirley (1973) .... *Professor of Design Sciences*
    B.A., University of Southwestern Louisiana; Certificate, New York School of Interior Design;
    M.A., Louisiana State University

Rice, Margaret J. (1968) .... *Assistant Professor Emeritus of Communication*
    A.B., A.M., University of Kansas

Rice, Ross R. (1950) .... *Professor of Political Science*
    M.A., Ph.D., University of Chicago

Rice, Roy C. (1946) .... *Professor Emeritus of Education*
    B.S., University of New Mexico; M.S., University of Massachusetts; Ph.D., University of Texas

Rice, Warren (1958) .... *Professor of Engineering*
    B.S., M.S., Ph.D., Texas A & M University

Richards, Gale L. (1965) .... *Professor of Communication*
    B.A., University of Akron; M.A., Ph.D., University of Iowa

Richards, Mary L. (1978) .... *Assistant Professor of Nursing*
    B.S.N., M.S.N., De Paul University

Richardson, Deane E. (1970) .... *Professor of Physical Education*
    B.S., Bradley University; M.A., Ed.D., Stanford University

Richardson, Grant L. (1953) .... *Professor of Agriculture*
    B.S., M.S., University of Arizona; Ph.D., Oregon State University

Richardson, H.D. (1940) .... *Professor Emeritus of Counselor Education*
    Ph.B., Ph.M., University of Wisconsin; Ph.D., Northwestern University; LL.D., Arizona State University

Richardson, Richard C. Jr. (1977) .... *Professor of Education; Chair,*
    B.S., Castleton State College;   *Department of Higher and Adult Education*
    M.S., Michigan State University; Ph.D., University of Texas

Rickel, Harry P. (1948) .... *Professor Emeritus of Music*
    B.M., M.M., University of Arizona

Rider, Wendell J. (1953) .... *Professor Emeritus of Music*
    B.S., Iowa State Teachers College; M.M., Eastman School of Music; Ph.D., University of Iowa

Righetti, Timothy L. (1980) .... *Assistant Professor of Agriculture*
    B.S., University of Maryland; Ph.D., University of California, Davis

Risseeuw, John L. (1980) .... *Assistant Professor of Art*
    B.S., M.A., M.F.A., University of Wisconsin, Madison

Ritchie, Kathleen E. (1972) .... *Instructor in Psychology*
    B.A., University of Arizona

Robbins, Earl R. (1961) .... *Associate Professor of Engineering*
    B.S.E.E., Texas Technological College; M.S.E., Ph.D., Arizona State University

Roberts, Thomas G. (1970) .... *Associate Professor of Education*
    B.A., Wake Forest University; M.A., Ph.D., University of North Carolina

Robinson, Daniel O. (1950) .... *Professor of Agriculture*
    A.B., Brigham Young University; M.S., University of Arizona; Ph.D., Ohio State University

Robinson, Helene M. (1967) .... *Associate Professor Emeritus of Music*
    B.A., University of Oregon; M.M., Northwestern University

Robinson, Sharon E. (1978) .... *Assistant Professor of Counselor Education*
    B.S., M.S., University of Wisconsin, LaCrosse; Ph.D., Indiana University

Rodd, Laurel R. (1975) .... *Assistant Professor of Japanese*
    B.A., DePauw University; M.A.T., East Tennessee State University; M.A., Ph.D., University of Michigan

Roe, Susan C. (1980) .... *Assistant Professor of Nursing*
    B.S., M.S., University of Arizona

Rollier, Dwayne A. (1971) .... *Associate Professor of Engineering*
    B.S., M.S., Oklahoma State University; Ph.D., Florida State University

Roosa, Mark W., (1980) .... *Assistant Professor of Home Economics*
    B.S., Ohio State University; M.A., Ph.D., Michigan State University

Rook, Fern H. (1969) .... *Assistant Professor Emeritus of Technology*
    B.A., University of Colorado; M.A., Arizona State University

Roper, Devon J. (1966) .... *Associate Professor of Technology*
    B.S., Utah State University; M.S., Arizona State University

Rosales, F. Arturo (1980) .... *Assistant Professor of History*
    B.A., Arizona State University; M.A., Stanford University; Ph.D., Indiana University

Rose, Jonathan (1968) .... *Professor of Law*
    B.A., University of Pennsylvania; LL.B., University of Minnesota

Rose, Seth D. (1976) .... *Assistant Professor of Chemistry*
    B.S., University of California, Berkeley; Ph.D., University of California, San Diego

Rosegrant, Teresa J. (1980) .... *Assistant Professor of Education*
    B.S., Southern Illinois University; M.A., Illinois State University; Ph.D., University of Illinois

Rossi, Patrick J. (1967) .... *Associate Professor of Psychology*
    B.S., St. Mary's College; M.A., San Fernando Valley State College; Ph.D., University of California, Riverside

Rossman, Mark H. (1974) .... *Associate Professor of Education*
    B.A., New York University; M.S., University of Bridgeport; Ed.D., University of Massachusetts

Rothschild, Mary A. (1975) .... *Assistant Professor of History;*
    B.A., M.A., Ph.D., University of Washington   *Director of Women's Studies*

Rover, R. Craig (1952) .... *Professor Emeritus of Education*
    B.A., Upsala College; M.A., St. Lawrence University; Ph.D., Cornell University

Rowe, Kenneth L. (1962) .... *Professor of Marketing;*
    B.A., M.A., Northern Iowa University; Ph.D., Michigan State University   *Chair, Department of Marketing*

Rowley, C. Stevenson (1970) .... *Associate Professor of Accounting*
    B.A., Trinity College; M.B.A., University of Chicago; Ph.D., University of Wisconsin, Madison;
    C.P.A., Arizona, Illinois

Roy, Radha R. (1963) .... *Professor of Physics*
    B.Sc., M.Sc., Presidency College, University of Calcutta; Ph.D., University of London

Ruccolo, James S. (1974) .... *Associate Professor of Music*
    B.M., Eastman School of Music; M.M., Arizona State University; D.M.A., University of Arizona

Ruch, William A. (1968) .... *Professor of Management*
    B.S., M.B.A., D.B.A., Indiana University

Rueda, Robert (1978) .... *Assistant Professor of Education*
    B.A., University of California, Los Angeles; M.S.W., University of Southern California

Ruff, Paul F. (1958) .... *Professor of Engineering*
    B.S.C.E., M.S.C.E., Case Western Reserve University

Rummell, John R. (1975) .... *Associate Professor of Architecture*
    B.A., M.S., Stanford University

Ruppé, Reynold J. (1960) .... *Professor of Anthropology*
    B.A., University of New Mexico; Ph.D., Harvard University

Russell, Paul E. (1967) .... *Professor of Engineering*
    B.S.E.E., B.S.M.E., New Mexico A&M University; M.S.E.E., Ph.D., University of Wisconsin, Madison; P.E.

Russell, Stanley J. (1969) .... *Associate Professor of Engineering*
    B.S., University of Illinois; M.S., Ph.D., University of Wisconsin, Madison

Rutherford, Robert B. Jr. (1976) .... *Professor of Education*
  B.S., M.Ed., University of Virginia; Ed.S., Ph.D., George Peabody College
Rutowski, Ronald L. (1976) .... *Associate Professor of Zoology*
  B.A., University of California, Santa Cruz; Ph.D., Cornell University

Sacks, Benjamin (1963) .... *Professor Emeritus of History*
  B.A., University of New Mexico; M.A., McGill University; Ph.D., Stanford University
Sackton, Frank J. (1976) .... *Professor of Public Affairs*
  B.S., University of Maryland; M.P.A., Arizona State University
Sadalla, Edward K. (1974) .... *Assistant Professor of Psychology*
  B.A., University of California, Berkeley; Ph.D., Stanford University
Sadler, William E. (1975) .... *Assistant Professor of Design Sciences*
  B.S., M.S., Kent State University
Salerno, Nicholas A. (1961) .... *Professor of English*
  B.A. in Ed., M.A., Arizona State University; Ph.D., Stanford University
Sanders, Bevie T. (1957) .... *Associate Professor of Accounting*
  B.B.A., North Texas State University; M.S., Texas A & M University;
  Ph.D., University of Texas; C.P.A., Arizona and Texas
Sanderson, R. Thomas (1963) .... *Professor Emeritus of Chemistry*
  B.S., Yale University; Ph.D., University of Chicago
Sandler, Irwin (1975) .... *Associate Professor of Psychology*
  B.A., Brooklyn College; Ph.D., University of Rochester
Sands, Kathleen M. (1977) .... *Assistant Professor of English*
  B.A., Fort Wright College; M.A., Ph.D., University of Arizona
Sanner, Robert D. (1979) .... *Assistant Professor of Chemistry*
  B.S., Miami University; Ph.D., California Institute of Technology
Sansone, Fred J. (1965) .... *Associate Professor of Mathematics*
  B.S.E., M.S.E., University of Michigan; M.S., Ph.D., Rutgers, The State University
Santora, Dolores (1979) .... *Associate Professor of Nursing*
  B.S.N., M.S.N., Wayne State University; Ph.D., Arizona State University
Sargent, Charles S. Jr. (1971) .... *Associate Professor of Geography*
  B.A., University of Wyoming; M.A., Ph.D., University of California, Berkeley
Sater, Vernon E. (1962) .... *Professor of Engineering*
  B.S.Ch.E., M.S.Ch.E., Ph.D., Illinois Institute of Technology
Satterthwaite, Lester L. Jr. (1968) .... *Professor of Education*
  B.S., M.S., Ed.D., Indiana University
Sattler, Howard E. (1967) .... *Professor of Education*
  B.S., M.S., Ph.D., Arizona State University
Satterlie, Richard A. (1980) .... *Assistant Professor of Zoology*
  B.A., Sonoma State University; Ph.D., University of California, Santa Barbara
Savage, Nevin W. (1959) .... *Professor of Mathematics*
  B.S., M.A., Pennsylvania State University; Ph.D., University of California, Los Angeles
Scalise, James W. (1975) .... *Associate Professor of Architecture; Assistant Dean,*
  B. Arch., Arizona State University; M. Arch., University of California, Berkeley   *College of Architecture*
Schabacker, Joseph C. (1963) .... *Professor of Management*
  B.S., Temple University; M.B.A., Ph.D., University of California, Los Angeles
Schade, Thomas V. (1974) .... *Associate Professor of Criminal Justice*
  B.A., Hope College; M.A., Ph.D., Western Michigan University
Schall, Merri H. (1960-66; 1967) .... *Associate Professor of Education;*
  B.A., Albion College; M.S., Ed.D., Arizona State University   *Chair, Department of Elementary Education*
Schaumburg, Donald R. (1953) .... *Professor of Art*
  B.A. in Art Ed., College of Arts and Crafts; M.F.A., Claremont Graduate College

Scheatzle, David G. (1979) .... *Associate Professor of Architecture*
    B.S., Kent State University; M.S.E., Arizona State University

Schlacter, John L. (1969) .... *Professor of Marketing*
    B.B.A., Western Reserve University; M.B.A., Ph.D., Ohio State University

Schlagenhauf, Don E. (1976) .... *Assistant Professor of Economics*
    B.S., Marquette University; M.A., Ph.D., University of Illinois

Schluntz, Roger L. (1980) .... *Professor of Architecture; Chair, Department of Architecture*
    B.Arch., University of Nebraska; M.Arch., University of California, Berkeley

Schmidt, Alfred H. (1960) .... *Professor Emeritus of Marketing*
    B.S., University of Oklahoma; M.B.A., D.B.A., Indiana University

Schmidt, Jean M. (1966) .... *Professor of Microbiology*
    B.A., M.S., University of Iowa; Ph.D., University of California, Berkeley

Schmidt, Peter A. (1978) .... *Associate Professor of Technology; Chair,*
    B.S., in Ed., Northern Illinois University;   *Department of Manufacturing Technology*
    M.A. in Ed., Ed.D., Arizona State University

Schmidt, Randall B. (1968) .... *Associate Professor of Art*
    B.A., Hamline University, Minnesota; M.A., University of New Mexico

Schnittgrund, Karen P. (1977) .... *Assistant Professor of Home Economics*
    B.S., M.S., Ph.D., University of Illinois at Urbana

Schoen, Robert A. (1966) .... *Assistant Professor of Technology*
    B.S., M.S., Arizona State University

Schoenwetter, James (1967) .... *Professor of Anthropology*
    A.B., University of Chicago; M.S., University of Arizona; Ph.D., Southern Illinois University

Schon, Isabel (1974) .... *Associate Professor of Education*
    B.S., Mankato State College; M.A., Michigan State University; Ph.D., University of Colorado

Schroeder, Milton R. (1969) .... *Professor of Law*
    B.A., Wesleyan University; J.D., University of Chicago

Schuback, Gertrud B. (1966) .... *Instructor of German*
    B.A., M.A., Arizona State University

Schwada, John W. (1971) .... *Past President of the University; Professor of Political Science*
    B.S., Northeast Missouri State College; M.A., University of Missouri; Ph.D., University of Texas

Schwartz, Bill Neal (1978) .... *Assistant Professor of Accounting*
    B.B.A., University of Wisconsin; M.A., University of Illinois, Chicago; Ph.D., University of California, Los Angeles;
    C.P.A., Illinois, California, Arizona

Scott, Craig O. Capt. (1979) .... *Assistant Professor of Military Science*
    B.S., M.S., Rensselaer Polytechnic Institute

Scott, Walter T. (1961) .... *Professor Emeritus of Mathematics*
    B.A., M.A., Ph.D., Rice University

Scoular, David B. (1952) .... *Professor Emeritus of Music*
    B.A., Texas Christian Univeristy; B.M., Lawrence College; M.A., Columbia University

Searfoss, Lyndon W. (1973) .... *Associate Professor of Education*
    B.S., West Chester State College; M.A., Ph.D., Syracuse University

Sebald, Hans (1963) .... *Professor of Sociology*
    B.A., Manchester College; M.S., Ph.D., Ohio State University

Sehested, Colene R. (1967) .... *Assistant Professor of Nursing*
    B.S., University of Arkansas; M.S., University of Maryland

Seipp, Kenneth F. (1963) .... *Professor of Music*
    B.S., Hartwick College; M.M., Conservatory of Music, University of Kansas City; Mus.Ed.D., Indiana University

Self, Stephen (1979) .... *Assistant Professor of Geology*
    B.Sc., University of Leeds, Yorkshire, England; Ph.D., Imperial College of Science and Technology, London

Selleck, Herbert H. (1973) .... *Associate Professor Emeritus of Construction*
    B.S.C.E., Iowa State University

Senner, Wayne M. (1973) .... *Associate Professor of German*
    B.A., Portland State University; M.A., University of Washington; Ph.D., University of Illinois
Seperich, George J. (1976) .... *Assistant Professor of Agriculture*
    B.S., Loyola University, Chicago; M.S., Ph.D., Michigan State University
Shafer, Robert E. (1966) .... *Professor of English; Director, English Education*
    B.S., M.S., University of Wisconsin, Madison; Ed.D., Columbia University
Shafer, Susanne M. (1966) .... *Professor of Education*
    A.B., Smith College; M.A., Syracuse University; Ph.D., University of Michigan
Sharer, Jon W. (1975) .... *Assistant Professor of Art*
    B.A., Roosevelt University, Chicago; M.S., Illinois Institute of Technology; Ph.D., Ohio State University
Shaw, Milton C. (1978) .... *Professor of Engineering*
    B.S., M.E., Drexel University; Ph.D., University of Cincinnati
Shell, Leon G. (1967) .... *Associate Professor of Counselor Education; Dean of Students*
    B.A., University of Colorado; A.M., Ed.D., University of Northern Colorado
Sheppard, Douglas C. (1971) .... *Professor of Spanish*
    B.A., Montana State University; M.A., Ph.D., University of Wisconsin, Madison
Sheridan, Eleanor (1973) .... *Assistant Professor of Nursing*
    B.S.N., M.S.N., Wayne State University
Sheridan, Michael F. (1966) .... *Professor of Geology*
    B.A., Amherst College; M.S., Ph.D., Stanford University
Sherman, Thomas L. (1964) .... *Professor of Mathematics*
    B.A., University of California, Los Angeles; M.S., Ph.D., University of Utah
Sheydayi, E. Yury (1973) .... *Associate Professor of Architecture*
    B.S.C.E., University of Arizona; M.S.C.E., Arizona State University
Shinn, Randall A. (1978) .... *Assistant Professor of Music*
    B.A., Southwestern Oklahoma State University; M.M., University of Colorado; D.M.A., University of Illinois
Shinn, Thelma J. (1975) .... *Associate Professor of English*
    B.A., Central Connecticut State College; M.A., Ph.D., Purdue University
Shipp, Vernon E. (1966) .... *Assistant Professor of Art*
    B.S., Grand Canyon College; M.A., Arizona State University
Shipper, Frank M. (1976) .... *Assistant Professor of Management*
    B.S.M.E., West Virginia Tech; M.B.A., Ph.D., University of Utah
Shirreffs, Janet H. (1977) .... *Associate Professor of Health Science*
    B.S., Ithaca College; M.S., Syracuse University; Ph.D., Texas Woman's University
Shofstall, Weldon P. (1950) .... *Professor Emeritus of Secondary Education*
    B.S. in Ed., Northeast Missouri State Teachers College; M.A.; Ph.D., University of Missouri
Shrock, David L. (1974) .... *Associate Professor of Transportation*
    B.E.E., General Motors Institute; M.B.A., D.B.A., Indiana University
Shuman, I. Gayle (1974) .... *Associate Professor of Criminal Justice*
    B.S., M.A. in Ed., Ed.D., Arizona State University
Silvaroli, Nicholas J. (1963) .... *Professor of Education; Director, Reading Education*
    B.S. in Ed., State University of New York, Fredonia; M.A., State University of New York, Buffalo;
    Ed.D., Syracuse University
Silver, Benjamin (1971) .... *Assistant Professor of Journalism and Telecommunication*
    B.A., M.A., University of Iowa
Simmons, Douglas J. (1963) .... *Assistant Professor of French*
    A.B., Wabash College; M.A.T., Harvard University; Certificat de francais usuel, degré supérieur;
    Certificat de pronônciation francaise, La Sorbonne (France)
Simon, Sheldon (1975) .... *Professor of Political Science*
    B.A., University of Minnesota; M.A., Princeton University; Ph.D., University of Minnesota
Singhal, Avi C. (1977) .... *Associate Professor in Engineering*
    B.Sc. Math., Agra University; B.Sc.Engr., B.Sc. Hons., St. Andrews University, Scotland;
    S.M., C.E., Sc.D., Massachusetts Institute of Technology

Sinkov, Abraham (1964) .... *Professor Emeritus of Mathematics*
B.S., College of City of New York; M.S., Columbia University; Ph.D., George Washington University

Sirkis, Murray D. (1968) .... *Professor of Engineering*
B.S., Massachusetts Institute of Technology; M.S., Ph.D., University of Illinois

Skoldberg, Phyllis (1977) .... *Professor of Music; Assistant Dean, College of Fine Arts*
B.M., M.M., New England Conservatory of Music; M.M.E., D.M., Indiana University

Smith, Andrew T. (1978) .... *Assistant Professor of Zoology*
A.B., University of California, Berkeley; Ph.D., University of California, Los Angeles

Smith, Arthur B. Jr. (1967) .... *Associate Professor of Administrative Services*
B.S., Hardin-Simmons University; M.B.A., Ed.D., University of Houston

Smith, Charles B. (1964) .... *Professor of Administrative Services*
B.S., Drake University; M.S., New Mexico Highlands University; Ed.D., University of Northern Colorado

Smith, Hal L. (1979) .... *Assistant Professor of Mathematics*
B.S., Ph.D., University of Iowa

Smith, Harvey A. (1977) .... *Professor of Mathematics; Chair, Department of Mathematics*
B.S., Lehigh University; M.S., A.M., Ph.D., University of Pennsylvania

Smith, L. Christian (1971) .... *Assistant Professor of History*
B.A., Union College; M.A., Ph.D., University of Illinois

Smith, Lehi T. (1959) .... *Professor of Mathematics*
B.S., M.A. in Ed., Arizona State University; Ed.D., Stanford University

Smith, Margo M. (1963) .... *Associate Professor Emeritus of Music*
B.M., Grinnell College; M.A. in Ed., Arizona State University

Smith, Marion W. (1952) .... *Associate Professor of Music*
B.S., in Mus. Ed., Capital University; M.M., American Conservatory of Music

Smith, Ralph E. (1970) .... *Professor of Accounting*
B.B.A., Washburn University; M.S., Ph.D., University of Kansas; C.P.A., Kansas

Smith, Richard L. (1967) .... *Professor of Engineering; Chair, Department of Industrial and*
B.S., Washington University; M.S., Ohio State University;   *Management Systems Engineering*
Ph.D., Arizona State University

Smith, Ronald D. (1963) .... *Associate Professor of History; Assistant Dean,*
A.B., San Diego State College; Ph.D., University of Southern California   *College of Liberal Arts*

Smith, Stanley E. (1977) .... *Assistant Professor of Journalism and Telecommunication*
B.A., Colgate University; M.A., Purdue University

Snider, Donald L. (1967) .... *Associate Professor of Engineering*
B.S.E.L., California State Polytechnic College; M.S.E.E., University of Pennsylvania;
Ph.D., Case Institute of Technology

Snow, Robert (1970) .... *Associate Professor of Sociology*
B.S., M.A., Ph.D., University of Minnesota

Snyder, Ernest E. Jr. (1958) .... *Professor Emeritus of Physics*
A.B., M.A., Colorado State University; Ed.D., New York University

Snyder, Lester M. Jr. (1967) .... *Professor of Counselor Education*
B.S., Millersville State College; M.Ed., Western Maryland College; Ph.D., University of Michigan

Somerville, Susan C. (1978) .... *Assistant Professor of Psychology*
B.A., University of New England (Australia); Ph.D., Australian National University

Sommerfeld, Milton R. (1968) .... *Professor of Botany; Chair, Department of Botany and Microbiology*
B.S., Southwest Texas State College; Ph.D., Washington University

Sparks, Charles F., Captain (1979) .... *Assistant Professor of Military Science*
B.S., Oregon State University; M.S., Arizona State University

Spence, John C. H. (1976) .... *Assistant Professor of Physics*
M.Sc., Ph.D., University of Melbourne (Australia)

Spinosa, Frank (1965) .... *Professor of Music*
B.M., M.A., Boston University; D.M.A., University of Illinois

Stadmiller, Jack E. (1963) .... *Associate Professor of Engineering Communications*
    B.S., University of Utah; M.A., Arizona State University

Stafford, Alfred B. (1958) .... *Professor Emeritus of Engineering*
    B.S.E.E., Carnegie Institute of Technology; M.A., University of Pittsburgh; Ph.D., University of Chicago

Stafford, Kenneth R. (1957) .... *Professor Emeritus of Educational Psychology*
    B.A., M.Ed., Ph.D., University of Oklahoma

Stahl, Robert (1978) .... *Assistant Professor of Education*
    B.A., M.A., Ed.D., University of Florida

Stahnke, Herbert L. (1941) .... *Professor Emeritus of Zoology*
    S.B., University of Chicago; M.A., University of Arizona; Ph.D., Iowa State University

Staley, Frederick A. (1970) .... *Associate Professor of Education*
    B.A., M.A., Western Michigan University; Ph.D., Michigan State University

Stalzer, Frank S. (1955) .... *Associate Professor of Music*
    B.M.Ed., University of Kansas; M.M., Eastman School of Music

Stange, Jean B. (1970) .... *Associate Professor of Home Economics*
    B.S., Iowa State University; M.S., University of Minnesota

Stanley, James T. (1968) .... *Professor of Engineering*
    B.S., M.S., Ph.D., University of Illinois

Stanton, Ann M. (1980) .... *Associate Professor of Law*
    B.A., University of Minnesota; J.D., Ph.D., Stanford University

Stark, Barbara L. (1972) .... *Associate Professor of Anthropology*
    B.A., Rice University; M. Phil., Ph.D., Yale University

Starkey, Penny J. (1977) .... *Instructor of Nursing*
    B.S., M.S., University of Missouri

Starrfield, Sumner G. (1972) .... *Professor of Astronomy/Physics*
    B.A., University of California, Berkeley; M.A., Ph.D., University of California, Los Angeles

Steadman, Lyle B. (1971) .... *Assistant Professor of Anthropology*
    B.A., Occidental College; M.A., University of California, Los Angeles; Ph.D., Australian National University

Steere, Caryl J. (1960) .... *Assistant Professor of Education*
    B.A., Albion College; M.A., Arizona State University

Steffl, Bernita M. (1961) .... *Professor of Nursing*
    B.S.N., M.P.H., University of Minnesota

Steinmann, Wilbur L. (1959) .... *Associate Professor of Engineering*
    B.S.E.E., University of Minnesota; M.S., University of Iowa

Stellhorn, Martin H. (1963) .... *Professor Emeritus of Music*
    Mus.B., St. Louis Institute of Music; Mus.M., Northwestern University; Ph.D., Washington University

Stephens, Nancy J. (1980) .... *Assistant Professor of Advertising*
    B.S., M.S., University of Illinois; Ph.D., University of Texas, Austin

Stevens, George E. (1979) .... *Assistant Professor of Management*
    B.S., Delaware State College; B.A., Thomas A. Edison College; M.B.A., Washington University;
    D.B.A., Kent State University

Stevenson, Harold W. (1967) .... *Professor of Finance*
    B.S., University of Minnesota; M.B.A., Ph.D., University of Michigan; C.F.A.

Steverson, Norris J. (1932) .... *Associate Professor Emeritus of Physical Education*
    B.A., Arizona State University; M.S., University of Southern California

Stewart, Donald G. (1964) .... *Associate Professor of Mathematics*
    B.A., M.S., University of Utah; Ph.D., University of Tennessee, Knoxville

Stewart, Ernest I. (1959) .... *Professor Emeritus of Health Science*
    B.S., M.S., Utah State University; Ph.D., Columbia University

Stewart, Kenneth M. (1947) .... *Professor Emeritus of Anthropology*
    A.B., M.A., Ph.D., University of California, Berkeley

Stiles, Philip G. (1969) .... *Professor of Agriculture*
    B.S., University of Arkansas; M.S., University of Kentucky; Ph.D., Michigan State University

Stimson, William C. (1980) .... *Assistant Professor of Technology*
    B.S.M.E., M.S.I.E., Arizona State University
Stites, William H. (1954) .... *Professor of Communication*
    B.A., Louisiana Polytechnic Institute; M.A., Ph.D., University of Denver
Stock, William A. (1973) .... *Associate Professor of Education*
    B.A., Blackburn College; M.S., Ph.D., Iowa State University
Stocker, David Allen (1978) .... *Associate Professor of Music*
    B.S., Concordia Teachers College; M.M., Ph.D., Northwestern University
Stone, John D. (1976) .... *Assistant Professor of Philosophy*
    B.A., University of Chicago; Ph.D., University of Texas, Austin
Stone, William J. (1967) .... *Professor of Physical Education*
    B.S., Boston University; M.S., Florida State University; Ed.D., University of California, Berkeley
Stoner, Richard G. (1963) .... *Professor of Physics*
    A.B., A.M., Ph.D., Princeton University
Stookey, John A. (1976) .... *Assistant Professor of Political Science*
    A.B., M.A., Marshall University; Ph.D., University of Kentucky
Stout, Minard W. (1968) .... *Professor Emeritus of Education*
    B.A., University of Northern Iowa; M.A., Ph.D., State University of Iowa
Stout, Robert (1978) .... *Professor of Education; Dean, College of Education*
    B.A., Carleton College, Northfield, Minn.; Ph.D., University of Chicago
Stowe, Noel J. (1967) .... *Associate Professor of History*
    B.A., Ph.D., University of Southern California
Strange, Richard E. (1974) .... *Professor of Music; Director of Bands*
    B.M.E., Wichita State University; M.M.E., University of Colorado; D.M.A., Boston University
Straub, Calvin C. (1961) .... *Professor Emeritus of Architecture*
    B. Arch., University of Southern California
Strauss, Steven L. (1978) .... *Assistant Professor of English*
    B.S., State University of New York; Ph.D., City University of New York
Strawn, Roland S. (1968) .... *Associate Professor of Technology*
    B.S.E.E., M.S.E.E., University of Illinois; Ph.D., Arizona State University
Streufert, Hildegarde (1961) .... *Associate Professor of Home Economics*
    B.S., University of Minnesota; M.S., Iowa State University
Strojnik, Ales (1969) .... *Professor of Physics*
    Diplom. Ing., Ph.D., University of Ljubljana (Yugoslavia)
Strom, Robert D. (1969) .... *Professor of Education*
    B.S., Macalester College; M.A., University of Minnesota; Ph.D., University of Michigan
Stuler, John H. (1962) .... *Professor of Art*
    B.A., M.F.A., Arizona State University
Stump, Edmund (1976) .... *Assistant Professor of Geology*
    A.B., Harvard University; M.S., Yale University; Ph.D., Ohio State University
Stumpf, Angela M. (1959) .... *Associate Professor of Nursing*
    B.S.N.E., Marquette University; M.A., University of Chicago
Stutsman, Paul S. (1967) .... *Associate Professor Emeritus of Chemistry*
    B.S., University of Illinois; Ph.D., University of Wisconsin, Madison
Stutts, Mary Ann (1977) .... *Assistant Professor of Marketing*
    B.A., University of Texas, Austin; M.B.A., Ph.D., Texas A&M University
Sullivan, Deborah (1967) .... *Assistant Professor of Sociology*
    B.S., University of Massachusetts, Amherst; M.A., University of California, Irvine; Ph.D., Duke University
Sullivan, Howard J. (1971) .... *Professor of Education; Associate Dean, Graduate College*
    B.S., Oregon College of Education; M.Ed., Ph.D., University of Oregon
Sullivan, John J. (1976) .... *Assistant Professor Emeritus of Education*
    B.A., Villanova University; M.A., Ph.D., Arizona State University

Sundwall, Harry W. (1962) .... *Professor Emeritus of Education*
    B.S., Brigham Young University; Ph.D., University of California, Berkeley
Sunkett, Mark E. (1976) .... *Instructor of Percussion/Music*
    B.M., Curtis Institute of Music; M.M., Temple University
Svoboda, William S. (1969) .... *Professor of Education*
    B.S. in Ed., M.S., Ed.D., University of Kansas
Swafford, James R. (1971) .... *Assistant Professor of Microbiology*
    B.S., M.S., Arizona State University
Swagert, S. Laird (1971) .... *Professor Emeritus of Political Science*
    B. in Ed., Western Illinois State Teachers College; M.A., Ph.D., University of Iowa
Swaim, S. Daniel (1975) .... *Associate Professor of Music*
    B.M., Cincinnati College Conservatory of Music; M.M.E., Indiana University
Swanson, Roger M. (1968) .... *Associate Professor of English;*
    B.A., North Central College; M.A., Ph.D., University of Illinois   *Dean of Admissions*
Swimmer, Alvin (1963) .... *Associate Professor of Mathematics*
    B.A., Pennsylvania State University; M.S., New York University; Ph.D., University of California, Berkeley
Szarek, Stanley R. (1974) .... *Associate Professor of Botany*
    B.S., California State University, Pomona; Ph.D., University of California, Riverside

Tambs, Lewis A. (1969) .... *Professor of History*
    B.S., University of California, Berkeley; M.A., Ph.D., University of California, Santa Barbara
Tate, Donald J. (1958) .... *Professor of Administrative Services*
    B.S., Kansas State Teachers College; M.A., Ed.D., New York University
Tathwell, Shirley M. (1979) .... *Instructor of Nursing*
    B.S., Mount St. Scholastica; M.S., University of Iowa
Taylor, Jack J. (1960) .... *Professor of Art*
    B.S. in Art Ed., Kutztown Teachers College; M.Ed., Pennsylvania State University
Taylor, Janet (1977) .... *Assistant Professor of Art*
    B.F.A., Cleveland Institute of Art; M.F.A., Syracuse University
Taylor, Louis (1949) .... *Assistant Professor Emeritus of English*
    B.S., in Ed., M.A., Ohio State University
Taysom, Elvin D. (1953) .... *Professor of Agriculture*
    B.S., University of Idaho; M.S., Utah State University; Ph.D., Washington State University
Tenney, Lester I. (1969) .... *Professor of Insurance*
    B.A., University of Miami; M.A., San Diego State College; D.B.A., University of Southern California
Tetting, Daniel W. (1973; 1978) .... *Assistant Professor of Nursing*
    B.S.N., DePaul University; M.S.N., University of Illinois
Thomas, Keith J. (1975) .... *Assistant Professor of Education*
    B.S., Illinois State University; M.A., Loyola University; Ed.D., University of Arizona
Thomason, Leslie L. (1969) .... *Professor Emeritus of Technology*
    A.B., M.A., Ed.D., University of Oklahoma
Thompson, Lee P. (1955) .... *Professor of Engineering*
    B.A., Indiana University; M.S., Ph.D., Texas A & M University; P.E.
Thompson, Lida F. (1980) .... *Assistant Professor of Nursing*
    B.S.N., University of New Mexico; M.S.N., University of Colorado
Thompson, Truet B. (1959) .... *Professor of Engineering*
    B.S., B.S.E.E., Louisiana Polytechnic Institute; M.S., Oklahoma State University; Ph.D., Northwestern University
Thomson, Ronald G. (1947) .... *Professor Emeritus of Physical Education*
    B.S., Springfield College; M.A., Arizona State University; Ed.D., University of Southern California
Thomson, Tom R. (1961) .... *Professor of Chemistry*
    B.A., University of California, Berkeley; M.S., Ph.D., Kansas State University

Tice, Thomas E. (1967) .... *Professor of Engineering*
 B.S.E.E., M.S.E.E., Ph.D., Ohio State University
Tidwell, Victor H. (1971) .... *Professor of Accounting*
 B.S., Illinois College; M.B.A., D.B.A., Indiana University; C.P.A., Iowa
Tilden, Arnold (1937) .... *Professor Emeritus of History*
 B.A., M.A., DePauw University; Ph.D., University of Southern California
Tillery, Bill W. (1973) .... *Professor of Science Education/Physics*
 B.S., Northeastern State College; M.A., Ed.D., University of Northern Colorado
Tillman, Hoyt C. (1976) .... *Assistant Professor of History*
 B.A., Belhaven College; M.A., University of Virginia; A.M., Ph.D., Harvard University
Tingey, Sherman (1966) .... *Professor of Management*
 B.S., Utah State University; M.B.A., Golden Gate College; Ph.D., University of Washington
Tippeconnic, John W. (1976) .... *Assistant Professor of Education*
 B.S., M.A., Oklahoma State University; Ph.D., Pennsylvania State University
Tipton, Gary P. (1969) .... *Assistant Professor of Chinese*
 B.A., Brigham Young University; Ph.D., Indiana University
Tobiason, Sarah J. (1963; 1974) .... *Assistant Professor of Nursing*
 B.S.N., Vanderbilt University; M.A., Columbia University
Toohey, Jack V. (1966) .... *Professor of Health Science*
 B.A., Arizona State University; M.S.E., University of Illinois;
 M.S., Northern Arizona University; Ed.D., Arizona State University
Tootle, John C. (1967) .... *Associate Professor of Administrative Services*
 B.S., Georgia Southern College; M.A., George Peabody College; Ph.D., Ohio State University
Torrest, Robert S. (1980) .... *Associate Professor of Engineering*
 B.S., Polytechnic Institute of Brooklyn; Ph.D., University of Minnesota
Towill, Leslie R. (1975) .... *Associate Professor of Botany*
 B.S., M.S., University of Wisconsin, Milwaukee; Ph.D., University of Michigan
Trelease, Richard N. (1971) .... *Associate Professor of Botany*
 B.S., M.S., University of Nevada; Ph.D., University of Texas
Trennepohl, Gary L. (1977) .... *Assistant Professor of Finance*
 B.S., University of Tulsa; M.B.A., Utah State University; D.B.A., Texas Tech University
Trennert, Robert A. (1974) .... *Associate Professor of History*
 B.A., Occidental College; M.A., Los Angeles State College; Ph.D., University of California, Santa Barbara
Tu, Eugenia Y. (1973) .... *Instructor of Chinese*
 B.Ed., Taiwan Normal University; B.A., Baylor Women's College; M.S., University of Arizona
Tuma, Jan J. (1978) .... *Professor of Engineering*
 B.S., College of Engineering, Prague; M.S. Oklahoma State University; Ph.D., University of Colorado
Turnbow, James W. (1959) .... *Professor of Engineering*
 B.S.M.E., Texas Technological College; M.S.E.M., Ph.D., University of Texas
Turner, Christy G. II (1966) .... *Professor of Anthropology*
 B.A., M.A., University of Arizona; Ph.D., University of Wisconsin, Madison
Turner, Katharine C. (1946) .... *Professor Emeritus of English*
 B.Ed., Illinois State Normal; M.A., Ph.D., University of Michigan

Umberson, George E. (1977) .... *Professor of Music; Director, School of Music*
 B.M.E., Eastern New Mexico University; M.A., University of Iowa; Ed.D., University of Northern Colorado
Urry, Katharine (1975) .... *Assistant Professor of Art*
 B.A., Mills College; M.F.A., University of Colorado

Valdivieso, L. Teresa (1971) .... *Assistant Professor of Spanish*
 B.A., M.A. in Ed., M.A., Ph.D., Arizona State University
Valentine, Carol Ann (1975) .... *Assistant Professor of Communication*
 B.A., M.A., University of Michigan; Ph.D., Pennsylvania State University

Valentine, Kristin B. (1976) .... *Associate Professor of Communication*
  B.S., University of Wisconsin; M.A., University of Washington; Ph.D., University of Utah
Vallejo, Carlos J. (1976) .... *Assistant Professor of Education*
  B.S., Chadron State Teachers College; M.A., Ed.D., University of Nebraska, Lincoln
Van Brederode, Henry L., Captain (1980) .... *Assistant Professor of Military Science*
  B.S., University of Nebraska; M.Ed., Arizona State University
Van Hook, Barry L. (1976) .... *Assistant Professor of Administrative Services*
  B.S., Illinois State University; M.S. in Ed., Ed.D., Northern Illinois University
Van Scoy, Herbert A. (1963) .... *Professor Emeritus of Spanish*
  B.A., M.A., University of Alabama; Ph.D., University of Wisconsin, Madison
Van Wagenen, R. Keith (1963) .... *Professor of Education*
  B.A., Pacific Union College; M.A. in Ed., Arizona State University; Ph.D., University of Utah
Vasquez, Mary (1975) .... *Assistant Professor of Spanish*
  B.A., Florida State University; M.A., Ph.D., University of Washington
Veatch, Jeannette (1968) .... *Professor Emeritus of Education*
  A.B., Western Michigan University; M.A., Ph.D., New York University
Veblen, David R. (1979) ....,.......................... *Assistant Professor of Geology*
  B.A., M.A., Ph.D., Harvard University
Verdini, William A. (1976) .... *Assistant Professor of Quantitative Systems*
  B.S., Case Western Reserve University; M.B.A., D.B.A., Kent State University
Vergis, John P. (1954) .... *Professor of Education*
  B.S., M.A., New York University; Ed.D., University of Southern California
Verzaal, Dale (1979) .... *Assistant Professor of Art*
  B.F.A., M.F.A., East Carolina University
Vestre, Norris P. (1972) .... *Professor of Psychology*
  B.A., Ph.D., University of Minnesota
Vining, David C. (1975) .... *Assistant Professor of Theatre*
  B.A., University of Redlands; M.F.A., University of Minnesota
Virgillo, Carmelo (1965) .... *Professor of Romance Languages*
  A.B., State University of New York, Albany; A.M., Ph.D., Indiana University
Volek, Emil (1975) .... *Associate Professor of Spanish*
  Prom. Phil., Ph.D., Charles University, Prague (Czechoslovakia)
Von der Heydt, Alfred (1950) .... *Professor Emeritus of German*
  Diploma, University of Frankfurt-on-the-Main (Germany); M.A., Yale University; Ph.D., Cornell University
Von Dreele, Robert B. (1971) .... *Associate Professor of Chemistry*
  B.S., Ph.D., Cornell University
Voss, Howard G. (1964) .... *Associate Professor of Physics*
  A.B., Hope College; M.N.S., Arizona State University; M.S., Purdue University
Votichenko, T. Alexander (1956) .... *Assistant Professor of Philosophy*
  A.B., Princeton University; M.A., Columbia University

Wagner, J. Bruce (1977) ....,.................. *Professor, Solid State Science/Physics/Engineering*
  B.S., Ph.D., University of Virginia
Wagner, Ronald F. (1962) .... *Professor of Art*
  B.S., University of Wisconsin; M.F.A., University of Iowa
Walker, Bruce J. (1974) .... *Professor of Marketing*
  B.A., Seattle University; M.B.A., D.B.A., University of Colorado
Walker, Charles Thomas (1971) .... *Professor of Physics; Chair, Department of Physics*
  A.B., M.S., University of Louisville; Ph.D., Brown University
Walker, Janet F. (1960) .... *Professor Emeritus of Nursing*
  B.S., Case Western Reserve University; M.S., Catholic University of America
Walker, John E. (1970) .... *Associate Professor of Education*
  B.A., Albion College; M.A., Michigan State University; Ed.D., Utah State University

Walker, Stephen G (1969) . . . . *Assistant Professor of Political Science*
A B , Creighton Univers ty, M A., Ph.D., University of Florida

Walker, Westbrook (1978) . ... *Assistant Professor of Education*
B S , Miles Col ege, M.S , Central Michigan University, Ph.D , Michigan State University

Wallace, Charles E. (1958) . . .. *Professor of Engineering, Chair, Department of Aerospace*
B S , Lew s and Clark College; M S , Oregon State University,   *Engineering and Engineering Science*
Ph.D , Stanford Un versity

Wallen, Carl J (1973)   . ... *Professor of Education*
B.A., University of California, Santa Barbara, M.A , San Franc sco State College, Ed D , Stanford University

Walsberg, Glenn E. (1978) .... *Assistant Professor of Zoology*
B S , Californ a State Univers ty, Long Beach Ph.D , University of Cal forn a, Los Angeles

Wamacks, Naomi W (1968)   . .. . *Associate Professor of Secondary Education*
B.A , M A , Ed D , Arizona State University

Wang, Alan P. (1970) . .   .. *Professor of Mathematics*
B S , Washington State University, M S , Un versity of Southern Cal forn a,
Ph D , University of California, Los Angeles

Wang, Cecelia (1971) . .. . *Professor of Mathematics*
B S , Immacu ate Heart Col ege, M.A , Ph D., University of Ca ifornia, Los Angeles

Wang, Edward Y. (1979) ... ... *Professor of Engineering*
B S , Mornings de College, M.S Purdue University; Ph D , Tufts Un versity

Ward, Jack W (1964) ...   . *Associate Professor of Construction*
B S.C E , University of Idaho

Warnicke, Retha M. (1973) .. .. *Associate Professor of History*
A B , Ind ana University, M A , Ph D , Harvard University

Warren, Morrison F (1968)   .... *Professor of Education Director, I D Payne Learning Laboratory*
B A , M A , Ed D , Ar zona State Un versity

Wasser, Paula K (1927) .. .. *Professor Emeritus of Art*
B S n Ed., University of North Dakota, M A , Stanford University

Watkins, Thomas B (1972)   ..   .. *Assistant Professor of Technology*
B S , Univers ty of Wyom ng, M S , Ar zona State Un versity

Watson, C yde W (1971) ... . *Associate Professor of Art*
B F A , Bethany Co lege, M A Kansas State Univers ty

Watson, George L (1969) . ... *Associate Professor of Political Science*
B.A., Phillips Univers ty, M A , Ph D , Duke University

Webb, L Dean (1978)   .. .. *Associate Professor of Education*
B A , M A T. Ph D , University of Florida

Weems, Charles W. (1976).   . . .. *Associate Professor of Agriculture*
B S , M S , East Tennessee State University, Ph D , West Virginia University

Wegner, Artnoll L (1957) ... ... *Professor of Physical Education*
B S , Wisconsin State Co lege, M S Un vers ty of Wisconsin P.E D , Indiana University

Weigend, Guido G. (1976) ... ... *Professor of Geography, Dean, College of Liberal Arts*
B S , M S , Ph.D University of Ch cago

Weiner, Gordon M (1968) ... ... *Assistant Professor of History*
A.B , Ph D , University of Pennsylvan a

Weiss, Neil A. (1970) . .   . . *Associate Professor of Mathematics*
B.A , M A , Ph D , University of California, Los Angeles

Weitz, Rose (1978) .. .. *Assistant Professor of Sociology*
B A , Lehman College, C ty University of New York; M A , Ph D , Yale University

Welch, H. William (1967) .. .. *Professor of Engineering*
B A , DePauw University, M S , Ph D , University of Michigan, P E

Wells, Christine L (1976) ... ... *Professor of Physical Education*
B.S., University of Michigan, M S , Smith College, Ph D , Pennsylvania State University

Wentz, Richard E. (1972) ... . *Professor of Religious Studies*
    A.B., Ursinus Co lege; B.D , Lancaster Theological Seminary, M.Phil., Ph D , George Washington University

Werther, William Jr. (1971) .... *Professor of Management*
    B S B A., M.A., Ph.D , University of Florida

Weschler, Louis F. (1980) .... *Professor of Public Affairs*
    B.A., California State University; M A., Ph D , University of California, Los Angeles

Whiffen, Marcus (1960) .... *Professor of Architecture*
    B A , M A., University of Cambridge

Whitam, Frederick L. (1966) .... *Associate Professor of Sociology*
    B.A , Millsaps College; A.M., Ph.D., Indiana University

White, Harold C. (1966) ... . *Professor of Management*
    B.S., M S., University of Oregon, Ph D., University of Florida

White, John P. (1963) .... *Professor of Political Science*
    A B , University of Cincinnati, A M , Ph.D., University of Chicago

White, Michael J. (1974) .... *Associate Professor of Philosophy*
    B A , Arizona State University; M.A., Ph D , University of California, San Diego

White, Nancy E. (1975) .... *Assistant Professor of Nursing*
    B.S N., University of Virgin a, M S.N., University of Colorado

Whitehurst, Harry B. (1958) ... . *Professor of Chemistry*
    B.A., M.A., Ph D , Rice University

Whysong, Gary L. (1974) .. .. *Associate Professor of Agriculture*
    B S , M S , Montana State University; Ph D , University of Wyoming

Wigand, Rolf T. (1975) .... *Associate Professor of Communication;*
    B.B.A., M A , Texas Tech University,   *Assistant Dean for Research, College of Public Programs*
    Ph D., Michigan State University

Wilcox, Sidney W. (1955) ... ... *Professor Emeritus of Engineering Communications*
    B.A , Bethany Peniel College; M.A , University of Oklahoma

Wilkinson, Joseph W. (1964) .... *Professor of Accounting*
    B S., Carnegie Institute of Technology; M.B A , Stanford University; D B A , University of Oregon; C P.A , California

Williams, Frank G. (1975) .... *Associate Professor of Health Services Administration*
    B.S , M.A , Oregon State University, M.A., Ph D , Un versity of Iowa

Williams, Robert C. (1978) .. .. *Assistant Professor of Anthropology*
    B A., M.A , University of Cambridge; B A , M A , Ph.D , University of Michigan

Williams, Scott H. (1974) . . .. *Assistant Professor of Technology*
    B S., M T., Georgia Southern Col ege

Williamson, Madeline J. (1976) .... *Assistant Professor of Music*
    B Mus., Ohio Wesleyan University; M M , Western Michigan University

Willson, Loretta L. (1947) .... *Assistant Professor Emeritus of Communication*
    B.A , University of South Dakota, M.A., Northwestern University

Wilson, Gail E. (1972) .... *Assistant Professor of Music*
    B S., Ohio State University, M.M., Arizona State University

Wilson, Gloria N. (1961) ... . *Associate Professor of Administrative Services*
    B.A , Montclair State College, M A., Ed D., Columbia University

Wilson, Joan Hoff (1976) .... *Professor of History*
    B.A , University of Montana, M.A., Cornell University, Ph.D., University of California, Berkeley

Wilson, Leonard A. II (1979) ....*Assistant Professor of Public Affairs/Political Science*
    B.A , University of Nevada, Las Vegas, M A , Ph D , University of Oregon

Wilson, Lee Ann (1980) .... *Assistant Professor of Art*
    B.A., Beloit College; M.A., M. Phil., Ph.D , Columbia University

Wilson, Lorna A. (1968) .... *Instructor of French*
    B Ed., University of Saskatchewan; M.A., Arizona State University

Wilson, Lynn D. (1961) .... *Professor Emeritus of Engineering*
    B S., M.S., Ph.D., Marquette University

Wilt, Glenn A. Jr. (1963) .... *Associate Professor of Finance*
    A.B., Occidental College; M.B.A., Miami University; Ph.D., University of Michigan; C.F.A.
Winkleman, Richard D. (1965) .... *Associate Professor of Economics*
    A.B., Southern Illinois University; A.M., Ph.D., University of Illinois
Wirtz, Dorothy (1959) .... *Professor Emeritus of French*
    B.A., University of Iowa; M.A., Ph.D., University of Denver
Wiseman, Douglas E. (1976) .... *Associate Professor of Education*
    B.S., M.A., Eastern Michigan University; Ph.D., University of Illinois
Witt, Daniel (1966) .... *Professor of Theatre*
    B.F.A., Art Institute of Chicago; M.A., Ph.D., University of Denver
Witt, Tom (1975) .... *Associate Professor of Design Sciences; Chair, Department of Design Sciences*
    B.A., M.A., M.F.A., University of California, Los Angeles
Wixted, J. Timothy (1978) .... *Assistant Professor of Asian Languages*
    B.A., University of Toronto; A.M., Stanford University; D.Phil; Oxford University
Wochner, Raymond E. (1952) .... *Professor Emeritus of Education*
    B.S., York College; M.A., University of Nebraska, Lincoln; Ph.D., University of Wyoming
Wolchik, Sharlene (1980) .... *Assistant Professor of Psychology*
    B.A., Vasser College; M.S., Ph.D., Rutgers, The State University
Wolf, Donald J. (1969) .... *Associate Professor of Political Science*
    B.A., M.A., Gonzaga University; S.T.M., University of Santa Clara; Ph.D., Georgetown University
Wolfe, Michael N. (1977) .... *Assistant Professor of Management*
    B.A., Hartwick College; M.S., Ph.D., University of Massachusetts
Wollam, Owen A. (1964) .... *Associate Professor of French*
    B.A., M.A., Montana State University; Ph.D., University of Washington
Wollman, Warren (1979) .... *Assistant Professor of Science Education/Physics*
    B.Eng.Sci., New York University; Ph.D., University of California, Berkeley
Wong, Timothy C. (1974) .... *Associate Professor of Chinese*
    B.A., Saint Mary's College of California; M.A., University of Hawaii; Ph.D., Stanford University
Wood, Billy G. (1977) .... *Associate Professor of Technology*
    A.B., University of California; B.S. in Ed., Eastern Illinois University; M.S., University of Arizona
Wood, Byard D. (1970) .... *Associate Professor of Engineering*
    B.S.M.E., M.S.M.E., Utah State University; Ph.D., University of Minnesota
Wood, Harry (1954) .... *Professor Emeritus of Art*
    B.A., M.A., University of Wisconsin, Madison; B.A., Ph.D., Ohio State University
Wood, Jean M. (1980) .... *Professor of Nursing*
    B.S., Loyola University; M.P.H., University of Michigan; Ph.D., University of North Carolina
Wood, Michael P. (1974) .... *Associate Professor of Technology*
    B.S., Ph.D., University of Sheffield; M.B.A., Xavier University
Wood, Steven D. (1975) .... *Associate Professor of Quantitative Systems*
    B.S., M.A., California State University, San Diego; Ph.D., University of Wisconsin, Madison
Woodfill, Marvin C. (1966) .... *Professor of Computer Science*
    B.S., M.S., Ph.D., Iowa State University
Wooding, Robert R. (1971) .... *Associate Professor of Construction*
    B.S., U.S. Naval Academy; B.C.E., M.C.E., Rensselaer Polytechnic Institute
Woodman, Natalie J. (1969) .... *Associate Professor of Social Work*
    B.A., Washington Square College of New York University; M.S.S., Smith College School of Social Work
Woods, Roosevelt Jr. (1965) .... *Professor of Art*
    B.S., M.A. in Ed., Arizona State University
Wooldridge, Charles B. (1959) .... *Associate Professor Emeritus of Engineering*
    A.B., B.S., University of Kentucky; M.S., Ph.D., Purdue University
Wooldridge, Mary C. (1959) .... *Assistant Professor Emeritus of Home Economics*
    B.S., M.S., University of Kentucky; Ph.D., Purdue University

Woolf, Charles M. (1961-63; 1964) .... *Professor of Zoology; Dean, Graduate College*
    B.S., M.S., University of Utah; Ph.D., University of California, Berkeley

Wootten, William W. (1959) .... *Associate Professor of History*
    B.A., University of Chicago; M.A., University of Iowa; Ph.D., University of Minnesota

Wootton, Richard T. (1964) .... *Professor of Education; Coordinator, Special Projects*
    B.S., M.S., Ed.D., University of Utah

Work, Richard N. (1965) .... *Professor of Physics*
    A.B., M.S., Ph.D., Cornell University

Wrenn, C. Gilbert (1965) .... *Professor Emeritus of Counselor Education*
    A.B., Willamette University; M.A., Ph.D., Stanford University; LL.D., Willamette University

Wright, Mary E. (1973) .... *Assistant Professor of Theatre*
    B.A., M.A., Ph.D., University of Minnesota

Wunsch, Alan P. (1973) .... *Associate Professor of Administrative Services*
    B.Ed., M.S.T., University of Wisconsin, Whitewater; Ed.D., University of California, Los Angeles

Wurster, Stanley R. (1971) .... *Associate Professor of Education*
    B.S., Lock Haven State College; M.S., Elmira College; Ed.D., New Mexico State University

Wurzell, Carol A. (1965) .... *Assistant Professor of Nursing*
    B.S., Chico State College; M.S., University of Maryland

Wyckoff, Susan (1979) .... *Associate Professor of Astronomy/Physics*
    B.A., Mount Holyoke College; Ph.D., Case Western Reserve

Wyndelts, Robert (1974) .... *Associate Professor of Accounting*
    B.B.A., M.P.A., Georgia State University; Ph.D., University of Georgia; C.P.A., Georgia, Arizona

Wytko, Joseph R. (1975) .... *Assistant Professor of Music*
    B.M.E., West Virginia University; M.M., Northwestern University

Yale, Francis G. (1952) .... *Associate Professor Emeritus of Science Education*
    A.B., M.A., University of Northern Colorado; Ed.D., Columbia University

Yamamoto, Kaoru (1972) .... *Professor of Education*
    B.S., University of Tokyo; M.A., Ph.D., University of Minnesota

Yeater, James W. (1958) .... *Professor of Theatre*
    B.A., Baker University; M.A., University of Washington; Ph.D., University of Illinois

Yellott, John I. (1973) .... *Professor Emeritus of Architecture*
    B.S., M.M.E., Johns Hopkins University

Young, Dennis L. (1975) .... *Associate Professor of Mathematics*
    B.S., St. Louis University; M.S., Ph.D., Purdue University

Young, Hewitt H. (1967) .... *Professor of Engineering*
    B.S.M.E., M.S.I.E., Case Institute of Technology; Ph.D., Arizona State University

Young, Joseph E. (1979) .... *Associate Professor of Art*
    B.A., California State College; M.A., University of California, Los Angeles

Young, Otis E. Jr. (1963) .... *Professor of History*
    A.B., A.M., Ph.D., Indiana University

Youngblood, Robert L. (1972) .... *Associate Professor of Political Science*
    B.A., Willamette University; M.A., University of Hawaii; Ph.D., University of Michigan

Yuen, David A. (1979) .... *Assistant Professor of Geology*
    B.S., California Institute of Technology; M.S., University of California, Berkeley;
    M.S., Scripps Institution of Oceanography; Ph.D., University of California, Los Angeles

Yuen, George U. (1957) .... *Professor of Chemistry*
    B.S., Arizona State University; Ph.D., University of Utah

Zacher, Robert V. (1947) .... *Professor Emeritus of Advertising*
    B.S. in B.A., M.S.B.A., University of Alabama

Zander, Karin Kirksey (1980) .... *Associate Professor of Law*
    B.A., University of Southern California; J.D., Yale University

Zaslow, Bertram (1956) .... *Professor of Chemistry*
    B.A., Cornell University; M.S., University of Minnesota; Ph.D., Iowa State University
Zautra, Alex (1976) .... *Assistant Professor of Psychology*
    B.A., Antioch College; M.S., Ph.D., University of Utah
Zeiss, Antonette M. (1977) .... *Assistant Professor of Psychology*
    B.A., Stanford University; M.A., Ph.D., University of Oregon
Zimmer, Carl R. (1959) .... *Associate Professor of Engineering*
    B.S.E.E., Cornell University; M.S.E.E., Ph.D., Syracuse University
Zonn, Leo E. (1975) .... *Associate Professor of Geography*
    B.A., M.A., California State University, Northridge; Ph.D., University of Wisconsin, Milwaukee
Zornow, Ruth A. (1970) .... *Associate Professor of Nursing*
    B.S., Case Western Reserve University; M.Ed., Ed.D., Columbia University
Zucker, Stanley H. (1975) .... *Associate Professor of Education*
    B.A., State University of New York, Stony Brook; M.S., Hofstra University; Ph.D., University of Missouri, Columbia
Zwiebel, Imre (1979) .... *Professor of Engineering; Chair, Department of Chemical and Bio Engineering*
    B.S., University of Michigan; M.S., Ph.D., Yale University

Associated Faculty

INTERCOLLEGIATE ATHLETICS

Tamburo, Richard P. (1980) .... *Director of Intercollegiate Athletics*
    B.A., Michigan State University
Plummer, Ramona F. (1957) .... *Associate Professor; Associate Athletic Director*
    B.S., M.A., University of Alabama
Littlewood, Mary L. (1965) .... *Assistant Professor; Softball Coach*
    B.S., Miami University; M.S., University of Colorado
Wulk, Ned W. (1957) .... *Assistant Professor; Head Basketball Coach*
    B.S., Wisconsin State University; M.Ed., Xavier University
Brock, James L. (1971) .... *Instructor; Head Baseball Coach*
    B.A., M.A., Ed.D., Arizona State University
Robinson, Don R. (1968) .... *Instructor; Gymnastics Coach*
    B.A., University of Northern Colorado; M.S., Eastern New Mexico University
Robison, Ray C. (1967) .... *Instructor; Assistant Trainer*
    B.S., Morningside College; M.S., Indiana University
Young, Troy L. (1971) .... *Instructor; Head Trainer*
    B.S., Fort Hays State College; M.S., Indiana University
Douglas, Bobby E. (1974) .... *Lecturer; Wrestling Coach*
    B.S., Oklahoma State University
Howard, Paul G. (1974) .... *Lecturer; Assistant Basketball Coach*
    B.A., Arizona State University
Kerr, Roger D. (1977) .... *Lecturer; Cross Country Track Coach*
    B.S., University of Iowa; M.A., University of Iowa; Ph.D., Purdue University

VISITING PROFESSORS

Baldwin, Bruce A. .... *Visiting Assistant Professor of Accounting*
    B.A., M.B.A., Michigan State University; D.B.A., Arizona State University
Bartels, Robert D. (1980) .... *Visiting Professor of Law*
    B.A., University of Michigan; J.D., Stanford University
Beane, Sydney D. (1979) .... *Visiting Assistant Professor of Social Work*
    B.A., Yankton College (South Dakota); M.S.W., Arizona State University
Christensen, James E. (1980) .... *Visiting Assistant Professor of Leisure Studies*
    B.S., St. Cloud State College; M.S., Ph.D., Iowa State University

Cohen, William (1980) .... *Merriam Distinguished Visiting Professor of Law*
B.A., LL.B., University of California, Los Angeles

Davis, George R. (1980) .... *Visiting Assistant Professor of Engineering*
B.S. in E.E., M.S., University of Illinois; Ph.D., University of Arizona

Dellheim, Charles Jay (1980) .... *Visiting Assistant Professor of Humanities*
B.A., Harpur College; M.A., Ph.D., Yale University

Fetter, Robert (1980) .... *Visiting Professor of Health Services Administration and Management*
B.S., Virginia Polytechnic Institute; M.B.A., D.B.A., Indiana University

Gomez, Reynaldo A. (1980) .... *Visiting Instructor in Education*
B.A., Southwest Texas State University; M.Ed., Stephen F. Austin State University;
Ph.D., Pennsylvania State University

Grime, Robert (1980) .... *Visiting Professor of Law*
B.A., B.C.L., Oxford University

Hall, Georgia (1978) .... *Visiting Associate Professor of Social Work*
B.S., Columbia University; M.P.H., Ph.D., University of Michigan

Hauck, George (1980) .... *Visiting Associate Professor of Law*
A.B., Occidental College; J.D., University of California, Berkeley

Hunt, Maurice (1980) .... *Visiting Assistant Professor; Acting Assistant Director of Freshman English*
B.A., University of Michigan; Ph.D., University of California, Berkeley

Islam, Obaidul (1980) .... *Visiting Professor in Engineering*
B.Sc. (M.E.), University of Dacca; M.S., Texas A&M University; Ph.D., Arizona State University

Jorquez, James S. (1980) .... *Visiting Assistant Professor of Social Work*
B.A., M.S.W., California State University; D.S.W., University of California

Lee, Maria-Luisa (1980) .... *Visiting Assistant Professor of Foreign Languages*
B.M., University of Texas at El Paso; M.A., Ph.D., University of Colorado, Boulder

Lewis, Elizabeth B. (1980) .... *Visiting Assistant Professor of Humanities*
B.A., Vassar College; M.A., Arizona State University; Ph.D., Georgetown University

Mogey, John M. (1980) .... *Visiting Professor of Sociology*
B.A., M.A., D.Sc., Queen's University, Belfast, Northern Ireland

Morris, Donald (1977) .... *Visiting Instructor of Education*
B.A., Anderson College (Indiana); M.S., University of Wisconsin; Ed.D., Arizona State University

Newby, H. Elizabeth (1980) .... *Visiting Associate Professor of Law*
LL.B., University of Western Australia; M.A., University of Sheffield

Peterson, Brenda S. (1979) .... *Visiting Lecturer of English*
B.A., University of California, Davis

Rice, James C. (1979) .... *Visiting Research Professor of Zoology*
B.Sc., Cornell University; Ph.D., University of Toronto

Rodriguez-Lee, Maria .... *Visiting Assistant Professor of Spanish*
B.A., University of Texas; M.A., Ph.D., University of Colorado

Russo, James R. (1980) .... *Visiting Assistant Professor of English*
B.A., M.A., M.F.A., Ph.D., University of Arizona

Shipley, Mary L. (1978) .... *Visiting Professor of Design Sciences*
B.F.A., University of Southern California; M.A., Ph.D., Case-Western Reserve University

Soleri, Paolo (1975) .... *Distinguished Visiting Professor of Planning*
D.Arch., Politecnico Di Torino

Van Esso, Andrew E. (1978) .... *Visiting Assistant Professor of Criminal Justice*
B.A., M.A., Loyola University; M.A., Ph.D., Northwestern University

Villaseca, F. Eugenio (1980) .... *Visiting Assistant Professor of Engineering*
B.S.E., Universidad Tecnica Federico; M.S., University of Notre Dame; Ph.D., Arizona State University

Wolcott, Harry F. (1980) .... *Visiting Professor of Education*
B.S., University California, Berkeley; M.A., San Francisco State College; Ph.D., Stanford University

Wong, Paul (1979) .... *Visiting Professor of Social Work*
    B.A., M.A., Ph.D., University of California, Berkeley

LECTURERS

Andrews, Marvin A. (1979) .... *Lecturer in Public Affairs*
    B.S., University of Illinois; M.P.A., Syracuse University
Braun, Stephen (1979) .... *Lecturer in Public Affairs*
    B.A., M.A., Washington University; Ph.D., University of Missouri
Brockmann, Robert J. (1980) .... *Lecturer in Technology*
    B.A., Georgetown University; M.A., University of Chicago
Cain, H. Thomas (1967) .... *Lecturer in Anthropology*
    B.A., University of Washington; M.A., University of Arizona
Casey, James M. (1979) .... *Lecturer in Public Affairs*
    B.A., Loras College; M.A., University of Iowa
Cervantes, James V. (1978) .... *Lecturer in English*
    B.A., University of Washington; M.F.A., University of Iowa
Coddington, Theron G. (1978) .... *Lecturer in Public Affairs*
    B.A., University of Washington; M.F.A., University of Iowa
Dalton, D. Allen (1980) .... *Lecturer in Economics*
    B.S., Boise State University; Ph.D., Virginia Polytechnic and State University
DesJardin, Margaret E. (1949) .... *Lecturer Emeritus in Dance*
Dickeson, Robert (1979) .... *Lecturer in Public Affairs*
    B.S., M.S., Ph.D., University of Missouri
Duncan, William A. (1980) .... *Lecturer in Accounting*
    B.S., Portland State University; Ph.D., University of Texas; C.P.A., Oregon
Evans, Kenneth R. (1980) .... *Lecturer in Marketing*
    B.A., University of California, Davis; M.B.A., California State University; D.B.A., University of Colorado
Ferrall, J. Eleanor (1969) .... *Lecturer in Public Affairs*
    A.B., Heidelberg College; M.A., Arizona State University
Francis, Peter N. (1979) .... *Lecturer in Public Affairs*
    A.B., Boston College; Ph.D., University of Connecticut
Fries, Robert H. (1975) .... *Lecturer in Engineering*
    B.M.E., M.S., Ohio State University
Fullmer, Thomas P. (1976) .... *Lecturer in Administrative Services; Director, Productivity Institute*
    M.A., Fordham University; Ph.D., Immaculate Conception College, Ross, California
Gibbs, Christine (1980) .... *Lecturer in Public Affairs*
    B.A., University of Arizona; M.P.A., Arizona State University
Good, Andrea L. (1975) .... *Lecturer in English*
    A.B., Bryn Mawr College; M.A., University of Pennsylvania Graduate School of Arts and Sciences
Gregory, Robert T. (1980) .... *Lecturer in Geology*
    B.A., University of California, San Diego; Ph.D., California Institute of Technology
Heck, Skip Thomas (1980) .... *Lecturer in Public Affairs*
    B.S., Northern Arizona University; M.S., University of Southern California; Ph.D., Arizona State University
Horwitch, Arnold M. (1974) .... *Lecturer in Humanities and Religious Studies*
    Ph.B., University of Chicago; M.A., Arizona State University; M.S., Lowell Technological Institute
Ingraham, Leonard W. (1973) .... *Lecturer in Education*
    B.S., City College of City University; M.A., Ed.D., Teachers College, Columbia University
Jamieson, William (1980) .... *Lecturer in Public Affairs*
    B.S., Arizona State University; M.S., Georgia State University
Keller, Thomas (1980) .... *Lecturer in Administrative Services*
    B.Ed., M.Ed., Ed. Spec., University of Toledo

Kneer, Dan C. (1980) .... *Lecturer in Accounting*
B.S., University of Evansville; M.A., Ph.D., University of Missouri; C.P.A., California, Missouri

Lafford, Barbara (1980) .... *Lecturer in Spanish*
B.A., Middlebury College, Vermont; M.A., Cornell University

Landry, Lawrence David (1980) .... *Lecturer in Public Affairs*
B.A., University of Notre Dame; M.A., University of Wisconsin

Lea, John H. (1980) .... *Lecturer in Management*
B.S., M.B.A., Arizona State University

Lippman, Ralph (1980) .... *Lecturer in Public Affairs*
B.A., M.P.A., D.P.A., University of Southern California

Manion, Patrick W. (1980) .... *Lecturer in Public Affairs*
B.A., M.P.A., Arizona State University

McDonald, John P. (1980) .... *Lecturer in Marketing*
B.S., M.B.A., Wayne State University.

McDonald, Kenneth A. (1978) .... *Lecturer in Public Affairs*
B.S., University of Detroit; M.A., Arizona State University

Miller, Charles W. (1978) .... *Lecturer in Public Affairs*
B.S., M.A., University of Denver

Milstein, Stanley R. (1974) .... *Lecturer in Zoology*
B.A., City College New York; M.A., M.D., University of Iowa

Paolino, John J. (1980) .... *Lecturer in Public Affairs*
B.A., M.A., University of Northern Colorado

Pattison, Diane D. (1980) .... *Lecturer in Accounting*
B.S., University of Oregon; M.B.A., California State University, Hayward; Ph.D., University of Washington

Pfister, A. J. (1980) .... *Lecturer in Public Affairs*
B.S., L.L.B., University of Arizona

Rozelle, Martha (1980) .... *Lecturer in Public Affairs*
B.A., East Carolina University; M.P.A., Florida State University

Sandvik, Gloria Jean (1980) .... *Lecturer in Public Affairs*
B.A., M.A., University of Oregon

Schroeter, John R. (1980) .... *Lecturer in Economics*
B.S., California Institute of Technology

Staab, Claire (1980) .... *Lecturer in Education*
B.A., University of California, Berkeley; M.A., Ph.D., Arizona State University

Stellhorn, Edythe G. (1960; 1973) .... *Lecturer in Nursing*
B.S., Northwestern University; M.S.N., Washington University

Stephenson, Larry K. (1980) .... *Lecturer in Public Affairs*
B.S., M.A., Arizona State University; Ph.D., University of Cincinnati

Stewart, Pamela (1977) .... *Lecturer in English*
B.A., Goddard College; M.F.A., University of Iowa

Stokes, Larry D. (1980) .... *Lecturer in Public Affairs*
B.S., M.S., Ph.D., University of Illinois

Swartz, Teresa A. (1980) .... *Lecturer in Marketing*
B.S.E.D., M.B.A., Clarion State College; Ph.D., Ohio State University

Tomlinson, Andrew D. (1978) .... *Lecturer in Public Affairs*
B.S., M.A., Arizona State University

Turner, Allen C. (1980) .... *Lecturer in Public Affairs*
B.S., Seattle Pacific College; M.A., University of Kentucky

Whaley, Patricia (1975) .... *Lecturer in Communication*
B.A., M.Ed., University of Georgia

Winchell, Dick G. (1980) .... *Lecturer in Public Affairs*
B.A., Wartburg College; M.A., University of Colorado

Zettler, Hugo F. (1977) .... *Lecturer in Law*
    B.S., Arizona State University; J.D., University of Arizona

ADJUNCT FACULTY

Abeyasekere, Dayal (1980) .... *Adjunct Visiting Professor of Engineering*
    B.S., University of Ceylon; M.S., Ph.D.; University of Melbourne, Australia

Barron, Milton L., (1981) .... *Adjunct Professor of Sociology*
    B.A., M.A., Ph.D., Yale University

Cheung, Susanna (1979) .... *Adjunct Lecturer of Home Economics*
    B.S., University of Washington; M.A., Arizona State University

Dandoy, Suzanne (1975) .... *Adjunct Professor of Health Services Administration*
    B.A., M.D., University of California, Los Angeles; M.P.H., University of California

Dearen, Dan (1975) .... *Adjunct Professor of Health Services Administration*
    B.S., Texas Tech University; M.A., Ed.D., Arizona State University

Dexter, Wayne R. (1975) .... *Adjunct Assistant Professor of Counselor Education*
    B.S., M.S., Brigham Young University; Ph.D., University of Otago, New Zealand

Feinman, Gary (1978) .... *Adjunct Assistant Professor of Anthropology*
    B.A., University of Michigan; Ph.D., City University of New York

Foster, Joyce (1972) .... *Adjunct Professor of Zoology; Assistant Academic Vice President*
    B.A., M.A., DePauw University; Ph.D., Arizona State University

Hecht, Frederick (1978) .... *Adjunct Professor of Zoology*
    B.A., Dartmouth College; M.D., University of Rochester

Huckins, Charles A. (1979) .... *Adjunct Professor of Botany and Microbiology*
    B.A., Brown University; M.S., Ph.D., Cornell University

Knipe, Duane D. (1972) .... *Adjunct Associate Professor of Agriculture*
    B.S., M.S., New Mexico State University; Ph.D., University of Arizona

Lee, Sheryl (1979) .... *Adjunct Lecturer of Home Economics*
    B.S., M.P.H., University of California at Berkeley

Lockhart, Carol (1975) .... *Adjunct Assistant Professor of Health Services Administration*
    B.S., Frances Payne Boton School of Nursing; M.S., University of California, San Francisco

Manheim, Bhavani B. (1973) .... *Adjunct Assistant Professor of Anthropology*
    B.A., M.A., Mysore University; Ph.D., Poona University (India)

Martens, Kathryn J. (1978) .... *Assistant Adjunct Professor of Education*
    B.A., M.A., Arizona State University; Ed.D., State University of New York, Albany

Marzke, Mary (1978) .... *Adjunct Assistant Professor of Anthropology*
    B.A., University of California; M.A., Columbia University; Ph.D., University of California

McCaw, Barbara K. (1978) .... *Adjunct Professor of Zoology*
    B.A., M.A., Stanford University; Ph.D., University of Oregon

Obitz, Fred (1975) .... *Adjunct Assistant Professor of Counselor Education*
    B.A., University of Colorado; M.A., Ph.D., University of Utah

Patton, David R. (1964) .... *Adjunct Associate Professor of Agriculture*
    B.S., West Virginia University; M.S., Virginia Polytechnic Institute; Ph.D., University of Arizona

Powell, Joseph (1977) .... *Adjunct Assistant Professor of Health Services Administration*
    B.C.E., University of Colorado; M.C.E., Rensselaer Polytechnic Institute

Rice, Grace Elizabeth (1978) .... *Adjunct Assistant Professor of Anthropology*
    B.A., Reed College; Ph.D., University of California

Rowe, David N. (1979) .... *Adjunct Professor of Political Science*
    A.B., Princeton University; M.A., University of Southern California; Ph.D., University of Chicago

Sample, Tish (1978) .... *Adjunct Assistant Professor of Anthropology*
    A.B., Whitman College; M.A., University of California; Ph.D., University of Wisconsin

Schaffer, Joseph (1979) .... *Adjunct Assistant Professor of Anthropology*
    B.A., Kent State University; M.A., University of California; Ph.D., University of Colorado

Shoemaker, Alice (1979) .... *Adjunct Lecturer of Home Economics*
    B.A., Goshen College; M.S., Purdue University

Snyder, Richard C. (1979) .... *Adjunct Professor of Political Science*
    A.B., Union College, Schenectady; M.A., Ph.D., Columbia University

Sutton, Samuel J. (1975) .... *Adjunct Professor of Law*
    B.A., B.S., University of Arizona; J.D., George Washington University

Wilcox, David R. (1979) .... *Adjunct Assistant Professor of Anthropology*
    B.A., Beloit College; Ph.D., University of Arizona

University Library

Donald E. Riggs (1979) .... *University Librarian*
    B.A., Glenville State College; M.A., West Virginia University; M.L.S., University of Pittsburgh;
    Ed.D., Virginia Polytechnic Institute and State University

Gater, Helen L. (1970) .... *Associate University Librarian*
    B.A., Fort Hays Kansas State College; M.A., University of Denver

Corey, Constance H. (1973) .... *Assistant University Librarian for Personnel and Planning*
    B.A., Denison University; M.L.S., University of Arizona; M.B.A., Arizona State University

Lowenthal, Sallie F. (1977) .... *Assistant University Librarian for Automation and Systems*
    B.A., M.L.S., University of California, Berkeley

Batalden, Sandra (1977) .... *Assistant Librarian, Collection and Acquisitions Service*
    B.A., M.A., University of Minnesota

Bell, George H. (1976) .... *Assistant Librarian, Science Reference Service*
    B.A., William Paterson College; M.L.S., Pratt Institute

Bender-Lamb, Sylvia L. (1978) .... *Assistant Librarian, Reference Service*
    B.A., University of California, Davis; M.A., University of Denver

Biblarz, Dora (1980) .... *Associate Librarian; Head, Collection and Acquisitions Service*
    B.A., University of California, Los Angeles; M.A., University of California, Davis;
    M.L.S., University of California, Los Angeles

Blouin, Deborah K. (1971) .... *Associate Librarian, Reference Service*
    B.A., Cedar Crest College; M.L.S., State University of New York, Albany

Borovansky, Vladimir T. (1968) .... *Librarian; Head, Science Reference Service*
    M.L.S., Charles University (Prague, Czechoslovakia)

Brem, Walter V. Jr. (1979) .... *Affiliate Librarian, Reference Srvice*
    B.A., M.A., University of California, Santa Barbara; M.L.S., University of California, Berkeley

Brownson, Charles W. (1980) .... *Assistant Librarian, Reference Service*
    B.A., South Dakota State University; M.A., University of Oregon; M.L.S., University of California, Berkeley

Conrow, Jane A. (1968) .... *Librarian; Head, Interlibrary Loan*
    B.A., M.L.S., Indiana University

DeFato, Rosalinda (1970) .... *Associate Librarian, Reference Service*
    B.A., St. John's University; M.L.S., University of California, Los Angeles

Dusenbury, Carolyn A. (1980) .... *Associate Librarian; Head, Reference Service*
    B.S., University of California, Santa Barbara; M.L.S., University of California, Los Angeles

Estok, Rita (1977) .... *Associate Librarian, Science Reference Service*
    B.A., Mount Mercy College Pittsburgh; B.S. in L.S., Carnegie Library School

Ferrall, J. Eleanor (1969) .... *Associate Librarian, Reference Service*
    A.B., Heidelberg College; M.A., Arizona State University

Fransen, Gary K. (1980) .... *Affiliate Librarian, Catalog Service*
    B.A., M.L.S., Emporia State University

Jones, Kay F. (1975) .... *Associate Librarian, Reference Service*
    B.A., Auburn University; M.L.S., University of Hawaii

Knepp, Kenneth B. (1968) .... *Associate Librarian, Catalog Service*
    B.A., University of the Pacific; B.D., Garrett Theological Seminary; M.A., University of Denver

Larson, Donna R. (1972) .... *Librarian; Head, Government Documents Service*
    A.B., M.A.L.S., University of Michigan
Leibold, Anne M. (1977) .... *Associate Librarian, Collection and Acquisitions Service*
    M.A., University of Paris
Machovec, George (1977) .... *Assistant Librarian, Science Reference Service*
    B.S., M.L.S., University of Arizona
Mawn, Geoffrey P. (1981) .... *Assistant Archivist; Arizona Historical Foundation Archivist*
    B.A., M.A., University of San Francisco; Ph.D., Arizona State University
McColgin, Ronda L. (1970) .... *Associate Librarian, Catalog Service*
    B.A., Arizona State University; M.S.L.S., University of Southern California
McDonald, Arlys L. (1970) .... *Associate Librarian; Head, Music Library*
    B.Mus., St. Mary of the Plains; M. Mus., University of Illinois
Meister, Marcia (1978) .... *Assistant Librarian, Government Documents Service*
    B.A., M.A., University of Wisconsin, Madison
Miller, Rosanna (1974) .... *Associate Librarian; Head, Map Service*
    B.A., M.A., Arizona State University; M.L.S., University of Arizona
Palais, Elliot S. (1959-62; 1966) .... *Librarian, Collection and Acquisitions Service*
    B.A., Bowdoin College; A.M.L.S., University of Michigan
Rhodes, Diane B. (1980) .... *Affiliate Librarian, Catalog Service*
    B.S., College of William and Mary; M.L.S., University of Wisconsin, Madison
Rich, Stephen K. (1976) .... *Assistant Librarian, Reference Service*
    B.A., Amherst College; M.L.S., Indiana University
Rose, Robert F. (1980) .... *Assistant Librarian; Head, Bimson Library*
    B.A., University of California, Berkeley; M.I.M., American Graduate School of International Management;
    M.L.S., University of Arizona
Ruppé, Carol V. (1962) .... *Librarian, Reference Service*
    B.A., University of New Mexico; M.A., University of Denver
Sager, Harvey M. (1977) .... *Assistant Librarian, Reference Service*
    B.A., San Francisco State College; M.A., California State University, Chico; M.A., University of Denver
Schneberger, Lois I. (1969) .... *Librarian; Head, Catalog Service*
    B.A., Viterbo College; M.L.S., Kansas State Teachers College
Smith, Gene W. (1974) .... *Assistant Librarian, Reference Service*
    B.S., University of Nebraska, Lincoln; B.A., Chadron State College; M.A., Arizona State University;
    M.L.S., University of Maryland
Swaty, Mary A. (1968) .... *Associate Librarian, Catalog Service*
    B.A., University of Missouri; M.L.S., Indiana University
Thomas, Alfred Jr. (1939) .... *University Archivist, University Archives*
    B.A., M.A., Arizona State University
Vanderhoff, Barbara A. (1968) .... *Associate Librarian; Head, Serial Records*
    B.A., Fort Hays Kansas State College; M.A., University of Denver
Voth, Annette (1978) .... *Associate Librarian; Collection and Acquisitions Service*
    B. Mus., University of Kansas, Lawrence; M.L.S., M.A., University of California, Berkeley
Walters, Sheila A. (1971) .... *Assistant Librarian, Science Reference Service*
    B.A., University of Oklahoma; M.L.S., Louisiana State University
Watrous, Lyle C. (1962) .... *Librarian; Head, Curriculum Service*
    B.A., University of North Carolina; B.S.L.S., Carnegie Institute of Technology; M.A., Arizona State University
Weir, Katherine M. (1980) .... *Associate Librarian; Head, Architecture Library*
    B.A., M.L.S., State University of New York, Geneseo
Williams, Jenny L. (1967) .... *Associate Librarian, Catalog Service*
    B.A., M.A., Indiana University
Wu, Ai-Hwa (1964) .... *Associate Librarian, Catalog Service*
    B.A., National Taiwan University; M.L.S., University of Washington

Wurzburger, Marilyn J. (1960) .... *Associate Librarian, Head, Special Collections*
    B.A., MacMurray College
Yao, Winberta M. (1975) .... *Associate Librarian, Reference Service*
    B.A., University of California; M.S., Columbia University

Law Library

Dahl, Richard C. (1966) ... . *Director*
    B.A., B.L.S., University of California, Berkeley; J.D., Catholic University
Nash, Richard M. (1976) .... *Associate Law Librarian*
    B.A., University of Missouri, Kansas City; M.A.L.S., University of Denver; J.D., Drake University
Au, Chih-Chun (1970) .... *Head, Technical Services*
    B.A., National Taiwan University; M.A., University of Chicago
Reed, Naomi H. (1980) .... *Acquisitions Librarian*
    B.A., Wheaton College; M.L.S., University of Wisconsin

Student Health Service

Jones, Richard L. (1968) .... *Director*
    B.S., Purdue University; M.D., University of Arkansas
Guerra, Frank B., Jr. (1969) .... *Assistant Director*
    B.S.B.A., B.S.Ph., University of Arizona
Baker, Charles J., F.A.C.P. (1970) .... *University Physician P/T*
    A.B., Tufts College; M.D., Cornell University; American Board of Pediatrics
Fee, Norman F. (1973) .... *Medical Consultant, P/T*
    B.A., Carleton College; M.D., George Washington University; American Academy of Orthopedic Surgeons
Gentner, George A., F.A.C.R. (1964) .... *Consulting Roentgenologist, P/T*
    M.D., University of Buffalo; Diplomate, American Board of Radiology
Gough, James S. (1975) .... *University Psychiatrist, P/T*
    B.A., University of Kansas; M.D., University of Kansas School of Medicine
Huff, Terry (1980) .... *Medical Consultant, P/T*
    M.D., OB-GYN, Residency, Maricopa County Hospital
Ponitch, Jerry A. (1976) .... *Medical Consultant, P/T*
    B.A., Monmouth College; M.D., Northwestern University; American Academy of Dermatology
Rierson, Robert D. (1978) .... *Medical Consultant, P/T*
    M.D., Boards in Obstetrics and Gynecology
Urrea, Don (1975) .... *Medical Consultant, P/T*
    B.A., University of Arizona; M.D., Cornell University; Board Certified Neurologist
Maresca, Robert (1979) .... *Medical Consultant, P/T*
    ENT Specialist
Geisler, Gordon (1946) .... *University Physician, P/T*
    M.D., University Manitoba, Winnipeg, Canada
Mankel, William C. (1973) .... *University Psychiatrist, P/T*
    M.D., University Miami (Florida)
Strand, Martin E. (1975) .... *University Physician*
    B.S., Albion College, M.D., Wayne University
Winter, Lewis S., Jr. (1976) .... *University Physician*
    B.S., University of Nebraska; M.D., University of Nebraska; Board Certified in Surgery
Reno, Joseph H. (1941) .... *University Physician, P/T*
    B.S., Temple University; M.D., Temple University; Diplomate American Board Orthopaedic Surgery
Thompson, W. G. (1949) .... *University Physician*
    M.D., University of Colorado School of Medicine

University Academic and Administrative Organization

Academic Administration

Provost/Academic Vice President .... *Paige E. Mulhollan*
  Assistant Provost .... *Mathew J. Betz*
  Assistant Provost .... *Joyce M. Foster*
  Assistant Provost .... *Elmer R. Gooding*
  Assistant Provost for Affirmative Action ....
    Assistant Affirmative Action Officer .... *Irene A. Wos*
  Assistant Provost for Research/Director, Grants and Contracts .... *Harold B. Hunnicutt*
  Registrar .... *Enos E. Underwood*
  Associate Registrar .... *William R. Haid*
  Assistant Registrar .... *Ronald K. Winterhof*

Colleges and Schools

College of Liberal Arts .... *Guido G. Weigend, Dean*
College of Architecture .... *Hugh Burgess, Dean*
College of Business Administration .... , *Dean*
College of Education .... *Robert T. Stout, Dean*
College of Engineering and Applied Sciences .... *C. R. Haden, Dean*
School of Engineering .... *C. R. Haden, Director*
College of Fine Arts .... *Jules Heller, Dean*
College of Law .... *Alan A. Matheson, Dean*
College of Nursing .... *Juanita F. Murphy, Dean*
College of Public Programs .... *Nicholas L. Henry, Dean*
Graduate College .... *Charles M. Woolf, Dean*
School of Social Work .... *Ismael Dieppa, Dean*
Continuing Education and Summer Sessions .... *Denis J. Kigin, Dean*

Instruction Units

Accounting .... , *Chair*
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Anthropology .... *Fred Plog, Chair*
Architecture .... *Roger L. Schluntz, Chair*
Art .... *Leonard Lehrer, Director*
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Chemical and Bio Engineering .... *Imre Zwiebel, Chair*
Chemistry .... *Morton E. Munk, Chair*
Civil Engineering .... *Louis A. Hill Jr., Chair*
Communication .... *Robert Goyer, Chair*
Computer Science .... *William Lewis, Acting Chair*
Construction .... *Vernon Hastings, Director*
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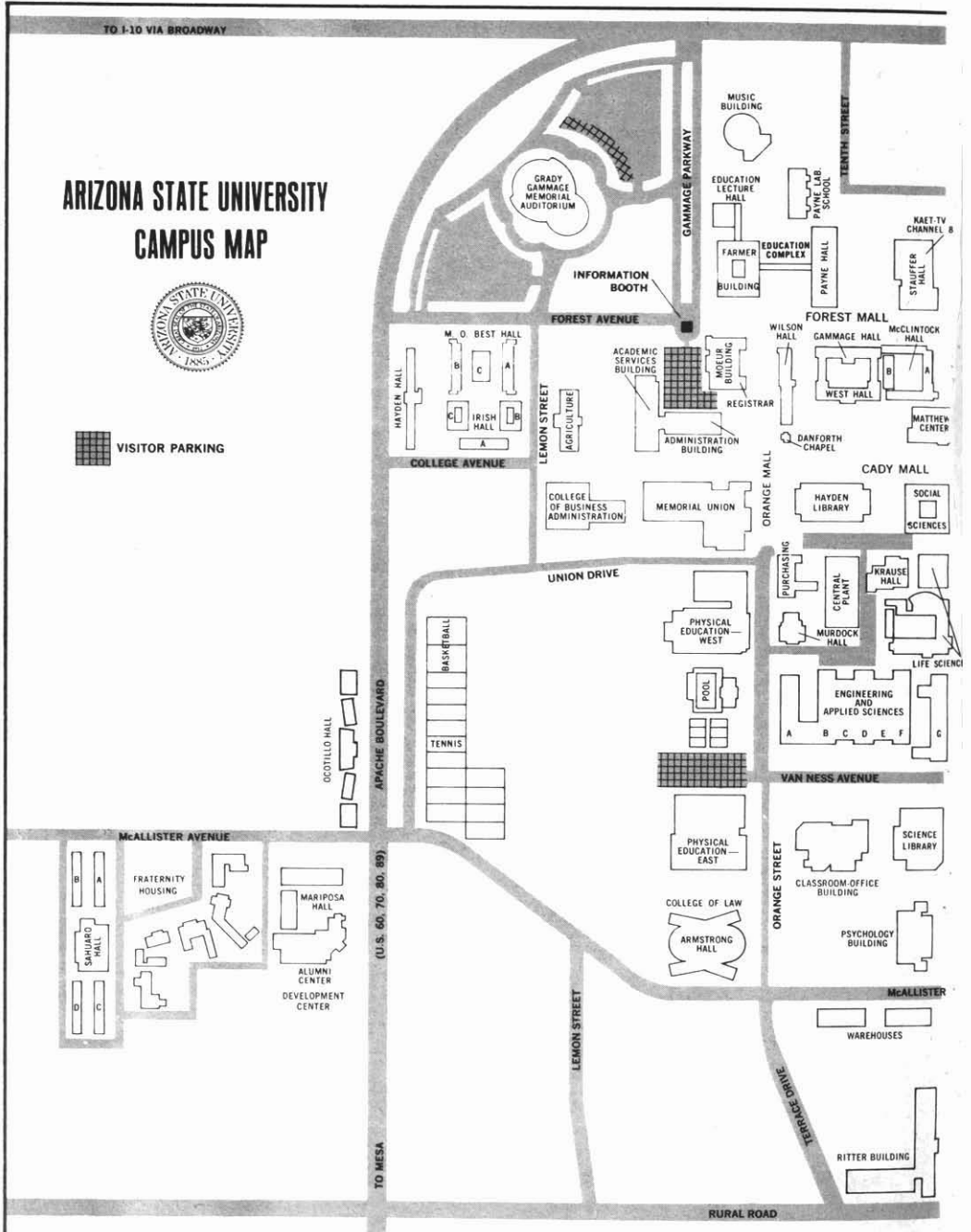ASU Audiovisual Services — Pages 15, 44, 55, 59, 211, 301
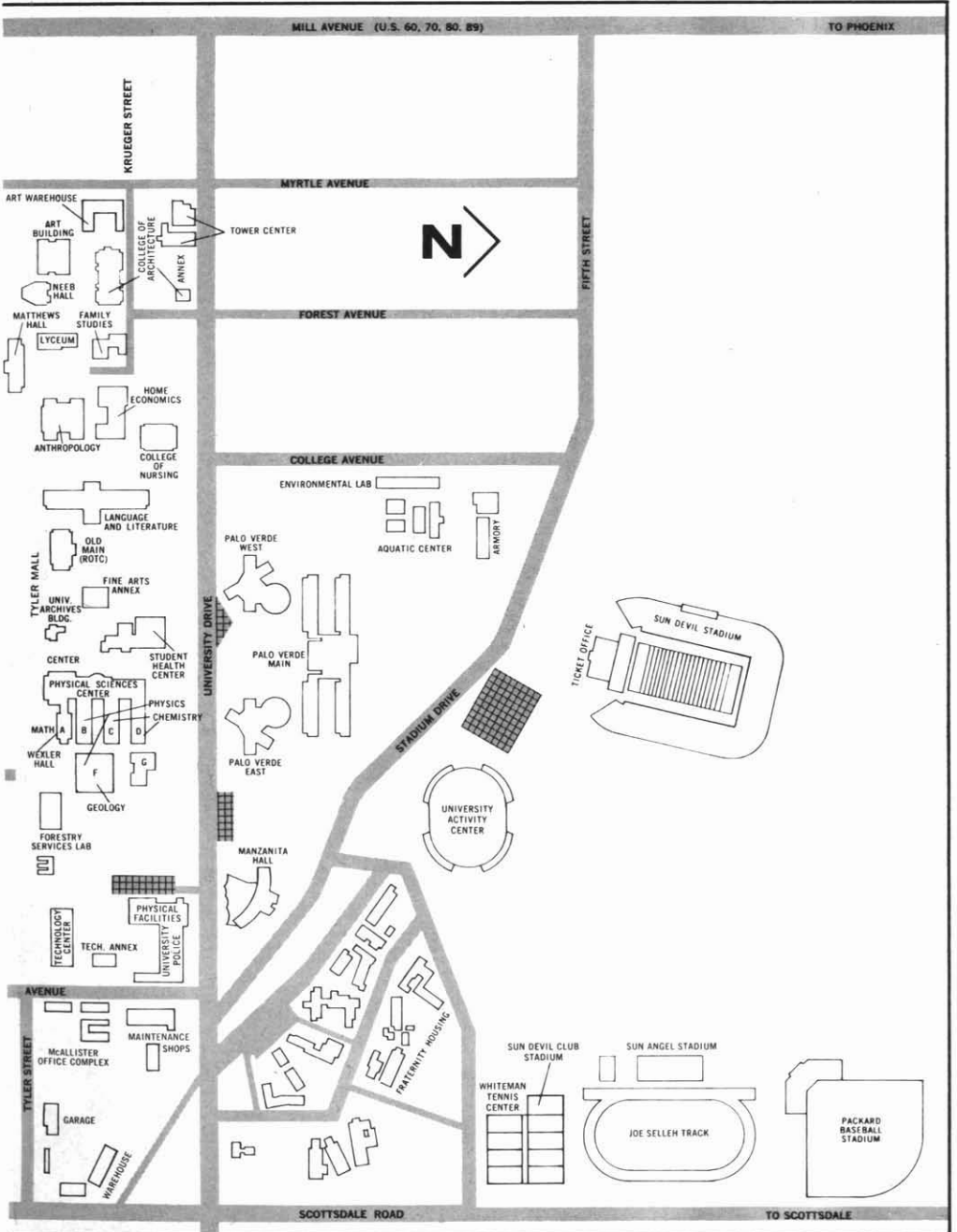
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ARIZONA STATE UNIVERSITY
CAMPUS MAP

MILL AVENUE (U.S. 60, 70, 80, 89)

TO PHOENIX

KRUEGER STREET

MYRTLE AVENUE

N

FIFTH STREET

ART WAREHOUSE

ART BUILDING

COLLEGE OF ARCHITECTURE

TOWER CENTER

ANNEX

NEEB HALL

MATTHEWS HALL

FAMILY STUDIES

LYCEUM

FOREST AVENUE

HOME ECONOMICS

ANTHROPOLOGY

COLLEGE OF NURSING

COLLEGE AVENUE

ENVIRONMENTAL LAB

LANGUAGE AND LITERATURE

PALO VERDE WEST

AQUATIC CENTER

ARMORY

OLD MAIN (ROTC)

TYLER MALL

FINE ARTS ANNEX

UNIV. ARCHIVES BLDG.

SUN DEVIL STADIUM

CENTER

STUDENT HEALTH CENTER

PALO VERDE MAIN

TICKET OFFICE

PHYSICAL SCIENCES CENTER

PHYSICS

CHEMISTRY

MATH A   B   C   D

STADIUM DRIVE

WEXLER HALL

F

G

PALO VERDE EAST

UNIVERSITY ACTIVITY CENTER

GEOLOGY

FORESTRY SERVICES LAB

MANZANITA HALL

UNIVERSITY DRIVE

TECHNOLOGY CENTER

PHYSICAL FACILITIES

TECH. ANNEX

UNIVERSITY POLICE

AVENUE

McALLISTER OFFICE COMPLEX

MAINTENANCE SHOPS

FRATERNITY HOUSING

SUN DEVIL CLUB STADIUM

SUN ANGEL STADIUM

TYLER STREET

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GARAGE

JOE SELLEH TRACK

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SCOTTSDALE ROAD

TO SCOTTSDALE