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

577 Issues and Trends in Secondary Education. (3) F SS
Analyses of ay and professiona reports, prob ems and ssues in American secondary educat on. Prerequ s te SED 433.

588 Human Relations in the Secondary Schools. (3) S, SS
Prob ems in human relat ons inherent n the interact on of pup ls teachers adm n strators non professional staff and laymen. Prerequ s te SED 433

711 Secondary Curriculum Development. (3) S, SS
Theories and processes of develop ng curricu um eva uation of research Prerequ sites· SED 433 522 or equivalent.

722 Improvement of Instruction in the Secondary School. (3) F SS
Evaluat on of the research, issues and theor es re ated to the mprovement of nstruct on. Prerequisites· SED 433, 533.

Special Courses: SED 294, 298 484 492 493 494 497, 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 33 34)

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
nterre ation of art, arch tecture, iterature, music ph losophy, rel gions, theatre and other performing arts n the modern world. Two lectures, two d scuss on meet- ngs per week.

118 Encountering the Arts. (3) F, S
Introductory course emphasiz ng personal contacts with the fine and performing arts Attendance of a w de range of events, with ana ys s and eva uat on

130 Introduction to Popular Culture. (3) F, S
Reflect ns of American values n 20th century popu ar arts Music, pr nt, art te evis on, rad o, movies, the es- thetics of popu ar culture

318 Artistic Styles and Forms. (3) S
Forma and sty istic aspects of the f ne and perform ng arts Deve opment and progression of style and form n the var ous arts

401 Humanities in World Cultures. (3-6) F S, SS
A humanit es study program of fore gn travel F ne and perform ng arts of the various world cu tures. May be repeated for credit. Prerequisite· approval of nstructor

480 Methods of Teaching the Humanities. (3) N
Methods of instruction, organizat on, discussion and presentation of the courses n the interdisc p inary hu- manities. Prerequis tes: HUE 101, 102 or approva of in structor

530 Popular Culture in America. (3) F
The uses of e sure t me from a h storica perspective Areas of concern nc ude te ev s on and radio f lm and stage, music, art and paperbacks

585 Philosophical Foundations of the Humanities. (3) S
Issues n inte lectua tradit ons of the Western wor d that are bas c to the interdiscipl nary humanit es. Pre requis te Humanit es education graduate status or ap proval of nstructor

Special Courses: HUE 294, 497, 499, 500, 584, 590, 591, 592, 594, 598 599, 600, 680 684, 690, 691, 692. (See pages 33 34)

SAFETY EDUCATION

SAE 466 Safety Education. (3) F S SS
Safety educat on n home, school and p ace of emp oy- ment

477 Driver and Traffic Safety Education, I. (3) F, SS
Preparation for teach ng the c assroom phase of dr ver education n the secondary schoo Prerequ s tes val d operator s icense and SAE 466 COE on y

478 Driver and Traffic Safety Education, II. (3) S SS
Preparat on for teach ng behind the wheel phase of dr ver educat on. S mulation inc uded Prerequis te val id operator s i cense and SAE 477 COE on y

Special Courses: SAE 492 493 494, 497, 498, 499, 580 583 584, 590 591, 592 593 594 598 599. (See pages 33-34)

EDUCATIONAL FOUNDATIONS

EDF 111 Exploration of Education. (3) F, S
Educat on as an nstrument n the deve opment of the ind vidual and society ts sign f cance as an Amer can inst tut on.

300 Self-Assessment for Teaching. (3)
nstructional and field experiences to introduce stu dents to the profess on of teach ng and the process of education Observat on part c pation in e ementary and secondary schoo s required Lab fee required

333 Basic Issues in Education. (3) F, S
Important contemporary soc o philosophica ssues edu cators face, ana ys s and problem so ving.

422 Group Dynamics and Education. (3 F, S Mou ton
Theory and use of group processes to facil tate human interaction and earning.

445 Education for Survival. (3) A Mou ton
Causes extent and seriousness of environmenta deg- radation Po lut on, resource dep etion, energy over population conservat on

500 Educational Research. (3) F S, SS
ntroductory course n the ana ys s, product on, and use of educationa research n the f e d

Special Courses: EDF 294 298 484, 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 33-34)

MULTICULTURAL EDUCATION

See offer ngs under MCE isting on page 199 (MCE EED) and Educat ona Foundat ons (SED)

SOCIAL AND PHILOSOPHICAL FOUNDATIONS

SPF 411 History of American Education. 3) F, Be ok
Soc al cond tions, ideas and nst tut ons which formed Amer can educat on

422 Educational Sociology. (3 S Metha
Schools as agents of soc a zat on and as socia sys- tems

511 School and Society. (3) F S SS
nterrelationsh p of schoo and soc ety and the ro e of education in soc al change

515 Education of Women. (3 F, S
Analysis of roles and status of women educational practices and alternat ves

520 Cultural Pluralism and Education. (3) N
Phi osophic analysis of the concept of cultura p ura ism and ts soc a imp ications for Amer can education

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

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

543 Bilingual Education Models. (3) F
Bilingual education programs in other countries, analysis of political, social, economic, and educational implications; practice in planning bilingual education curricula.

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

566 History of Education. (3) F, S, SS
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
Problems of American education and their social 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:
ABRAHAM, FAAS, MOORE, PREHM, PRIETO, RUTHERFORD, ZUCKER

ASSOCIATE PROFESSORS:
HOWELL (ED 305), D'ALONZO, HARTWELL, McCOY, NELSON, ROBERTS, WISEMAN

ASSISTANT PROFESSORS:
COHN, RUEDA

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
Characteristics and assessment specific to mental retardation. Terminology, educational programming and therapeutic procedures are emphasized

314 Introduction of Bilingual/Multicultural Special Education. (3) F, SS
Theoretical background and practical application of general issues regarding the education of bilingual /multicultural handicapped children. Practicum included.

336 Behavioral and Emotional Problems in Children. (3) S, SS
Characteristics and assessment specific to emotionally and behaviorally disturbed children. Terminology and educational programming emphasized.

361 Introduction to Learning Disabilities. (3) F, SS
Characteristics and assessment specific to learning disabilities. Terminology and educational programming emphasized.

411 Parent, School, Community Relations and the Exceptional Child. (1-6) F, S, SS
Educational situations facing the special education teacher presented through instructional modules. Students must complete a minimum of six one-hour modules during the program.

412 Evaluating Exceptional Children. (3) F, S, SS
Normative and criterion referenced diagnostic techniques including formative evaluation. Emphasis upon application Practicum included

413 Prescriptive Programming in Language, Reading and Arithmetic for Exceptional Children. (3) F, S, SS
Methods, techniques and materials for use in prescriptive teaching. Practicum included. Prerequisite: SPE 412.

414 Techniques and Strategies in Behavior Management. (3) F, S, SS
Practical techniques of behavior management. Overview of humanistic, psychoeducational, cognitive and ecological approaches. Practicum included.

415 Social Behavior Problems of Exceptional Children. (3) F, S, SS
Analysis and intervention into social behavior problems of exceptional populations. Practicum included. Prerequisite: SPE 414.

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

465 Student Teaching in Special Education. (3 15) F, S
Prerequisites: (1) Approval of Special Education Department, (2) completion of SPE 311, 411, 412, 413, 414, 415 and basic introductory course in at least one area of specialization; and (3) completion of EDF 300 (or equivalent), EDP 310, EDT 405, RDG 314, RDG 315, EED 380. Y grade only.

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

512 The Mentally Retarded Child. (3) F, SS
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) N
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) S, SS
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) S, SS
Behavior management approaches with maladaptive behavior of exceptional children Prerequisite: SPE 511 or equivalent.

536 Behavioral and Emotional Problems of Children. (3) F, SS
Explores maladaptive behavior of individuals. Variables contributing to behavior patterns of behavior disordered children.

538 Methods of Teaching the Behaviorally Disordered. (3) S, SS
Development of methods for managing the academic and social behavior of behaviorally disordered children and youth in educational settings. Prerequisites: SPE 336 or 536.

551 Teaching the Young SMH. (3) S
Functional characteristics, methods, and curriculum for teaching preschool and elementary level severely /multiply handicapped children. Prerequisites: SPE 311 or 511 and 312 or 512.

552 Methods Teaching Adolescent and Adult SMH Individuals. (3) F
Functional characteristics, methods, materials, and curriculum for educational program management of severely/multiply handicapped adolescent and adult individuals. Prerequisites: SPE 311 or 511 and 312 or 512.

561 Characteristics and Diagnosis of Learning Disabilities. (3) F, SS
Background and models comprising the topic of learning disabilities, identification and characteristics.

562 Methods of Remediating Learning Disabilities. (3) S, SS
Various methods and intervention strategies for remediating learning disabilities of children and youth. Prerequisites: SPE 361 or 561.

563 Methods Teaching the Mildly Handicapped Adolescent. (3) A
Identification, remediation, and alternative curriculums for exceptional students at the secondary school level. Social and academic variables.

574 Educational Evaluation of Exceptional Children. (3) F, SS
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, SS
Mainstreaming, noncategorical, financing, legal diagnostic, labeling, legislative and other critical and controversial issues related to the education of exceptional children.

576 Precision Teaching. (3) S
Theory and techniques which apply to systems of formative evaluation. Emphasis on precision teaching.

578 Methods of Teaching the Mentally Retarded. (3) S, SS
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) F
Curriculum planning and methods of teaching in secondary school and post-school programs. Work evaluation, work-study, sheltered employment. Prerequisite: SPE 312 or 512.

582 Classroom Research with Exceptional Children. (3) S
Introduction to conducting classroom research. Specific research techniques with primary emphasis on applied behavior analysis techniques.

585 Creativity: Research and Development. (3) S
Nature of creativity explored in terms of philosophical underpinnings, empirical evidence, human development, self-actualization, and the ecology surrounding the creative event.

588 The Gifted Child. (3) F, SS
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) S, SS
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
Analysis of the research and theoretical literature focused on the identification, evaluation, and classification of exceptional children.

675 Causation of Handicapping Conditions. (3) F
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
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
Analysis of the literature describing learning, educational, personal-social and cognitive characteristics of exceptional children.

775 Intervention Program in Special Education. (3) S
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) S
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, 780, 790, 792, 799. (See pages 33-34.)

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 Chemical and Bio Engineering
- Department of Civil Engineering
- Department of Electrical and Computer Engineering
- Department of Industrial and Management Systems Engineering
  - Industrial Engineering
  - Manufacturing Engineering
- Department of Mechanical and Aerospace Engineering
  - Aerospace Engineering
  - Energy Systems Engineering
  - Engineering Science
  - Materials Science
  - Mechanical Engineering
- Engineering Special Studies
  - Bioengineering
  - Nuclear Sciences
  - System Engineering
  - Urban Systems Engineering
- Engineering Interdisciplinary 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 Electronics and Computer Technology
  - Electronic Engineering Technology

Computer Engineering Technology
Microelectronic Engineering Technology
Department of Industrial Technology
Graphic Communications Engineering Technology
Graphic Communications Industrial Technology
Industrial Supervision
Technical Teacher Education
Vocational Teacher Education
Department of Manufacturing Technology
Manufacturing Engineering Technology
Mechanical Engineering Technology
Welding Engineering Technology

Research

The college is committed to becoming one of national prominence for engineering research at the graduate level. In addition, 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. These activities are carried out under the academic divisions or departments listed in the following catalog material and also through the interdisciplinary research centers listed below:

Center for Advanced Research in Transportation
Center for Arid and Tropical New Crop Applied Science and Technology (NEWCAST)
Center for Automated Engineering and Robotics
Center for Energy Systems Research
Center for Research in Engineering and Applied Sciences
Center for Solid State Electronics

Center for Professional Development

As the professional "half life" for engineers and scientists decreases continually in most technical fields, the need for continuing education or "life long" learning increases with each passing day. In response to this need, the College's Center for Professional Development provides continuing education services to the local and national technical communities. The Center offers a wide variety of technical conferences, institutes, seminars, and short courses for professionals engaged in the rapidly changing areas of science and technology.

Cooperative Education

The co-op program is a study work plan of education which alternates periods of academic study with periods of employment in business, industry and government directly related to a student's major. Students who choose this program usually complete 12 months of employment and graduate with both the academic background and practical experience gained from working with professionals in their chosen field.

A student is eligible upon completion of 45 or more hours of classes in a selected engineering or construction major. Certain positions may require completion of specific courses of study. Transfer students are required to complete at least one semester at ASU before beginning work. All student applicants must have a minimum grade point average of 2.5 and the approval of their advisor. Internships may also be available in other divisions of the College.

The academic credit earned varies with the different programs of study. Interested students should contact the Coordinator of Cooperative Education.

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 Engineering Special Studies. Course requirements comprising these majors are drawn primarily from the various engineering disciplines. The B.S. programs are offered through the Engineering Interdisciplinary 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 se

quence 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 department 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.

Graduate Degrees

Deficiencies for admission to the graduate degree programs will be specified at the time of admission. The Graduate Record Examination (V,Q,A) is recommended but not required unless specified by the respective academic unit. TOEFL scores must be submitted by foreign student applicants before admission is considered. The minimum required score is determined by each academic unit.

Master of Science Degree (M.S.)

Agriculture. This program provides competent students with opportunities to complete advanced studies with emphasis on research in Agribusiness and Environmental Resources in Agriculture. Areas of concentration in Agribusiness are management, marketing, finance, international agriculture, and food quality assurance. Areas of concentration in Environmental Resources in Agriculture are range resource management, land reclamation, resource conservation, and urban hort culture. Admission requires completion of 18 semester hours in agriculture, environmental sciences or closely related course work. Scores from the GRE or MAT are required. A minimum of 30 semester hours of approved graduate course work is required, including a thesis or thesis substitute. An oral examination in defense of thesis or thesis substitute is required.

Computer Science. This graduate program provides an opportunity for qualified students holding a baccalaureate degree in computer science or related fields to complete advanced studies with emphasis on research. Admission requires an appropriate baccalaureate degree. A minimum of 30 semester hours of approved course work is required, including a thesis or thesis substitute. An oral examination in defense of the thesis or thesis substitute is required.

Engineering. This program is a research oriented graduate degree program, providing an opportunity to highly competent students to major in Chemical, Civil, Electrical, Industrial or Mechanical Engineering, or Engineering Science. Admission normally requires an appropriate undergraduate engineering degree and satisfying all Graduate College admission requirements, as well as special department requirements. A minimum of 30 semester hours of approved graduate course work is required, which must include a thesis, or thesis substitute, and an oral examination at completion of the program. Students writing a thesis must enroll in 6 semester hours of thesis, research, or applied project.

Master of Science in Engineering Degree (M.S.E.)

Engineering. This program is a professionally oriented graduate degree program and is intended as a preparation for a career in professional practice. Two options are available: the first is a thesis or thesis substitute (engineering report or research paper); the second is a no thesis, no report degree program. Both options require a minimum of 36 semester hours of approved graduate level course work. Entry into this program requires the satisfying of all Graduate College admission requirements, special department requirements, and a baccalaureate degree with a major in engineering or other closely related degree program.

Option 1: Designed primarily for full time students who plan to major in one of the engineering disciplines. The M.S.E. degree Option 1 is awarded upon successful completion of graduate course work, engineering projects and research endeavor resulting in a thesis or thesis substitute (engineering report or research project). A final oral examination is required in defense of the thesis or thesis substitute.

Option 2. Designed primarily for students who hold full-time jobs and must attend university classes on a part time basis and who plan to major in one of the engineering disciplines. The M.S.E. degree Option 2 is awarded upon successful completion of graduate course work, a final written comprehensive examination of the graduate course work taken for the degree and over the respective undergraduate prerequisites is required. Students selecting this option must check with the

respective department regarding eligibility for financial aid offered by the School of Engineering.

Master of Technology Degree (M.Tech.) 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: Aeronautical Technology, Electronic Engineering Technology, Graphic Communications Technology, Industrial Supervision, Industrial Education, Vocational Education, and Manufacturing Technology. Admission requires an appropriate baccalaureate degree with a minimum of 30 semester hours in technology or equivalent. Scores from the GRE are required. A minimum of 32 semester hours of approved course work is required, including a practicum or applied project. An oral examination in defense of the practicum or applied project is required.

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.

Student Services

The Dean's Office in the College of Engineering and Applied Sciences maintains a special section staffed to assist students in the following matters:

Advisement and Counseling. For assistance and counseling in planning a program of study, each student in this college 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 to all students for counseling and assistance. The office of the Student Advisement Coordinator also administers, for the College Standards Committee, the probation, disqualification, and readmission processes for those students who are academically deficient.

International Students. The Student Services office will assist international students in this college encountering special problems related to their college studies and student status.

Minority Students. A Minority Programs Coordinator is available to assist those students encountering difficulty in academic or other areas, and also to assist qualified minority students in filing for financial assistance, including special minority scholarships.

Scholarships. Academic scholarships for continuing students in this college may be applied for through the Student Advisement Coordinator. Other scholarships may be available through the Student Financial Assistance Office.

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.

Major A specialized group of courses contained within the program of study. Example: program of study—engineering; major—civil engineering. Example: program of study agriculture; major agribusiness.

Area of Emphasis (technical electives), Pattern or Concentration is a selection of courses within a major or among one or more majors. The number of technical electives varies from curriculum to curriculum. In a number of the majors 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: major 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.

Entrance requirements of this college may differ from those of other academic units on campus. Depending on the curriculum selected, students must meet the following requirements:

	Minimum Scores			
	H.S. Rank	ACT	SAT	TOEFL*
Agriculture	**	**	**	500
Computer Science (all degrees)	Upper 20%	24	1100	550
Construction	**	23	1050	550
Engineering	Upper 25%	23	1050	550
Technology	**	**	**	500

*For international students.
**Same as university requirements, see page 19.

Students admitted to the University by the GED (General Education Development) are required to take either the ACT or the SAT in order to meet the above requirements.

Students not admissible to programs in this college who enroll in another college at ASU may not register for any 300 or 400 level courses in this college, unless such courses are required in their degree programs.

Readmission. If a student applying for readmission has a cumulative GPA less than the transfer admission requirements (listed below), the decision on readmission will be made by the Standards Committee of the College based in part on the recommendation of the department or division in which the student wishes to enroll.

Transfer Into and Within College. Effective with this catalog, students transferring into or between departments or divisions within the College must meet the catalog requirements of the new department or division in effect at the time of transfer.

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

No grades lower than C will be accepted as transfer credit to meet the graduation requirements of this college.

The requirements for admission of transfer students are as follows:

	Transfer GPA
Agriculture	2.00
Computer Sciences (all degrees)	2.75
Construction	2.25
Engineering	2.50
Technology	2.25

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 transferred from a community college will be applied only as lower division credits. Prospective Arizona community college transfer students should consult their advisor and refer to the annual *Arizona Higher Education Course Equivalence Guide* for a listing of the acceptable courses transferable to the various College degree programs.

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.

Retention. A student is expected to make satisfactory progress toward completion of degree requirements in order to continue enrollment in the College of Engineering and Applied Sciences. 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 with grade point averages below 2.00.
4. Grades of E, W, or I in half the credit hours appearing on the official enrollment record for any semester.

Disqualification. After one semester on provisional status a student who fails to meet the retention standards will be disqualified. Students disqualified by this college who are accepted by another college at ASU may not register for courses in this college which apply to the former major. Further, students at the

university who have been disqualified academi cally are not eligible to enroll in Summer Sessions until the disqualification period has expired and they have been reinstated.

Reinstatement. The College of Engineering and Applied Sciences will not accept an application for reinstatement until the disqualified student has remained out of this college for at least one regular semester. Merely having remained in a disqualified status for the above period of time does not, in itself, constitute a basis for reinstatement. Proof of ability to do satisfactory college work in the chosen discipline will be required.

English Proficiency Requirement. English proficiency is required. As a minimum each student must complete ENG 101 and ENG 102, or ENG 105, 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 28.

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) Alpha Pi Mu Industrial Engineering Honor Society, (2) Alpha Zeta Agriculture Honor Society, (3) Eta Kappa Nu Electrical Engineering Honor Society; (4) Pi Tau Sigma Mechanical Engineering Honor Society, (5) Sigma Lambda Chi Construction Honor Society, (6) Tau Alpha Pi National Honor Society, Engineering Technologies, and (7) Tau Beta Pi National Engineering Honor Society. Information on any of these organizations may be obtained from the respective Department, Division or School offices, or the Office of the Student Advisement Coordinator.

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.

Students must select courses from the following lists which are approved and acceptable for *all* undergraduate degree programs in this College. It is recommended that at least 6 of the 16 hours total be 300 or 400-level courses, and that the student select at least two courses from the same subject area.

Humanities and Fine Arts

Art History: Any ARH course numbered from ARH 100 through 488

Architectural Philosophy and History. APH 300, 304, 305, 414, 417

Communications: COM 241, 344

Dance History: DAH 280

Decorative Arts. DEH 171

English: ENG literature courses only

Design History and Theory: DES 100, 200, 201, 313, 314

Foreign Language: All, *except* for engineering degree candidates. Only literature courses in the 300 or 400-level series are acceptable for engineering degree candidates.

Humanities Education: Any HUE course numbered HUE 101 through 401

Humanities (Interdisciplinary): Any HUP course numbered HUP 101 through 494

Music: MUS 107, 340, 347, 355, 356, 357

Philosophy. All *except* PHI 313

Religious Studies: All REL courses

Theatre: THE 100, 320, 321, 420, 421, 425

Behavioral and Social Sciences

Agriculture: AGB 302, 380, 470; ERA 310

Anthropology: All ASB courses

Civil Engineering: CEE 371

Communications: COM 100, 263, 300, 320, 363, 365

Study of Justice: CRJ 100, 200, 360

Cultural Geography: Any GCU course numbered GCU 102 through 361; 455, 462

Economics: All ECN courses (ECN 201 *required* of all construction and engineering students)

Family Studies: FAS 330, 331, 332, 436

History: Any HIS course numbered HIS 100 through 479

Political Science: Any POS course numbered POS 101 through 474

Psychology: PGS 100, 306, 310, 315, 341, 350, 414, 430, 458

Society, Values and Technology: All STE courses *except* STE 303

Sociology: SOC 101, 251, 301, 305, 332, 351, 352, 360, 432, 452, 453, 454, 455, 456, 483, 485

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

G. J. Seperich, Ph.D., Director

PROFESSORS:
CHALQUEST, GORDON, METCALF, MILLER, MOODY, RICHARDSON, ROBINSON, STILES, WEEMS

ASSOCIATE PROFESSORS:
SEPERICH (AG 281), ASHOOR, BACKHAUS, BRADY, BROCK, MADDY, WHYSONG, WOOLVERTON

ASSISTANT PROFESSORS:
EDWARDS, RIGHETTI, STUTZ, TOROK

Purpose

The Division of Agriculture provides academic programs directed toward the agribusiness and environmental aspects of agriculture. Agriculture is a dynamic industry which provides employment to about 23 percent of the U.S. labor force. Courses in the Division of Agriculture are designed to prepare students for the wide range of job opportunities which exist in the agricultural industries and governmental agencies. The academic programs are especially designed to include the needs of the urban student who has had little or no previous agriculture experience. An interest in plants, animals or foods can be the starting point for career development in agricultural industries or natural resource management. The undergraduate programs also provide the necessary training for students preparing to enter graduate degree programs.

General Information

Admission. See pages 18-22 and 36 for in formation regarding requirements for admission, transfer, retention, disqualification, and reinstatement.

In addition, students who are beginning their initial college work in the Division of Agriculture should present secondary school units in accordance with the minimum University requirements. There are no secondary school agricultural course requirements.

Organization

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

Agribusiness

Concentration	*Area of Emphasis*
Agribusiness	Agribusiness Management
	Agribusiness Marketing
	International Agricu ture
Pre Veterinary Medicine	
Food Industry	Food Quality Assurance
	Food Industry Management

Environmental Resources in Agriculture

Concentration	*Area of Emphasis*
Natural Resource Management	Land Reclamation Soil Conservat on
	Range Ecology
	Resource Systems
Urban Horticulture	

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

The Division of Agriculture, in conjunction with the U.S. Department of Commerce and its Minority Business Development Agency, has established a Technology Commercializa tion Center (TCC). This Center for Arid and Tropical New Crop Applied Science and Technology (NEWCAST) has as its purpose to carry out projects that would lead to the commercialization of arid and tropical zone indigenous plants through the development of viable new crop agribusinesses. It is the bio logical evaluation center for the entire TCC system.

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 major cores, and area of emphasis courses ead to the Bachelor of Science degree. Forty percent of the semester hours required for graduation must be up per division.

Master of Science (M.S.). The Division of Agriculture offers the Master of Science de gree in Agribusiness and in Environmental Resources in Agriculture. Thesis and non thesis options are offered in the Agribusiness program. 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 major 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 concentration and an area of emphasis.

The agribusiness major is an applied, industry-oriented curriculum. The study of animals, plants and their utilization in the food and fiber system forms the base of the program. Students then learn to analyze firms involved in input supply activities, commodity processing, food manufacturing and food dis tribution. Students also study government ag ricultural programs and regulatory activities which affect agribusiness. Because of the United States' role in supplying commodity and food products to the world markets, inter national aspects of agribusiness development and trade are emphasized.

Two concentrations exist within the environmental resources in agriculture major. The natural resource management concentration emphasizes the study of wild and ecosystem management. Students may choose to study range resources in the range ecology area of emphasis, soil resources in the land reclama tion soil conservation area of emphasis, or a systems approach to resource management in

*See pages 209-210 for specific requirements and approved l'st of social and behav ora sciences, and humanit'es and fine arts.

the resource systems area of emphasis. The ur ban horticulture concentration emphasizes the production, care and marketing of plant mate rials for urban environments. The program is designed to be flexible so that individual stu dents can choose areas to emphasize such as commercial horticulture, landscape horticulture or horticultural science.

Agriculture Core

All students pursuing a Bachelor of Science degree in the Division will complete the fol lowing 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 major combines business and technical agriculture as they relate to the management, marketing and financial objectives of agribusiness firms. Topics of interest include the supplying of resources and services to agricultural producers, the management of crop and livestock enterprises, the processing of raw agricultural products and the management and quality assurance of food manufacturing. Food distribution is examined from the points of view of food wholesalers and retailers as well as food service firms which include restaurants and specialized food firms. The study of agribusiness also includes analysis of the critical roles of government in regulating certain aspects of agribusiness and promoting international trade in agribusiness products.

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

			Semester Hours
AGB	101	Food Chain	2
CHM	101	Introductory Chem stry	4
MAT	115	Col ege Algebra and Trigonometry (4) or MAT 210 Mathematica Ana ysis	3
ECN	201	Pr nc ples of Economics	3
AGB	312	Agricultural Marketing	3
AGB	364	Food Technology	3
AGB	442	Agribusiness Management 1	3
AGB	490	Recent Advances in Agribusiness	1
		Total	22-23

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

Agribusiness Management integrates the knowledge and skills needed to successfully manage people, products and services in agribusiness enterprises. Agribusiness management combines the agricultural sciences, behavioral science and common sense. Emphasis is placed on up to date management methods that will allow graduates to successfully meet challenges in the food and fiber industries. Graduates are qualified to make signifi cant contributions in a broad range of career opportunities which exist in agribusiness. Many start career paths which will lead to upper level agribusiness management positions.

Agribusiness Marketing involves the flow of products and services through the various market channels for agricultural inputs, commodities and food. Several approaches to the study of agricultural marketing including functional, institutional and behavioral are examined. Specialized courses in marketing are offered to allow students to develop expertise in specific marketing functions. Agribusiness firms recognize the importance of marketing and place heavy emphasis on it. Agribusiness marketing graduates can look forward to choosing from among many good career op portunities.

International Agriculture relates world-wide agricultural resources to the requirements and potentials of the various nations. Particular emphasis is given to economic development and to the international trade of food and fiber products. 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 of foreign countries. Provided is a basic knowl edge of U.S. agricultural techniques which is extended to the global aspects of agriculture. Graduates in this area are particularly qualified to aid in the development of the world's agricultural potential to provide food and fiber to meet the expanding populations. Jobs exist in commercial industries and in government agencies United States, international and foreign. A language capability in addition to English is recommended.

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 agri business, 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 concentration 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 re lated jobs in agribusiness and government.

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

Food Quality Assurance is a scientific and technical competence required by the food in dustry. Strong emphasis is given to basics such as chemistry, analytical techniques and food safety. This unique program offers employ ment opportunities for graduates in food industries, regulatory agencies and consumer or ganizations, all of whom maintain continuous quality control and inspection programs to protect our food supply.

Food Industry Management includes organization, buying, marketing and regulatory aspects of all types of enterprises in the food industry. Students become aware of the uniqueness of the food products including their production, processing and distribution. Em ployment opportunities for graduates exist in all phases of 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 Trigonometry	4
ENG	101	and 102 Freshman Composition	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 Spec alization 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 major emphasizes the application of principles drawn from basic biology, ecology and soil science. Students in the natural resource man agement concentration will study application of these principles to wildland ecosystems. Students in the urban horticulture concentration will study the application of these princi ples in garden, landscape and greenhouse environments.

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

			Semester Hours
BIO	101	and 102 Biological Principles and Processes	8
MAT	115	College Algebra and Trigonometry	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 Soil Conservation 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 background 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, is designed to provide a solid foundation in horticultural practice while providing sufficient flexibility for students to emphasize areas of particular interest. For example, students may choose to emphasize the commercial aspects of horticulture by including agribusiness courses in the curriculum to insure financial as well as horticultural knowledge. Students may also choose to emphasize landscape horticulture by concentrating on courses in design and landscape horticulture; horticultural science by directing their program of study to include courses in botany, genetics and chemistry; or to concentrate on horticultural management of pests, soils and water by including coursework in plant diseases, pests, nutrition and water management. Graduates find employment in the nursery industry, landscape management (e.g., park or golf course management), commercial or government laboratories, the agricultural chemistry industry, or may begin their own businesses.

Typical Curriculum for Environmental Resources in Agriculture

First Year

			Semester Hours
ENG	101	and 102 Freshman Composition	6
MAT	115	College Algebra and Trigonometry	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 n 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, quant'ty and cost of national food supplies on technology, marketing and wor d agricultural policies.

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

150 Animal Science. (3) F, S
Comparative growth, deve opment 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 veter nary medicine.

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

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

305 Nutritional Science. (3) F, S
Energy and nutrients in iving systems. Corequisite. CHM 101 or equivalent

306 Nutritional Science Laboratory. (1) F,S
Exper mental trials involving the pr nc ples of nutrition and the phys o og cal ro es of nutr ents in metabol sm. Corequisite· AGB 305. Three hours aboratory

310 Crop Management. (3) F, S
Crop production and management principles and their appl cation to crop growth and development. Prerequi s te: AGB 130.

312 Agricultural Marketing. (3) F S
Marketing arrangements for agr cultural products.

313 Intermediate Agricultural Marketing Analysis. (3) F
Theory and analysis of marketing in agribusiness. Prerequ's te. AGB 312

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

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

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

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

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

353 Applied Animal Nutrition. (3) S
Feedstuffs, feeding standards and their appl cation n meeting nutrit onal 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.

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

365 Food Technology Laboratory. (1) F, S
Experiments and procedures in process ng and packag ng foods Corequisite. AGB 364 Three hours laboratory

366 Meats. (3) S
Meat purchasing, retail cut identification, meat prepara t on and preservation for the customer. Prerequ site: AGB 150 or FON 142.

367 Meat Science. (3) F
Basic science of muscle and meat in anima production processing and uti ization. Prerequisite. AGB 150 or FON 142.

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

369 Food Quality Instrumentation. (3) S
Processing control and scientific instrumentat on used in food quality assurance laboratories. Two lectures, 3 hours laboratory. Prerequ sites. AGB 368; CHM 115.

370 Companion Animals to Man. (3) S
Select on, breed ng, health and care of pets. ncludes 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. Prerequ s te. CHM 101 or BIO 100.

372 Light Horse Management. (2) F, S
Breeds, care, selection and hand ing 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 implementat on of government regulations that affect the management of agribusiness Prerequ site· junior stand ng.

390 Agricultural Accounting. (3) F
Basic accounting applications commonly used by agricultural ndustr es, includ ng tax and management in format on systems

402 Agricultural Cooperatives. (3) F, Metcalf
Organ zat on, operat on and management of agricultural cooperatives.

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

404 Sales and Merchandising in Agribusiness. (3) F Woolverton
The principles and techniques of selling and commodity merchandising in the agricultural industries Two lectures, 3 hours laboratory.

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

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

413 Commodity Trading II. 3) S, Chalquest
Trading on futures markets Emphasis on the hedging practices with financial and currency instruments Prerequisite. AGB 312

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

425 Food Safety. (3) S; Staff
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. AGB 364, CHM 231 Three lectures 3 hours laboratory

428 Comparative Nutrition. (3) F; Moody
Effects of nutrition on animal systems and metabolic functions. Prerequisites· AGB 305 CHM 231.

430 Range Livestock Management. (3) F· Staff
Operation and management of beef cattle and sheep emphasizing range conditions Prerequisite· AGB 300

431 Intensified Livestock Management. (4) S; Moody
Management techniques in arid high density animal units Prerequisites. AGB 150 or 300 AGB 305 or 353. Three lectures, 3 hours aboratory.

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; Chaquest
Control and prevention of infectious and noninfectious diseases of domestic animals. Prerequisite. M C 201 or 210

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; Weems
Control and function of the nervous, muscular cardiovascular, respiratory, and renal systems of domestic animals Prerequisites CHM 113· B O 101 Three ectures, 3 hours aboratory.

436 Animal Physiology II. (3) N Weems
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 Weems
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.

439 Veterinary Practices. (3) F, S; Chalquest
Observation of and participation in veterinary medicine and surgery supervised by local veterinarians Open to advanced pre-veterinary students only Prerequisite· Concurrent or previous credit for AGB 433

440 Food Marketing. (3) S; Edwards
Food processing packaging, distribution, market research, new food R&D and social implications Prerequisite. AGB 364.

441 Meat Technology. (3) S, Seperich
Processing and utilization of meat products. Prerequisite· AGB 367. Two ectures, 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
dent fees the size scope and organization of the various agricultural or ented industries

445 Advanced Crop Management. (3) F, S; Richardson
Latest techniques in producing and harvesting major irrigated field crops Includes crop planning. Prerequisite. AGB 310 Two ectures, 3 hours laboratory.

450 International Agricultural Development. (3) F; Staff
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, Staff
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; Staff
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, Staff
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; Metcalf
Dimensions, location, mix, methods and changes of international trade in agricultural products Prerequisite: AGB 312

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

458 International Agribusiness. (3) N; Metcalf
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 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.

505 Commodity Analysis. (3) S
Analysis of commodity markets. Prerequisite: one year of economics or marketing.

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

509 Advanced Agribusiness Marketing Channels. (3) S
Analysis of agribusiness market channel systems. Formulation of marketing strategies.

510 Advanced Agribusiness Management I. (3) S
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
Analysis of organization behavior, change and resource requirements within agribusiness systems. Prerequisite: AGB 442.

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

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

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

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

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

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

527 Agribusiness Research Methods. (3) S
The use of model building, hypothesis testing and empirical analysis in solving agribusiness problems.

530 Advanced Agribusiness Policy. (3) S
Policymaking history, structure and process. Prerequisite: AGB 508.

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

536 Advanced Food Quality Instrumentation. (3) S
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 33-34.)

ENVIRONMENTAL RESOURCES IN AGRICULTURE

ERA 301 Arboriculture. (3) S
The establishment, care and maintenance of ornamental trees and shrubs. Prerequisite: AGB 130.

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 115 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 Watershed Management. (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.

367 Range Resource Policy. (2) N
Range management policy as influenced by social, political, economic and ethical factors. Introduction to organizations and agencies concerned with range resources. Prerequisite: ERA 346.

370 Forest Silvics and Management. (3) S '84
Silvicultural principles underlying the practice of forestry. Growth of trees and stands, forest site evaluation, manipulation of stands to direct succession and forest measurements. Prerequisites: ERA 346, 350; BIO 320. Two lectures, 3 hours laboratory.

375 Soil Fertility. (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 Plant Propagation. (3) S
Principles and skills in propagating landscape trees and

shrubs by seminal and vegetative means, including fruit plants. Prerequisites: AGB 130; BIO 102. Two lectures, 3 hours laboratory.

382 Lawns and Greens. (3) S
Selection, establishment and maintenance of turf grasses for lawn, park and sports areas. Prerequisite: AGB 130. 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 Nursery Management. (3) F; Backhaus
Production of trees and shrubs for wholesale and retail marketing. Prerequisites: ERA 380, 381. Two lectures, 3 hours laboratory.

440 Crop Growth and Development. (3) F; Backhaus
Environmental factors affecting the adaptation, distribution, growth and development of crops. Prerequisites: BIO 102; CHM 231; ERA 381.

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.

450 Horticultural Plant Problems. (3) S; Stutz
Identification and control of biotic and abiotic factors which cause common problems to horticultural plants. Prerequisites: ENT 300 and a plant pathology course.

452 Soil, Water and 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. Prerequisites: AGB 130; ERA 325. Two lectures, 3 hours laboratory.

470 Land Reclamation. (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
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
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
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
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
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.

581 Plant Tissue and Cell Culture. (3) F
Asceptic, clonal propagation of plants via isolated cells, tissues and organs. Prerequisite: BOT 360; ERA 381 or 440. Two lectures, 3 hours laboratory.

Special Courses: ERA 484, 494, 498, 499, 500, 580, 584, 590, 591, 592, 593, 594, 598, 599. (See pages 33-34.)

Department of Computer Science

PROFESSORS:
LEWIS (ASB 212), FINDLER, GIBBS, WOODFILL
ASSOCIATE PROFESSORS:
HUEY, MILLER, OZKARAHAN, PHEANIS
ASSISTANT PROFESSORS:
COLLOFELLO, HANSCHE, OLSEN, WOODFIELD
INSTRUCTOR:
WALKER

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 71 for the Liberal Arts B.S. requirements).

General Information

Admission. See pages 18-22 and 36 for information regarding requirements for admission, transfer, retention, disqualification, and reinstatement.

In addition, 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 STP 326 Intermediate Statistics (3)) 2

Mathematics content electives approved by advisor.... 5

Technical Elect ves 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 6 10

Social and Behavioral Sciences..... 10-6

Engl sh Proficiency[2] 6

ENG 101, 102 Freshman Composition (or ENG 105 Advanced Freshman Composition (3)) 6

Technical Writing 3

ECE 400 Engineering Communication (or ENG 301 Writing for the Profess onals) ..

Unrestricted Electives. 12

Total Degree Requirements. 128

[1] *See page 210 for the specific requirements and the approved list.*

[2] See page 209 for English exemption

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	Freshman Composition	3
MAT	270	Calculus w Analy. Geom. I.	4
General Studies E ective..... 3			
Unrestricted Elective			3
			16

Second Semester

CSC	101	Intro to C.S. II	3
ENG	102	Freshman Composition	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

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			
Unrestr cted Elective			3
			16

Bachelor of Science in Engineering

The Department of Computer Science administers the B.S.E. 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	Microcomputer Systems Design I	4
CSC	423	Microcomputer Systems Design II	3
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.

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. 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) F, S
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. (Also listed as ECE 122.)

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. Non majors only. 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 (Equivalent to 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. Non majors only. Prerequisite. CSC 182 or 183

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

410 Introduction to File and Database Structures. (3) S, Gibbs, 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) S, Ozkarahan
Introduction to various database implementation languages, emphasizing a comparison of Codasyl and relational database concepts. Prerequisite: CSC 410.

420 Computer Architecture I. (3) F S Huey, M ller
Dig tal computer integrat on des gn of instruct on codes contro microprogramming nput and output, memory structures, concurrent y process ng hardware, software cons derat ons Prerequis te CSC 320

421 Microcomputer Fundamentals. 4) F, S; Pheanis Woodfi
Hardware, software and assembly- anguage program- m ng of a m crocomputer system are used as vehicles to teach fundamenta s of d g ta system des gn Lecture and laboratory Prerequis tes. CSC 200, 320.

422 Microcomputer Systems Design I. 4) F, S· Pheanis Woodfi l
Continuation of hardware portion of CSC 421 Des gn of microcomputer systems us ng contemporary log c and microcomputer system components Requ res assemb y language programm ng. Prerequis te CSC 421

423 Microcomputer Systems Design II. (3) S Pheanis Woodfi
nformat on and techn ques presented n CSC 421 422 are used to develop the hardware des gn of a mu t - processor, mu t programming m croprocessor based system. Prerequisite CSC 422

430 Elementary Concepts of Operating Systems. (3) F, S, Col ofe lo, Mil er
Des gn and mp ementation of superv sory system com ponents Input output methods, process management, mult programm ng and multiprocessing systems, stor age management f le systems Prerequis tes. CSC 210, 420.

438 Systems Programming. (3) A, Pheanis
Design and mplementation of systems programs. text editors, f le ut l ties, mon tors assemb ers re ocat ng l nking loaders, O hand ers, schedu ers etc. Prerequ s te approva of nstructor

440 Compiler Construction I. (3) F, Hansche, Olsen
Introduction to programming language implementation Implementation strateg es· comp at on, interpretat on, trans at on. Major comp lation phases exical analysis, semantic analysis optim zat on, code generat on Pre requis te· CSC 340.

450 Analysis of Algorithms. (3) F, Gibbs
Des gn and ana ys s of computer a gor thms us ng an a ytical and emp r cal methods, comp ex ty measures, des gn methodo og es, survey of mportant a gorithms Prerequis te. CSC 210

457 Theory of Formal Languages. 3) A; Gibbs Hansche
Theory of grammar, methods of syntact c analysis and spec f cat on, types of art f c a languages re at onship between formal anguages and automata Prerequis te· MAT 243 Equiva ent to MAT 401).

460 Software Project Management and Development I. (3) F, Col ofel o, Woodfie d
Software fe cycle ana ys s programming teams, proj- ect documentat on and m estones, requ rements and specif cat ons des gn testing and maintenance tools and techn ques Prerequ site· sen or stand ng

470 Computer Graphics. (3) S O sen
Disp ay dev ces, data structures transformat ons, n teract ve graph cs three-d mensional graphics, h dden line prob em Prerequ s tes. CSC 210, MAT 242

473 Functional Language Applications. 3) A Hansche, O sen
Structured operators app ied to structured operands in mplementation languages for sc entific and business applications Prerequis tes: MAT 243 CSC 210

474 Modeling for Computer Simulation. (3) A, Lew s
Mathemat cal descript on of general dynamic systems (discrete event, discrete time, and continuous) n forms su table for computer implementation. Prerequ sites. CSC 355, MAT 242, 274.

475 Simulation Theory and Languages. (3) A, Lewis
Stat st ca background for s mulation. Mode construc tion and val dation analysis of results Languages which support s mulat on. Prerequis tes. CSC 474, ECE 383 or STP 326.

483 Fortran Programming for Graduate Research. (3) F, S, Lewis
Introductory course for graduate research computing. Subrout nes, program ibrar es, mathematical and sta t stica app ication ons, batch and time shar ng environ- ments, data f es, p otting. Two lectures 2 hours labo- ratory Non majors only.

512 Database Systems Design. (3) F
In depth study of the theory of database systems. Pre- requis te· CSC 410.

515 Information Storage and Retrieval. (3) N
Concepts of nformation storage and retrieval· theory, app cations, and case stud es. Prerequisite· CSC 410

520 Computer Architecture II. (3) A
Theoretical structure of computers and computations, SIMD and M MD systems, performance tradeoffs, mem- ory hierarchies, interconnection networks Prerequ s te· CSC 420.

521 Microprocessor Applications. (4) S
M croprocessor technology and ts app cation to the des gn of pract ca digital systems Hardware assembly- anguage programming, and nterfacing of microprocessor based systems. Lecture and aboratory. Prerequis te· CSC 421.

522 Microprogramming. (3) A
Theory practice, and appl cation of m croprogramming. Prerequis te. CSC 420 or 421.

523 Microcomputer Systems Software. (3) F
Deve op ng system software for a mu ti-processor, mult -programming microprocessor-based system us ng information and techn ques presented in CSC 421, 422. Prerequ site· CSC 422

525 Digital Testing and Reliability. (3) A
Fault mode ng, test generation and s mulat on for com- b national and sequentia circu ts, memory testing, se f- check ng log c, fault to erant log c re abi ty analysis. Prerequ s te. CSC 320. (Equ valent to EEE 515).

530 Operating Systems Theory. (3) F
Formal methods for contro of concurrent processes, process schedu ng, memory and aux liary storage man agement Network operating systems Operating system des gn Prerequ s te. CSC 430.

532 Security in Computing Systems. (3) A
In-depth development of the concepts of computer se- cur ty, impact on computer hardware and software, and on user Prerequis te CSC 430

535 Performance Evaluation. (3) S
Top cs n computer system measurement and eva ua- t on hardware software monitors, workload character zat on program behav or adaptive schedu ing, simu a t on mode s, measurement nterpretat on. Prerequisite. CSC 430

540 Compiler Construction II. (3) S
Forma pars ng strategies optimization techniques, code generat on extens bil ty and transportab lity con s derat ons recent deve opments Prerequis te· CSC 440.

542 Translator Writing Systems. (3) N
Comp ler writ ng tools definition of syntax and seman t cs, compiler construct on using translator writing sys tems. Prerequ site CSC 440

545 Programming Language Design. (3) N
Language constructs, extensibility and abstractions, runtime support. Language design process. Prerequisite: CSC 440.

550 Combinatorial Algorithms and Intractability. (3) N
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
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
Lattices, boolean algebras, post algebras, boolean differential calculus, multivalued logic, fuzzy logic, finite state machines. Prerequisite: EEE 427 or CSC 355.

555 Automata Theory. (3) N
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
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
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) S
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
Pattern classification by distance functions and likelihood functions, deterministic and statistical approaches to trainable pattern classifiers, syntactic pattern recognition. Prerequisite: STP 326 or ECE 383. (Equivalent to EEE 553).

Special Courses: CSC 294, 484, 492, 493, 494, 498, 499, 590, 591, 592, 598, 599, 790, 791, 792-799. (See pages 33-34.)

Division of Construction

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

PROFESSORS:
HASTINGS (COB 268), MICHELS, PETERMAN

ASSOCIATE PROFESSORS:
BURTON, CARR, SELLECK, WARD

ASSISTANT PROFESSORS:
WILSON

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 breadth of view necessary for a constructor as well as significant 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. See pages 18-22 and 36 for information regarding requirements for admission, transfer, retention, disqualification, and reinstatement.

In addition, the Division of Construction requires secondary school units totalling 3½ units in mathematics, including advanced algebra, geometry and trigonometry. Students having 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. These may include MAT 115 College Algebra and Trigonometry, MAT 117 College Algebra, MAT 118 Plane Trigonometry and PHY 101 Introduction to Physics.

The freshman and sophomore programs of study are designed to facilitate transfer for junior and community college students or Associate Degree graduates. Vocational and craft oriented courses taught at community colleges will not be accepted for credit towards a bachelor's degree.

Students shall complete the following basic requirements prior to registering for advanced courses:

(1) All first semester first year courses and the University English requirement (see page 28) must be completed by the time the student has accumulated 48 semester hours of program requirements

(2) All second semester, first-year courses must be completed by the time the student has completed 64 semester hours of program requirements. Transfer students will be given a one semester waiver.

Any student not making satisfactory progress will be permitted to register for only those courses required to correct any deficiencies.

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

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

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.

Bachelor of Science Degree in Construction

Students seeking a Bachelor of Science degree in construction must satisfactorily complete a curriculum of not less than 132 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 heavy 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 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 industry 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 will be made up in the selected fields of specialization to achieve a minimum of 132 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	Principles of Economics	3
ECN 202	Principles of Economics	3
	Elective	3

*See pages 209 210 for specific requirements and approved list.

Science and Mathematics (22 Sem. Hrs.)

PHY	111/ 113	General Physics (Mechanics and Heat)	4
PHY	112/ 114	General Physics (Electricity, Light, Magnetism)	4
MAT	226	Elements of Statistics	3
MAT	270	Cal. with Analytic Geom. I	4
CSC	181	Programming in Basic (3) Science/Lab Elective	4
or			
CIS	201	Business Programming	3

English Requirement (6 Sem. Hrs.)

ENG	101 /102	Freshman Composition	6
or			
ENG	105	Advanced Freshman Composition	3

(Must pass exemption examination - see placement examinations for proficiency, page 28.)

Construction Core Requirements (70 Sem. Hrs.)

ACC	211	Elementary Accounting	3
ECE	104	Engineering Graphics	2
CON	221	Statics Mechanics	3
ADS	233	Business Communication	3
ADS	305	Business Law	3
CON	243	Construction Materials and Specifications	2
CON	244	Construction Graphics	2
CON	252	Construction Equipment	2
EEE	273	Electrical Construction	4
CEE	310	Construction Materials Testing	3
CEE	341	Surveying	3
CEE	380	Hydraulics and Hydrology	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

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 132 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 specific lower division requirements are shown below:

First Semester

			Semester Hours
ENG	101	Freshman Composition	3
PHY	111	/113 Gen. Physics	4
MAT	270	Calculus	4
ECE	104	Engrg. Graphics	2
Humanities Elective			3
			16

Second Semester

ENG	102	Freshman Composition	3
DES	100	Intro to Arch. I	2
PHY	112	/114 Gen. Physics	4
ACC	211	Elem. Accounting	3
Science Elective			4
		Total	16

Third Semester

ECN	201	Principles Economics	3
CSC	181	or CIS 201 Programming	3
CON	221	Statics	3
ADS	233	Business Communication	3
CON	243	Intro. Const. Mat.	2
CON	244	Constr. Graphics	2
		Total	16

Fourth Semester

ECN	202	Principles Economics	3
MAT	226	Elements of Statistics	3
CON	323	Strength of Materials	3
CEE	341	Surveying	3
CON	252	Constr. Equipment	2
		SS Elective	3
		Total	17

One of the following three areas of emphasis is to be selected by each student.

General Building Construction. The general building emphasis provides a foundation for students who wish to follow careers as managers or owners of firms engaged in the construction of residential, commercial and institu-

tional structures. While conventional building is still a major factor in this field, modern educational focus is on building systems 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
REA	411	Real Estate Law	3
CON	472	Land Development Feasibility	2
Approved technical electives			6

Heavy Construction. The heavy construction emphasis prepares students for careers with constructors. Typical projects in which they are involved 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.)

ADS	306	Business Law II	3
CEE	344	Route Surveying	3
CON	486	Heavy Construction Estimating	3
CON	482	Cost Engineering	2
Approved technical electives			6

Specialty Construction. Specialty construction includes areas such as mechanical, electrical, air conditioning, roofing, concrete, commercial and industrial refrigeration and fire protection systems. This area of emphasis 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 technical electives			9

CONSTRUCTION

CON 221 Static Mechanics. (3) F, S
Force systems acting on structures. Forces, moments, equilibrium, centroids, trusses, beams, cables, frames, machines, friction, section properties, masses. Both US and SI units of measurement. Field trips. 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. Computer graphic applications for construction. Field trips. Lecture and two 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. Prerequisite: Sophomore standing.

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.

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. Prerequisite: Sophomore standing.

345 Mechanical Systems. (3) F, S
Heating and cooling systems for buildings. Sanitary and water piping layout and simple design. Computer-aided calculations. Field trips. Four hours lecture and laboratory. Prerequisites: CON 243, CSC 181 or equivalent; PHY 111, 113.

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, 244, 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: CSC 181 or equivalent; CON 243, 244; 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: CSC 181 or equivalent, ACC 211, 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 and management history, union and open shop organization of building and construction workers; applicable laws and government regulations; goals, economic power, jurisdictional disputes, and 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. Prerequisites: ADS 233; CON 389.

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. Three lectures, 1 recitation. 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. Computer applications. Prerequisites: CSC 181, 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.

496 Construction Contract Administration. (3) F, S
Case studies. Effects of organization on construction contract operations. Essentials of construction law. Prime contracts, sub-contracts, joint venture and consortium agreements, and change orders. Documentation. Claims, arbitration, and litigation. Quality control requirements. Bonding, insurance, indemnification procedures. Ethical practice, licensing, codes, etc. Field trips. Prerequisites: Senior standing; ADS 233, ENG 301, or CON 374.

531 Economics of the Construction Industries. (3) F
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
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. Prerequisites: CON 389, CON 395 or approval of instructor.

577 Construction Systems Engineering. (3) F
Systems theory as applied to the construction process. Alternates for structuring information flows and the control of projects. Prerequisite: IEE 476 or equivalent.

Special Courses. 294, 484, 494, 498, 499. (See pages 33-34.)

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 industrial 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

See pages 18-22 and 36 for information regarding requirements for admission, transfer, retention, disqualification, and reinstatement.

In addition, beginning college 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. Calculus and biology are 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 111, 113 College Physisics (or PHY 101 Introduction to Physics), ENG 101 Freshman Composition*, CHM 113 General Chemistry—are taken to satisfy omissions or deficiencies.

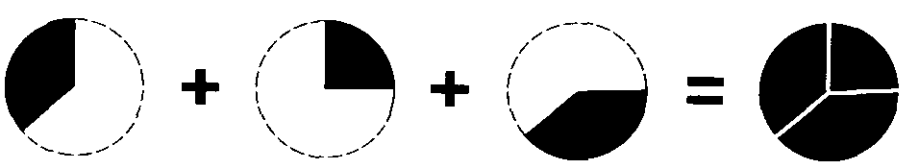
Requirements for Graduation. In order to qualify for graduation from the School of Engineering a student must have a grade point average of at least 2.00 for the 51 semester hours of required courses in the major field.

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 major. 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 36-37). 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 major. These courses comprise approximately 25% of the degree program.

The majors 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, bioengineering, 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.



*See statement on Placement Examinations for Proficiency—English, page 28.

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

The areas offered under the Engineering Special and Interdisciplinary 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 major to support an area of emphasis. Major 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 major, with a considerable part of the time being spent with the major. This arrangement can be illustrated by the chart below.

The sequential arrangement of all course work for the B.S. and B.S.E. degrees into the three categories shown on page 228 is especially helpful to the beginning student. 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

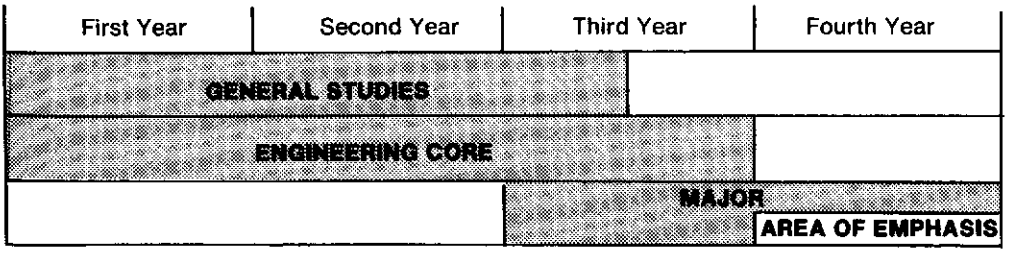
			Semester Hours
Fall Semester			
CHM	114[1]	or CHM 116 General Chemistry	4
MAT	290[2]	Calculus I	5
ECE	102	Introduction to Engineering	2
ECE	104	Engineering Graphics and Design	2
Social Sciences (or ENG 101)			3
Total			16
Spring Semester			
ECE	122	Computer Programming	2
		or CSC 182 Elementary Computer Programming (2)	
MAT	291[3]	Calculus II	5
PHY	115[4]	University Physics	4
PHY	117	Univ. Physics Lab	1
Humanities or Fine Arts			2
ENG	102[5]	or ENG 105 English	3
Total			17

[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 elect to take MAT 270 must also complete MAT 271 and 272.
[4] Students who have not completed one unit of physics in high school should complete PHY 111 and 113 (or PHY 101) in the preceding semester.
[5] Students not eligible for ENG 105 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 majors—chemical, civil, computer systems, electrical, industrial, and mechanical engineering—are accredited by the Engineering Accreditation



Commission of the Accreditation Board for Engineering and Technology (ABET). The engineering special and interdisciplinary studies (including aerospace engineering, manufacturing engineering and materials science) are accredited by ABET under the designations Engineering and Engineering Science, respectively. Master of Science 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 28).

(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 (see pages 36-37 for approved list).

(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) *Major studies* that provide a depth of understanding for a more definitive body of knowledge appropriate to a particular aspect of social 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 28)
General Studies			
Humanities and Fine Arts Courses			6 to 10*
Behavioral and Social Sciences Courses			7 to 3*
ECN	201	Principles of Economics	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
MAT	274	Elementary Differential Equations	3
		(or ECE 380 Ordinary Differential Equations)	
Approved Mathematics Content Electives			4
		Total General Studies	47

* See page 2-0 for the specific requirements and the approved list.

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.

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 major(s). The courses required are listed below:

			Semester Hours
Engineering Core			
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 Materials	3
		or ECE 351 Engineering Materials or ECE 352 Semiconductors and Devices or CHM 442 General Physical Chemistry	
ECE	400	Engineering Communications	3
		Total Engineering Core	32

Major

Majors and areas of emphasis are offered by the six engineering departments: Chemical and Bio Engineering, Civil Engineering, Electrical and Computer Engineering, Industrial and Management Systems Engineering, Mechanical and Aerospace Engineering, and Special and Interdisciplinary Engineering. About one-fourth of the major 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 majors offered are described on the following pages.

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

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

Department of Chemical and Bio Engineering

PROFESSORS:
ZWIEBEL (COB B-210L), BERMAN, DORSON, GUILBEAU, KUESTER, SATER, TREBILCOCK

ASSOCIATE PROFESSORS:
BECKMAN, BELLAMY, TORREST, TOWE

ASSISTANT PROFESSORS:
CALE, NELSON

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[1] 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 20
CHE 311, CHE 312, CHE 331, CHE 332,
CHE 333, CHE 342, CHE 352

[1] See page 210 for approval of humanities and social sciences.

Chemical Engineering Design 14
CHE 432, CHE 442, CHE 451, CHE 461, CHE 462

Technical Electives 6
A selection from among CHE under graduate courses 4 1, 412, 413, 473, 487 or CHE graduate courses, or appro priate technical courses in other depart ments with adv sor's approval. One elec tive course must have chemical content and must be selected from among CHM 361, CHE 473, or any three credit hour 400 level CHM course.

Total for cred t requirement for BSE 131

To fulfill accreditation requirements and to adequately prepare for the advanced chemistry courses, chemical engineering majors are re quired to take the CHM 113 and CHM 116 ntroductory chemistry sequence (CHM 117 and CHM 119 are acceptable substitutes). Other freshman chemistry courses are *not ac ceptable,* and transfer students who have taken another chemistry course may be required to enro in CHM 113 and/or CHM 116.

The Chemical and Bio Engineering Department also offers graduate programs lead ng to the M.S.E., M.S and Ph.D. degrees These programs provide a blend of classroom instruc tion 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

Most students interested in pursuing a career in chemical engineering will follow the typical sequence of courses outlined below. However, those students who wish to specialize may select to follow one of the following areas of emphasis through the elective courses. Also, substitutions may be made from selected required courses by petitioning the department faculty. For those students who wish to emphasize biomedical or premedical studies the preferred and already approved substitutions are given below. In order to establish an area of emphasis the student must declare his her intention in writing at least one year prior to graduation

The following are possible areas of emphasis with a suggested list of elective courses.

Biomedical Students who wish an emphas s in biomedical engineering should make the fol lowing substitutions in the undergraduate Chemical Engineering curriculum. CHE 411 for CHE 461; CHE 412 or AGB 435 for CHE 462

Additionally, students pursuing this area of emphasis will take CHM 361 or AGB 435 as a technical elective in the first semester, fourth year, and CHE 413 as a technical elective in the second semester, fourth year.

Premedical Students who wish to satisfy requirements for medical school should make the following substitutions in the undergradu ate Chemical Engineering curriculum: CHE 411 for CHE 461; CHE 412 or AGB 435 for CHE 462

Additionally, students pursuing this area of emphasis will take either CHM 361, AGB 435, or an upper level biology course as a technical elective in the first semester, fourth year, and CHE 413 as a technical elective in the first semester, fourth year. The student is also required to take BIO 101 and 102 to meet medical school admission requirements; however, these courses will not be counted towards the engineering bachelor's degree.

Energy Conversion and Conservation. CHE 553, 554, 556; MEE 583, 456, 458, 487.

Environmental Control. CHE 553, 554, 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

			Semester Hours
First Semester			
CHM	113	General Chemistry	4
MAT	290	Calculus I	5
ENG	101	Freshman Composition	3
ECE	102	Intro. to Eng neering..	2
ECE	104	Engrg. Graphics Design	2
CHE	496	Profess onal Seminar..	0
			16
Second Semester			
CHM	116	General Chemistry..	4
MAT	291	Calculus II..	5
ENG	102	Freshman Composition	3
PHY	115	Univers ty Phys cs	4
PHY	117	Univ Phys'cs 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
CHE	331	Transport Phenomena	3
CHM	332	Gen Organic Chemistry	3
CHM	335	Gen Org. Chem. Lab	1
ECE	210	Engrg. Mech. I Statics	3
		General Studies	4
CHE	496	Prof. Seminar	0
			17

Third Year

First Semester

CHE	332	Chem. Eng. Operations	3
CHE	342	Appl'ed ChE Thermo	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	3
CHE	496	Prof. Seminar	0
			18

Second Semester

CHE	333	Appl of Transport Phen.	3
CHE	352	Transport Laboratory	2
CHM	442	Physical Chemistry	3
ECE	304	Elec. Networks	4
ECE	313	Intro Deformable Sol.	3
		General Studies	3
CHE	496	Prof Seminar	0
			18

Fourth Year

First Semester

CHE	432	Princ. of ChE Design	3
CHE	442	Chemical Reactor Design	3
CHE	461	Process Control.	3
CHE	451	ChE Laboratory	2
		Tech. Elective	3
		General Studies	3
CHE	496	Prof. Seminar	0
			17

Second Semester

CHE	462	Process Design	3
ECE	334	Elec. Dev ces Instru.	4
ECE	400	Engrg. Communications	3
		Tech Elective	3
		General Studies	3
CHE	496	Prof Seminar	0
			16

Graduation Req irements 13 semester h urs pl s English pr ficienc

Department of Civil Engineering

PROFESSORS:
O'BANNON (EC G-120D), BETZ, BLACKBURN, KLOCK, LUNDGREN, MATTHIAS, PIAN, RUFF, TUMA

ASSOCIATE PROFESSORS:
BORGO DUFFY, HIGGINS, PAVLOVICH, SINGHAL

ASSISTANT PROFESSORS:
HINKS, UPCHURCH

PROFESSOR EMERITUS:
W LSON

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 projects include buildings, bridges, highways, airports, dams, canals, irrigation projects, wa ter 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, en gineering sciences, and design specified in the engineering core are satisfied within the civil engineering core.

			Seme ter H urs
CEE	321	Structural Analysis	3
CEE	322	Stee 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 CE Practice	2
MAE	371	Fluid Mechanics	3
IEE	300	Economic Analysis for Engineers	2

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 550 (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.

Entering freshmen must have completed one year of high school chemistry and one year of high school physics with grades of B or better in each subject. Students who do not meet these requirements will take CHM 113 (4) CHM 116 (4) sequence in lieu of CHM 114 (4) and PHY111/113 (3 1) as a prerequisite to PHY 115 117.

A student must have earned a cumulative GPA of 2.50 or better to be eligible to take a 500-level course for credit toward the BSE degree.

Bachelor's Degree Program. Requirements for the bachelor's degree include the completion of the Civil Engineering Core courses and 15 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 by students whose cumulative GPA is 2.50 or better.

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 Technical Electives (minimum 9 hrs. required). A maximum 6 hrs. may be selected outside Civil Engineering. Only one Construction course may be used for technical elective credit.

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, 579, 581, 582, 583.

Construction Engineering: CEE 344, 573, CON 383, 395, 496. Only one course may be selected from CON 383, 395, 496.

Civil Engineering Program of Study
Typical Four-Year Sequence

Freshman Year

			Semester Hours
First Semester			
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]	Freshman Composition	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]	Freshman Composition	3
			18

Junior Year

First Semester

ECE	334	Electr. Device/Instru.	4
		Math Elective[3]	2
MAE	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]	3
CEE	362[5]	Environmental Engrg.	3
CEE	323[5]	Concrete Structures	3
IEE	300	Econ. Anal. Engrs.	2
		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 means for qualified students to complete the 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 140. To complete this pre-architectural sequence in two years, students should have done well in algebra, trigonometry and physics in high school. Completion of a pre-calculus math course and chemistry are desirable.

Joint Bachelor of Architecture/Master of Science in Engineering Degree Program

Students who complete the pre-architecture sequence in civil engineering may satisfy prerequisites for an M.S.E. degree (option 1 or 2), 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 earn the M.S.E. degree with 36 additional hours of approved course work if their academic qualifications satisfy graduate college requirements.

[1] With sufficient ACT or SAT scores, ENG 105 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). See page 210 for approved list.

[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 not restricted to, any of the courses listed for the areas of emphasis.

Department of Electrical and Computer Engineering

PROFESSORS:
(EC A-209), P.M ANDERSON, BACKUS, BLACKLEDGE, CADZOW, DeMASSA, HADEN, W. T. H GG NS, I. KAUFMAN, KELLY, PALAIS, PATTERSON, P.E. RUSSELL, SCHRODER, S RKIS, T.B. THOMPSON, TICE, WANG, WELCH

ASSOCIATE PROFESSORS:
AKERS, BOSE, DAVIS, GREENEICH, McKLVEEN, O'GRADY, PAI, ROBBINS, ROEDEL, SHEN, STE NMANN ZIMMER

ASSISTANT PROFESSORS:
TYLAVSKY, WHITE

The professional activities of electrical en g'neers directly affect the lives of most of the world's population every day. They are respon sible for the design and development of radio and television transmitters and receivers, telephone networks and switching systems, and electric power generation and d'stribution. Less well known, but perhaps equally im portant in terms of their impact on society, are the design and application of digital computers. Within the broad scope of these systems, the electrical engineer is concerned with a challenging and diverse array of design and development problems.

Electrical engineers design miniscule semi conductor integrated circuits which contain many thousands of elementary devices They design systems for automatically controlling mechanical devices and a variety of processes. They are responsible for the design of satellite communication links as well as patient moni toring systems for hospitals. The development of the microprocessor has expanded the op portunit es for electrical engineers to improve the design of familiar products since these devices are now incorporated in automobi es, consumer and office products, enterta nment systems, and a vast variety of test and measurement instruments and machine tools.

A student can earn a B.S.E. degree in elec trica engineering by choosing one of two options. the regular electrical engineer'ng option or the computer engineering option. Many stu dents of electrical engineering will be involved in a variety of electrical and electronic problems in the course of their careers. For these students, the regular electrical engineering option which includes a broad background in the diverse aspects of electrical engineering, is the appropriate choice to meet career objectives. On the other hand, recent advances in solid state electronics and digital systems have produced a need for electrical engineers who are specialists in digital computer systems. The computer engineering option is intended for those students who are planning to pursue a career in the computer industry. The curricu lum of each option is structured so that courses required in one may be chosen as tech nical electives in the other.

Academic Requirements

The curriculum in electrical and computer engineering builds upon the base provided by the engineering core. Beyond the engineering core, the curriculum is divided into three sections: the electrical and computer engineering core courses, the courses required for the option, and the technical elective courses. Approved technical elective courses serve to provide stu dents 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. Successful completion of the curriculum leaves the student prepared to embark on a career in electrical and computer engineering or to pursue advanced 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 those 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 program 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 all 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	Elcmentary D'fferential Equations	3
MAT	242	Elementary Linear Algebra	2
MAT	362	Adv. Math for Eng neers 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 Hour
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	396	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	4

Technical Electives in Electrical and Computer Engineering

The regular program in electrical 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.

Electromagnetic Fields and Waves: EEE 440, 441, 443, 445, 448.

Solid State Electronics: EEE 434, 435, 436, 437, 438.

Networks and Electronic Circuits: EEE 402, 405, 406, 425, 432, 433.

Computer Engineering: EEE 411, 422, 423, 424, 427.

Communication and Control: EEE 451, 455, 459, 480, 482.

Power Systems: EEE 360, 460, 461, 462, 463, 464, 470, 471, 473, 474

With the approval of their faculty advisor, qualified students may choose technical electives from other courses in engineering, mathematics, and the sciences at or above the 300-level including graduate courses. In addition up to six credit hours of technical electives may be chosen from the approved list of courses from the College of Business Administration.

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[1]		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

			Semester Hours
First Semester			
EEE	340	Electromagnetics I	3
ECE	334	Electron c Dev & Inst	4
EEE	301	Networks	3
ECE	340	Thermodynamics	3
EEE	396	Professional Seminar	0
HU SS		Elective	3
			16
Second Semester			
EEE	440	Electromagnetics II	4
EEE	360	Electron echanics	3
EEE	303	Signals & F lters	3
ECE	352	Semiconductors	3
HU SS		E ect ve	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 Elect ves	4
			18
Second Semester			
		Tech E ectives	11
HU SS		Elective	4
ECE	400	Engrg. Commun	3
			18

Computer Option, Electrical Engineering

Junior Year

First Semester			
EEE	422	C mputer Design I	3
ECE	334	Electronic Dev & Inst	4
EEE	301	Networks	3
ECE	340	Thermodynamics	3
EEE	396	Profess onal Seminar	0
HU SS		Elect ve	3
			16
Second Semester			
EEE	423	Computer Design II	4
EEE	340	Electromagnetics I	3
EEE	303	Signals & F lters	3
ECE	352	Semiconductors	3
		Tech. Electives	3
HU SS[1]		Elective	2
			18

Senior Year

First Semester			
EEE	424	Computer Structures	3
EEE	425	Digital Ckts.	4
ECE	313	Deformable Solids	3
		Tech Electives	4
HU SS		Elective	3
			17
Second Semester			
EEE		Tech Electives	12
HU SS		Elective	3
ECE	400	Engrg. Commun	3
			18

[1] See p ge 710 for approved ist of humanities and socia sc ences

Department of Industrial and Management Systems Engineering

PROFESSORS:
SM TH (EC G-120B), BEDWORTH, SHAW, YOUNG

ASSOCIATE PROFESSORS:
ANDERSON, AUTORE, BAILEY, DEAN, KNIGHT, LAWLER, MOOR, POLLOCK, ROE, ROLLIER, STADMILLER

ASSISTANT PROFESSOR:
MACKULAK

PROFESSOR EMERITUS:
HOYT

Industrial engineering provides a multi-disciplinary approach for analyzing, under standing and resolving problems within or ganizations. Emphasis is on objective and an alytical 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 organizations employing industrial engineers in clude hospitals, government at all levels, trans-

portation, 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 curricula is designed to provide students with instruction in the latest technology including CAD, CIM, CAM, robotics, controls, data base, graphics, and microtechnology with particular emphasis on factory automation.

The purpose of the Industrial Engineering major, 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 major:

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	Integrated Production Control	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
MAE	351	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 309, ASE 483, MAE 441, MAE 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

			Semester Hours
First Semester			
ECE	102	Intro. to Engineering	2
ECE	104	Engrg. Graphics Design	2
ENG	101	Freshman Composition	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	Freshman Composition	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 I 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
MAE	351	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	Integrated Production Control	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

Manufacturing Engineering. Manufacturing engineering is concerned with the application of the principles of science to increase productivity in industry. This involves the design of systems that allow for the best utilization of men, machines, material, and money. Modern manufacturing engineering is concerned with the application ot technology including computers, robots, graphics, mathematical and digital models, information and data base systems, microtechnology, and systems theory.

Emphasis is placed on management and economics as well as technology. Graduates of the program will be well qualified to participate in the introduction of CAD/CAM and factory automation technology to industry.

The following courses are required as 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:

IEE	300	Economic Analysis for Engineers	2
IEE	330	Introduction to Data Base Design	2
IEE	374	Quality Control	3
IEE	431	Engineering Administration	3
IEE	463	Computer Aided Processes	3
IEE	464	Computer Integrated Design Applications	3
MAE	317	Dynamic Systems and Control	4
MAE	351	Production Processes	3
MAE	422	Mechanics of Materials	3
MAE	441	Principles of Design I	3
MAE	447	Robotics and Its Influence on Design	3
MAE	452	Manufacturing Engineering	3
MET	403	N/C Computer Programming	3
Technical Electives			12

Graduation Requirements: 130 semester hours minimum (excluding English requirement). Scholastic index of 2.0 or better (C average)

[1] Students with ACT English test score of 25 (SAT 650) or better take ENG 105.

[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 (see page 210) 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 Aerospace Engineering

PROFESSORS:
METZGER (EC G 127B), ALLEN, AVERY, BEAKLEY, BICKFORD, CARPENTER, CHEN, COOPERRIDER, DAVIDSON, DITSWORTH, EVANS, FLORSCHUETZ, JACOBSON, JANKOWSKI, LOGAN, NELSON, RICE, SHAW, STANLEY, L. THOMPSON, WAGNER, WALLACE, WOOD

ASSOCIATE PROFESSORS:
COGHLAN, HENDRICKSON, HIRLEMAN, LIU, RANKIN, ROY, S. RUSSELL, SO, YAO

ASSISTANT PROFESSORS:
HASSAN, KRAUSE, LIMBERT, McNEILL, NEITZEL, RAJAN

The Mechanical and Aerospace Engineering Department is the administrative home for five undergraduate majors:

Aerospace Engineering
Energy Systems Engineering
Engineering Science
Materials Science
Mechanical Engineering

All five majors build on the broad exposure to the engineering, chemical and physical sciences as well as the mathematics embodied in the General Studies and engineering core courses required of all engineering students.

The *Aerospace Engineering* major provides training for the aerospace industries and government agencies. The *Energy Systems Engineering* major provides training for students interested in the energy field and in employment with energy companies (i.e., petroleum companies, solar energy agencies, the nuclear industry, and with utility companies). The *Engineering Science* major is intended for students that prefer more emphasis in the science and analysis side of engineering than is generally available in more traditional engineering programs. The specialized *Materials Science* major is designed for students who want extensive training in processing, use and creation of materials. The *Mechanical Engineering* major is, perhaps, one of the most broadly applicable programs in engineering, providing training for a wide variety of employment opportunities. All of these majors are discussed in more detail below.

The above majors can serve as entry points to immediate professional employment or to graduate study. The emphasis in all 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.

Minimum Scholastic Requirements. All degree programs in the department require that students attain at least a C (2.00) average in the engineering core and major 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.

Engineering Core Options

Among the options listed on page 230 as part of the engineering core requirements, Mechanical and Aerospace engineering students are required to select the following:

			Semester Hours
ECE	340	Thermodynamics	3
ECE	350	Structure and Properties of Materials	3

The first two years are usually totally devoted to the General Studies and engineering core requirements. Thus, all the degree programs in the department share essentially the same course schedule for that period of time. A typical schedule is given below:

Program of Study
Typical First and Second-Year Sequence

Freshman Year

			Semester Hours
First Semester			
MAT	290	Calculus I	5
CHM	114	or CHM 116 General Chemistry	4
ECE	102	Introduction to Engineering	2
ENG	101	Freshman Composition	3
SS or HUM Elective[1]			3
			17
Second Semester			
MAT	291	Calculus II	5
PHY	115	Univ. Physics	4
PHY	117	Univ. Physics Lab	1
ECE	104	Engrg. Graphics Design	2
ECE	122	Computer Programming	2
ENG	102	Freshman Composition	3
			17

Sophomore Year

First Semester

MAT	274	Elem. Diff Equations	3
PHY	116	Univ Physics	4
PHY	118	Univ. Physics Lab	1
ECE	210	Engr. Mech. I Statics	3
MAT	242	or ECE 384 (Check Program)	2
SS or HUM Elective			4
			17

Second Semester

ECE	304	Elec Ntwk Sys. Analogies	4
ECE	312	Engrg Mech. II: Dynamics	3
ECE	313	Intro Deformable Solids	3
ECE	340	Thermodynamics	3
ECE	386	Part. Diff. Equations	2
ECE	350	Stru. Proprts. of Matls	3
			18

See pages 209 210 for spec fic requirements and approved ist of behaviora and social sciences (SS) and humanities and fine arts HUM

Aerospace Engineering

The primary concern of aerospace engineers is the design and development of a wide variety of aircraft and space vehicles. The current challenges to the aerospace engineer include the design of a new generation of high effi ciency transport aircraft, the development of the next generation of space transports and the design of large space systems. In addition to the design of vehicles, the aerospace en gineer is involved in the further development of the many spin offs of the aerospace indus try. These include contributions to communi cations, air and water pollution monitoring, management of the earth's resources, and the understanding and control of weather. Future contributions are anticipated in the area of zero gravity manufacturing of high purity ma terials and medicines, and the design of solar power satellites.

The undergraduate curriculum includes the study of flight mechanics, aerospace struc tures, aerodynamics, and propulsion. These subjects provide the foundation necessary for aerospace design.

Aerospace Engineering Major

In addition to the courses listed above under engineering core options, Aerospace En gineering students are required to fill their four hour General Studies approved mathe matics content electives with:

			Semester Hours
MAT	242	Elementary Linear Algebra	2
ECE	386	Part. Diff. Eqns. Engr	2

The Aerospace Engineering major consists of:

MAE	315	Mechanics Laboratory	2
MAE	317	Dynamic Systems and Control	4
MAE	371	Fluid Mechanics	3
MAE	413	Intermediate Dynamics	3
MAE	415	Vibration Analysis	3
MAE	422	Mechanics of Materials	3
MAE	426	Aerospace Structures	3
MAE	460	Gas Dynamics	3
MAE	461	Aerodynamics	3
MAE	462	Dynamics of Flight	3
MAE	463	Propulsion	3
MAE	464	Aerodynamics Laboratory	2
MAE	468	Aerospace Systems Design	3

Computer Elective Choose one of:

CSC 383 3) or EEE 321 (4) or IEE 463 (3) or MAE 405 (3) ..... 3 or 4

Area of Emphasis (Technical) Elec ..... 10 or 9

Aerospace Engineering Areas of Emphasis

Technical electives may be selected from one or more of the following areas. A student may, with prior approval of the department, select a general area or a set of courses that would support a career objective not covered by the following categories.

Aerodynamics. MAE 372, 382, 402, 471, 474, 475, 488.

Computer Science. CSC 305, 383; EEE 321, 322, 421, 422; MAE 404, 405.

Engineering Mathematics. ASE 486, 582, 586; CSC 383; ECE 383, 384; MAE 527.

Flight and Space Dynamics. MAE 417, 474, 475, 492, 513.

Propulsion. MAE 382, 435, 456.

Stress Analysis. MAE 355, 404, 441, 442, 492, 523, 528, 529, 555; EEE 439.

Structural Dynamics. MAE 410, 492, 511, 515, 528, 502, 555; EEE 439.

Aerospace Engineering
Program of Study
Typical Last Two-Year Sequence

Junior Year

			Semester Hours
First Semester			
MAE	315	Mechanics Laboratory	2
ECE	334	Electr. Device/Instru.	4
MAE	371	Fluid Mechanics	3
MAE	413	Intermediate Mechanics	3
MAE	415	Vibrations	3
MAE	422	Mechanics of Materials	3
			18
Second Semester			
MAE	317	Dynamic Systems and Control	4
MAE	426	Aerospace Structures	3
MAE	460	Gas Dynamics	3
MAE	461	Aerodynamics	3
Computer Elective			3 or 4
			16 or 17

Senior Year

First Semester			
MAE	461	Aerodynamics	3
MAE	463	Propulsion	3
MAE	464	Aerodynamics Laboratory	2
Technical Electives			5
SS or HUM Electives[1] (see page 210)			3
			16
Second Semester			
ECE	400	Engineering Communications	3
MAE	468	Aerospace Systems Design	3
Technical Electives			5 or 4
SS or HUM Electives (see page 210)			6
			17 or 16

Energy Systems Engineering

There is little doubt that the long range future of the United States is contingent upon our ability to deal effectively with our chronic energy problems. 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 energy production, conservation and research. This in turn has stimulated employment of engineers and scientists trained in fields that relate to this problem area.

Of the established fields of engineering, the field of mechanical engineering is the 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.

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 (including solar energy); conventional sources and conversion; electrical power and distribution; environmental; and nuclear power. A general area of emphasis is also available to allow a student to generate a pre-approved sequence of interest.

Energy Systems Engineering Major

In addition to the courses listed above under engineering core options, Energy Systems students are required to fill their four-hour General Studies approved mathematics content electives with:

ECE	384	Numerical Analys. Engr.	2
ECE	386	Part. Diff. Eqns. Engr.	2

The Energy Systems Engineering major consists of:

EEE	360	Electrodynamics	3
IEE	300	Economic Analysis for Engr.	2
PHY	361	Modern Physics	3
MAE	317	Dynamic Systems and Control	4
MAE	371	Fluid Mechanics	3
MAE	372	Fluid Mechanics	4
MAE	382	Thermodynamics	3
MAE	430	Introduction to Nuclear Engr.	3
MAE	433	Nuclear Plant Systems Design	3
		or	
MAE	446	Thermal System Design	(3)
MAE	488	Heat Transfer	3
MAE	489	Statistical Thermo. of Energy Sys.	3
MAE	498	Energy Sources and Systems	3
MAE	491	Experimental Mechanical Engr.	3
MAE	492	Projects	2
		Area of Emphasis (Technical) Electives	9

Energy Systems Engineering Areas of Emphasis

Technical electives may be selected from one or more of the following areas. A student may, with prior approval of the department, select a general area or a set of courses that would support a career objective not covered by the following categories.

Alternative Sources and Conversion. EEE 436, 438, 439; GLG 301; MAE 336, 437, 438.

Conventional Sources and Conversion. ECE 384; EEE 439; MAE 415, 417, 422, 435, 436.

Electrical Power and Distribution. EEE 301, 470, 471, 473, 474; MAE 415, 417, 422, 435, 437, 442.

Environmental. BIO 320, 330; CEE 361, 362, 461; EEE 461; GLG 302; MAE 336, 417.

Nuclear. EEE 439, 461; GLG 321; MAE 415, 417, 422, 431, 433, 435, 437, 442.

Energy Systems Engineering
Program of Study
Typical Last Two-Year Sequence

Junior Year

			Semester Hours
First Semester			
ECE	334	Electr. Device/Instru.	4
MAE	371	Fluid Mechanics	3
MAE	382	Thermodynamics	3
MAE	489	Stat. Thermo. of Energy Systems	3
PHY	361	Modern Physics	3
			16
Second Semester			
EEE	360	Electromechanics	3
MAE	372	Fluid Mechanics	4
MAE	430	Intro. to Nuclear Engrg.	3
MAE	488	Heat Transfer	3
MAE	498	Energy Sources and Systems	3
			16

Senior Year

First Semester			
IEE	300	Econ. Analysis for Engineers	2
MAE	446	or MAE 433	3
MAE	491	Exp. Mechanical Engineering	3
Technical Electives			3
SS or HUM Electives[1]			6
			17
Second Semester			
ECE	400	Engineering Communications	3
MAE	317	Dynamic Systems and Control	4
MAE	492	Projects	2
Technical Electives			6
SS or HUM Electives[1]			3
			18

Engineering Science

The engineering science curriculum is designed for those who wish a more general background in engineering than is typically available in more specialized curricula paths and who wish to gain a depth of understanding in underlying disciplines which are the scientific bases of engineering. The program is developed around fundamental course work in the broad fields of engineering mechanics, materials science, physics and mathematics. A major emphasis is placed on engineering mechanics which includes many important specialized areas such as acoustics and vibrations, elasticity of conventional and composite materials, rotor and gyrodynamics, finite element modeling of complex mechanical systems, and biomechanics of prostheses, just to name a few.

An engineering science graduate has the fundamental education which provides the flexibility and understanding required to cope with rapidly occurring changes in technology and needs of society. Problems in urban noise, vibration control in space vehicles at launch, optimal design of composite materials for aerospace and automotive structures, computer-aided modeling of structures ranging from surgical implants in the body to space satellites are some examples of problems an engineering science graduate may encounter.

Engineering Science Major

In addition to the courses listed above under engineering core options, Engineering Science students are required to fill their four-hour General Studies approved mathematics content electives with:

MAT	242	Elementary Linear Algebra	2
ECE	386	Part. Diff. Eqns. Engr.	2

The Engineering Science major consists of:

PHY	361	Modern Physics	3
MAE	315	Mechanics Laboratory	2
MAE	355	Introduction to Metallurgy	3
MAE	371	Fluid Mechanics	3
MAE	372	Fluid Mechanics	4
MAE	404	Finite Elements in Engineering	3
MAE	410	Acoustics and Noise Control	3
MAE	413	Intermediate Dynamics	3
MAE	415	Vibration Analysis	3
MAE	402	Intro. to Continuum Mechanics	3
MAE	422	Mechanics of Materials	3
MAE	488	Heat Transfer	3
MAE	492	Projects	2

Computer Elective—Choose one of:

CSC 383 (3) or EEE 321 (4) or IEE 463 (3) or MAE 405 (3) ..... 3 or 4

Area of Emphasis (Technical) Elect. ..... 10 or 9

Engineering Science Areas of Emphasis

Technical electives may be selected from one or more of the following areas. A student may, with prior approval of the department, select a general area or a set of courses that would support a career objective not covered by the following categories.

Biomechanics. CHE 411, 412; EEE 434; MAE 341, 526.

Computer Science. CSC 305, 383; EEE 321, 322, 421, 422; IEE 463; MAE 405.

Engineering Mathematics. ASE 483, 485, 486; CSC 383; ECE 383, 384; MAE 527.

Engineering Mechanics. ASE 486; EEE 439; MAE 426, 523, 529, 555.

Manufacturing Engineering. IEE 300, 374, 431, 463; MAE 351, 452, 450.

Materials Science and Metallurgy. MAE 450, 452, 453, 455.

Vibration and Acoustics. CEE 536, 537; EEE 439; MAE 511, 512, 513.

Engineering Science Program of Study
Typical Last Two-Year Sequence

Junior Year

			Semester Hours
First Semester			
ECE	334	Electr. Device/Instru.	4
MAE	371	Fluid Mechanics	3
MAE	413	Intermediate Dynamics	3
MAE	422	Mechanics of Materials	3
PHY	361	Modern Physics	3
			16
Second Semester			
MAE	355	Introduction to Metallurgy	3
MAE	372	Fluid Mechanics	4
MAE	410	Acoustics and Noise Control	2
MAE	402	Intro. to Continuum Mechanics	3
MAE	488	Heat Transfer	3
SS or HUM Electives[1]			3
			18

Senior Year

First Semester			
MAE	315	Mechanics Laboratory	2
MAE	404	Finite Elements in Engineering	3
MAE	415	Vibrations	3
Technical Electives			3
Computer Elective			3 or 4
SS or HUM Elective[1]			2
			16 or 17
Second Semester			
ECE	400	Engineering Communications	3
MAE	492	Projects	2
SS or HUM Elective[1]			4
Technical Electives			8 or 7
			17 or 16

[1]See page 210.

Materials Science

Historically, man's knowledge of materials has had a tremendous impact on the advancement of civilization as reflected in the names "stone," "bronze," and "iron" attached to various ages of the development of our society. This is as true today as it was in the past. Engineering development and scientific advancement is often limited by the availability of materials to meet design requirements, and technological breakthroughs often result from the development of some new material or new materials processing technique.

Materials Science is the engineering and scientific discipline that is concerned with the study of fundamental relationships between the structure of materials and their properties. The program provides students with the knowledge necessary to make decisions concerning the optimum utilization of existing materials or to develop and process new materials.

Essentially all major industries and research laboratories are involved to some extent with the selection, utilization, and development of materials in designing and producing engineered systems. Thus, students who major in Materials Science find employment opportunities in a variety of industries and research facilities associated with aerospace, solid state electronics, energy conversion, transportation, manufacturing and chemical processing. The responsibilities of a materials scientist or materials engineer include research and development of materials to meet some new demand brought about by advancing technology, or to select the best choice of existing materials for a specific application. Materials scientists also develop new techniques for processing materials to reduce costs of products or to create new products. Also, they are often responsible for analyzing data on field tested materials to determine the effects of the environment on materials performance.

The tools of a materials scientist include highly sophisticated analytical equipment. Since a considerable emphasis in Materials Science is placed on the microscopic world, instruments such as transmission and scanning

electron microscopes, X ray diffractometers, and Auger spectrometers, are a necessary part of the field.

The undergraduate curriculum requires that students take a series of interdisciplinary courses of fundamental importance to an understanding of all materials.

Materials Science Major

The Materials Science major consists of:

CHM	441	General Physical Chemistry	3
CHM	442	General Physical Chemistry	3
EEE	437	Intro. to Solid State Electronics	3
		or	
PHY	471	Quantum Mechanics*	(3)
ECE	352	Semiconductors and Devices	3
MAE	355	Metallurgy	3
MAE	371	Fluid Mechanics	3
MAE	450	Mechanical Properties of Solids	3
MAE	451	X ray & Electron Diffraction	3
MAE	453	Corrosion and Corrosion Control	3
MAE	455	Physical Metallurgy	4
MAE	488	Heat Transfer	3
MAE	492	Projects	2

Computer Elective Choose one of:

CSC 383 (3) or EEE 321 (4) or IEE 463 (3) or MAE 405 (3) ..3 or 4

Area of Emphasis (Technical) Elect. .. 12 or 11

*Required for the Physical Metallurgy and Electronics areas of emphasis.

Materials Science Areas of Emphasis

Technical electives may be selected from one or more of the following areas. A student may, with prior approval of the department, select a general area or a set of courses that would support a career objective not covered by the following categories.

Physical Metallurgy PHY 481 is required. Remainder chosen from CHE 311; CHM 471; MAE 422, 452, 492; PHY 461

Electronics PHY 481 is required. Remainder chosen from CHM 471, EEE 435, 437, MAE 437, 438; PHY 461, 471, 481.

Manufacturing and Materials Processing. CHE 311; MAE 351, 372, 415, 422, 441, 442, 452.

Polymer Science. CHM 331, 332, 438, 471; MAE 372, 452, 492.

Mechanical and Energy Systems MAE 372, 415, 422, 430, 433, 438, 441, 442; EEE 464.

Materials Science Program of Study
Typical Final Two-Year Sequence

Junior Year

			Semester Hours
First Semester			
ECE	352	Sem conductors and Devices	3
CHM	441	Gen Physical Chem.	3
ECE	334	Electr Devices Instru.	4
MAE	355	Introduct'on to Metallurgy	3
MAE	371	Fluid Mechanics	3
			16
Second Semester			
CHM	442	Gen Physical Chem.	3
MAE	455	Physical Metallurgy	4
MAE	488	Heat Transfer	3
Computer Elective			3 or 4
Technical Elective			3
			16 or 17

Senior Year

First Semester			
EEE	437	Intro to Solid State Elect	3
		or	
PHY	471	Quantum Mechanics	(3)
MAE	450	Mech Properties of Solids	3
MAE	451	X-ray and Electron Diffraction	3
Technical Elective			3
SS or HUM Electives[1]			5
			17
Second Semester			
ECE	400	Engineering Communications	3
MAE	453	Corros on and Corrosion Control	3
MAE	492	Projects	2
Techn cal Electives			6 or 5
SS or HUM Electives[1]			4
			18 or 17

See page 210

Mechanical Engineering

Mechanical Engineering is a creative discipline that draws upon a number of basic sciences to design the devices, machines, processes, and systems which involve mechanical work and its conversion from, and into, other forms. It includes the conversion of thermal, chemical and nuclear energy into mechanical energy through various engines and powerplants; the transport of energy via devices like heat exchangers, pipelines, gears, and linkages; and the use of energy to perform a variety of tasks for the benefit of society, such as in transportation vehicles of all types, manufacturing tools and equipment, and

household appliances. Furthermore, since all manufactured products must be constructed of solid materials and because most products contain parts that transmit forces, Mechanical Engineering is involved in the structural integ rity and materials selection of almost every product on the market.

Mechanical engineers are employed in vir tually every kind of industry. They are involved with seeking new knowledge through research, with doing creative design and devel opment, and with the construction, control, management, and sales of the devices and systems needed by man. Therefore, a major strength of a Mechanical Engineering educa tion is the flexibility it provides in future em ployment opportunities for its graduates.

The undergraduate curriculum includes the study of principles governing the use of ener gy; principles of design, instruments, and control devices; and the application of these stud ies to the creative solution of practical, mod ern problems.

Mechanical Engineering Major

In addition to the courses listed above under engineering core options, Mechanical Engineering students are required to fill the four-hour General Studies approved mathematics content electives with:

ECE	384	Numerical Analysis for Engineers	2
ECE	386	Part. Diff. Eqns Engr.	2

The Mechanical Engineering major consists of:

MAE	317	Dynamic Systems & Control	4
MAE	351	Production Processes	3
MAE	371	Fluid Mechanics	3
MAE	372	Fluid Mechanics	4
MAE	382	Thermodynamics	3
MAE	415	Vibrations	3
MAE	422	Mechanics of Materials	3
MAE	441	Preliminary Design	3
MAE	445	Engineering Design	3
MAE	488	Heat Transfer	3
MAE	491	Experimental Mechanical Engineering	3
MAE	492	Projects	2

Computer Elective-Choose one of:
CSC 383 (3) or EEE 321 (4) or IEE 463 (3) or MAE 405 (3) ..... 3 or 4

Area of Emphasis (Technical) Elect. ..... 11 or 10

Mechanical Engineering Areas of Emphasis

Technical electives may be selected from one or more of the following areas. A student may, with prior approval of the department, select a general area or a set of courses that would support a career objective not covered by the following categories.

Aerospace. MAE 410, 413, 435, 436, 437, 446, 460, 461, 462, 463, 464, 471.

Biomechanical. CHE 411, 412, 517 (recommended); EEE 301, 434, 439; MAE 321, 526.

Computer Methods. ASE 483, 485, 486; CHE 581; ECE 383; EEE 321, 322, 421, 422; IEE 463, 475; MAE 404, 405, 471; MAT 464, 465.

Control and Dynamic Systems. ECE 383; EEE 321, 322, 360, 439, 483; IEE 463; MAE 413, 417, 418, 419, 462.

Design. ECE 351, 383; EEE 439; MAE 341, 333, 403, 404, 405, 417, 438, 442, 447.

Engineering Mechanics. MAT 213, 464, 466; MAE 341, 410, 413, 426, 430, 442, 471.

Manufacturing. IEE 300, 374, 411, 431, 461, 463; MAE 341, 355, 401, 403, 404, 442, 447, 450, 453, 455.

Stress Analysis, Failure Prevention and Materials. ECE 383; EEE 439; MAE 341, 355, 404, 426, 447, 450, 451, 453, 455.

Thermosciences. MAE 333, 336, 430, 435, 436, 437, 446, 460, 461, 463, 471, 489.

Mechanical Engineering Program of Study Typical Last Two-Year Sequence

Junior Year

			Semester Hours
First Semester			
ECE	334	Electr. Device Instru.	4
MAE	351	Production Processes	3
MAE	371	Fluid Mechanics	3
MAE	383	Thermodynamics	3
MAE	422	Mechanics of Materials	3
			16
Second Semester			
MAE	317	Dynamic Systems and Control	4
MAE	372	Fluid Mechanics	4
MAE	442	Preliminary Design	3
MAE	488	Heat Transfer	3
Computer Elective			3 or 4
			17 or 18

Senior Year

First Semester			
MAE	445	Engineering Design	3

MAE	491	Exp. Mech Engrg.	3
Technical Electives			5 or 4
SS or HUM Electives (See page 210).			6
			17 or 16

Second Semester

ECE	400	Engineering Communications	3
MAE	415	Vibrations	3
MAE	492	Projects	2
Technical Electives			6
SS or HUM Electives (See page 210)			3
			17

Programs in Engineering Special and Interdisciplinary Studies

The majors of Engineering Special Studies and of Engineering Interdisciplinary 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 majors generally permit. These majors are School of Engineering programs. Unlike the departmental major 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) engineering interdisciplinary programs that lead to the degree Bachelor of Science.

The B.S.E. Engineering Special Programs are designed primarily for students intending to pursue engineering careers at a professional level in industry or graduate studies. The B.S. Engineering 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.

Engineering Special 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 MAE 371 Fluid Mechanics	
CHE	411	Biomedical Engineering I	3
CHE	412	Biomedical Engineering II	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

Technical Elective (including two courses of engineering science and one course of engineering design type content) 16

Computer Systems Engineering. This program is administered by the Department of Computer Science (see page 219).

Manufacturing Engineering. This program is administered by the Department of Industrial and Management Systems Engineering (see page 238)

Materials Science. This program is administered by the Department of Mechanical and Aerospace Engineering (see page 241).

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, 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, power systems engineering, 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	332	Chemical Engineering Operations	3
EEE	460	Nuclear Engineering	3
EEE	461	Health Physics Principles and Radiation Measurements	3
EEE	462	Reactor Safety Analysis	3
EEE	463	Electric Power Plant Systems	3
EEE	464	Nuclear Engineering Experiments	3
MAE	317	Dynamic Systems and Control	4
		or EEE 480 Feedback Systems	
MAE	422	Mechanics of Materials	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 four traditional engineering disciplines—chemical, 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 in-

clude a course specifically oriented to the relationships among technology, society, and human values.

The following course is required as a part of the General Studies requirement:

			Semester Hours
HUP	402	Technology, Society and Human Values	3

The following courses are required as a part of the engineering core.

MAT	242	Elementary Linear Algebra	2
		or ECE 382 Linear Algebra for Engineers	
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	4
IEE	473	System Applications of Linear Programming	3
IEE	476	Introduction to Operations Research Models	3
MAE	317	Dynamic Systems and Control	4
Technical Electives			11

Urban Systems Engineering. Throughout the past century there has been a rapid growth of urban areas within the United States. There will be regional shifts from one section of the United States to another, but overall urban populations will continue to expand. The problems of urban areas are interdisciplinary and highly interrelated involving numerous physical, social and cultural parameters. Many engineers work on the solution of urban problems through employment in both the private and public sectors. A selected combination of courses focus on the urban physical infrastructure and on the modern techniques needed for the analysis of large complex systems. This option would be of interest to those concerned with urban engineering, transportation planning, environmental engineering, city planning, urban management and decision making, or those wanting a quantitatively based knowledge of the urban complex.

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:

MAT	242	Elementary Linear Algebra	2
		or ECE 382 Linear Algebra for Engineers	
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 Operations Research Models	3
MAE	371	Fluid Mechanics	3
PUP	403	Interdisciplinary Urban Planning	3
Technical Electives (including one course of engineering design type content)			16

Engineering Interdisciplinary Studies—B.S.

Business and Pre-Law. This program accommodates especially those engineering students whose primary intent is to earn a law degree (J.D.) or a graduate degree in business administration (M.B.A.). 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.

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:

MAT	242	Elementary Linear Algebra	2
		or ECE 382 Linear Algebra for Engineers	

In addition, the following courses are required:

ACC	211	Elementary Accounting	3
ACC	212	Elementary Accounting	3
ADS	305	Business Law	3
ASE	485	Engineering Statistics	3
CSC	304	Introduction to Cobol	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	Integrated Production	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
Basic Science Elective			3
Engineering Technical Electives (including two courses of engineering science and one of engineering design type content)			10

Geological Engineering. This program 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	323	Optical and X-Ray Techniques	3
GLG	418	Geophysics	3
GLG	424	Petrology-Petrography	4
MAE	371	Fluid Mechanics	3
Engineering Technical Electives (including two courses of engineering design type content) (An approved summer engineering-geology field course is also highly recommended)			14

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 MAE 371 Fluid Mechanics	
CHE	411	Biomedical Engineering I	3
CHE	412	Biomedical Engineering II	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 I	3
Approved Pre-Medical Elective			3
Engineering Technical Electives (including two courses of engineering science and one of engineering design type content)			8

Analysis and Systems

ASE 399 Cooperative Work Experience. (1) F,S; Hirata
Usually involves two 6-month work periods with industrial firms or government agencies alternated with full-time semester and summer sessions studies. Prerequisites: At least 45 hours completed in major area with minimum 2.50 GPA; approval of instructor. Not open to students from other colleges on campus.

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 Project in Entrepreneurship. (3) S; Staff
Preparation of plans for new-venture start up. Identification and evaluation of new venture opportunities. Selection of legal form of organization, drafting offering statement, sources of venture capital, cash flow projections. Prerequisite: ASE 450 or approval of instructor.

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, SS; Anderson, Dean, Rollier
Statistical methods applied to engineering problems. Estimation, tests of hypotheses, regression, correlation, analysis of variance and nonparametric statistics. 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. Prerequisites: MAT 242 and 274 or ECE 380 and 382.

492 Project in Design and Development. (2,3) F, S, SS
Individual project in creative design and synthesis. Prerequisite: Senior standing.

496 Professional Seminar. (1-3) F,S; Staff
Topics of interest to students in the engineering special and interdisciplinary studies.

510 Rotating Internship. (1) N
Exposure by scheduled rotating assignments to major hospital and health delivery departments including medical, administrative, and support functions.

582 Linear Algebra in Engineering. (3) F
Development and solution of systems of linear algebraic equations. Applications from mechanical, structural and electrical fields of engineering. Prerequisite: MAT 242 or ECE 382 or equivalent.

586 Partial Differential Equations in Engineering. (3) S
Development and solution of partial differential equations in engineering. Applications in solid mechanics, vibrations, heat transfer. Prerequisites: MAT 242 and 274 or ECE 380 and 382; ECE 386.

Special Courses: ASE 484, 494, 498, 499. (See pages 33-34.)

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) F, S
Extension of energy balance calculations and introduction of thermodynamic principles. Prerequisite: CHE 311.

331 Transport Phenomena. (3) F, S
Transport phenomena with emphasis on fluid systems. Prerequisites: MAT 274; PHY 116; CHE 311

332 Chemical Engineering Operations. (3) F, S
Continuation of transport principles with emphasis on energy transport in stationary and fluid systems. Prerequisite: CHE 312, 331

333 Applications of Transport Phenomena. (3) F, S
The application of transport phenomena to mass transfer and the design of mass transfer equipment. Prerequisite: CHE 312, 331; Corequisite: CHE 332, 342

342 Applied Chemical Thermodynamics. (3) F, S
Energy relations and equilibrium conversions based on chemical potentials and phase equilibria. Prerequisite: CHE 312.

351 Measurements Laboratory. (2) N
Introduction to laboratory practices and the use of measurement devices. Prerequisite: CHM 116; Corequisite: CHE 311, CHM 335

352, 353 Transport Laboratories. (2,2) S
The demonstration of transport phenomena principles with experiments in fluid flow, heat and mass transfer. Prerequisite: CHE 331 for CHE 352; CHE 332 for CHE 353; Corequisite: CHE 333 for CHE 353

364 Chemical Process Instrumentation. (3) N
Theory and applications of analytical and control instrumentation used in the chemical process industries. Prerequisite: CHM 116. Lecture, demonstrations and laboratory.

411 Biomedical Engineering I. (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.

412 Biomedical Engineering II. (3) S; Dorson
Review of electrophys o ogy and nerve pacing applications introduction to biomechanics and joint/limb replacement technology, cardiovascular and pulmonary fluid mechanics, application of mathemat cal model ng Prerequisite· approval of instructor.

413 Physiological Instrumentation. (3) S; Gu lbeau
Problems, concepts and techn ques of biomedical instrumentation in static and dynamic environments. Prerequisite· ZOL 360 or AGB 435 or equ'valent Lecture and laboratory

432 Principles of Chemical Engineering Design. (3) F Staff
Siz ng of unit operations equ pment, such as fractiona tors, strippers absorbers, and extractors w th app cations to comp ex industrial processes. Prerequisites. CHE 333, 342

442 Chemical Reactor Design. (3) F, S; Staff
App ication of k net cs to chemica reactor des gn. Prerequ s tes. CHE 342, Corequ site. CHE 333

451 Chemical Engineering Laboratory. (2) F
Operation, control and design of exper mental and industria process equipment; ndependent research projects. Prerequis tes. CHE 333 352. S x hours aboratory.

461 Process Control. (3) F, Staff
Process dynam cs, instrumentation and feedback app ied to automat c process contro . Prerequis te· ECE 304 Lecture and laboratory

462 Process Design. (3) S; Staff
App icat on of econom c princ p es to opt mize equ pment selection and design; development and design of process systems. Prerequ s tes· CHE 432 and 442.

473 Industrial Chemistry. (3) S, Staff
Reaction systems as encountered in large scale opera tions. Typ cal examp es from inorgan c, organ c, po y mer, biochemical, fermentat on, and electrochem cal n dustries. Prerequ s tes. CHM 318 or 332 and CHM 442

487 Applied Mathematics in Chemical Engineering. (3) S, Staff
Mathematical formu at on of complex chem cal eng neering problems. Analytica and numer cal solution of the resulting l near or non linear, ordinary and partia differential equat ons Prerequis tes· MAT 274, CHE 332 and 342.

492 Chemical Engineering Projects. (2) S; Staff
Indiv dual projects n chem ca engineering operat ons and design. Prerequisite Approva of instructor. S x hours aboratory

496 Professional Seminar. (0) F, S, Staff
Professional and ethica aspects with a d scussion of emp oyment opportunities and respons bi ties. Lectures and field trips.

501 Introduction to Transport Phenomena. (3) F
Transport phenomena w th emphasis on fluid systems Open only to trans tion students w th approva of n structor

502 Introduction to Chemical Engineering Operations. (3) S
Continuat on of transport principles with emphasis on energy transport n stat onary and fluid systems Open only to trans t on students with approval of instructor

503 Introduction to Mass Transport. (3) S
The appl cation of transport phenomena to mass trans fer and the des gn of mass transfer equipment. Open only to transit on students w th approval of instructor.

504 Introduction to Chemical Thermodynamics. (3) F
Energy relations and equ librium conversions based on chemical potentia s and phase equ libr a. Open only to transition students with approva of instructor.

505 Introduction to Chemical Reactor Design. (3) S
Appl cation of kinet cs to chem cal reactor des gn Open only to trans tion students w th approva of nstructor

515 Physiological Transport Processes. (3) N
Analysis of heat, mass momentum and e ectrica energy transfer in mammals, der vat on of both m croscop c and macroscop c models based on current research

517 Prosthetic and Diagnostic Engineering. (3) N
Cr teria for mechan ca rep acement or ass stance of organ functions d agnostic methods equ pment and usage, ex st ng methodo ogy and future requirements n clud ng deta led des gns

533 Transport Processes. (3) F
Un fied treatment of momentum heat and mass transfer from mo ecu ar theory and continuum po nts of v ew. Cont nuum equat ons of microscop c and macroscop c systems, mult component and mu t phase systems

534 Turbulent Mixing. (3 N
Turbulence and m x ng n mu t component systems with/without chem ca react ons. Computat ona mode s app ed to chem ca processes. Prerequ site CHE 533

536 Convective Mass Transfer. (3 N
Turbu ent f ow for mu t component systems ncluding chem ca reactions w th appl cations n separations and air po ution Prerequis te CHE 533 or MAE 571

543 Thermodynamics of Chemical Systems. 3) F
C ass cal and statistica thermodynam cs of non-ideal phys cochem cal systems and processes, predict on of optimum operating cond tions.

544 Chemical Reactor Engineering. (3) S
Reaction rates, thermodynamics, and transport princi ples app ied to the des gn and operation of chem cal re actors Prerequis te. CHE 543

553 Air and Water Quality Control. (3) N
Origins of po utants environmental nteractions, and concerns Physical and chem ca processes nc uding d spersion particle mechanics, fi trat on sampling sedimentation coagulat on, flotation, absorpt on Contro techno ogy

554 New Energy Technology. (3) N
Gas fication iquefaction pyrolysis and combust on processes for coa , wastes, other raw mater a s n-s tu processes for coal o shale and geothermal energy Environmental quality issues.

556 Separation Processes. (3) N
Topics n b nary/mu ticomponent separation rate governed and equi ibrat on processes mass transfer criteria, energy requ rements separat ng agents and de vices staged operat ons

562 Chemical Systems Engineering. (3) N
Process dynamics, systems ana ysis, computer appl ca tions, process contro

563 Chemical Engineering Design. (3) N
Computat ona methods· the des gn of chemica p ants and processes

581 Process Optimization Techniques. 3 S
Method for optimiz ng engineer ng processes. Experimenta des gn and analysis, near and non near regress on methods, class cal, search, and dynam c pro gramm ng algor thms Prerequis te Approval of in structor.

587 Advanced Applied Mathematical Analysis in Chemical Engineering. (3) F
Formulation and so ution of complex mathematica re a t onships resu ting from the descript on of phys ca problems n mass, energy, and momentum transfer and chemical kinet cs. Prerequ s te. CHE 487 or approva of instructor.

Special Courses: CHE 484, 494, 498, 499, 584, 590, 591, 592, 593, 594, 598, 599, 792, 799. (See pages 33-34.)

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 550 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. Not acceptable as a technical elective for CEE students. (Also listed as PUP 301.)

372 Transportation Engineering. (3) F, S
Highway, rail, water and air transportation. Operational characteristics and traffic control devices of each transport mode. Impact on urban form. Prerequisite: Same as CEE 322.

380 Hydraulics and Hydrology. (3) F, S
Application of hydraulic engineering principles to flow of liquids in pipe systems and open channels; hydrostatics; characteristics of pumps and turbines. Introduction to hydrology. Not open to engineering students. Prerequisite: CON 221. Two lectures, 3 hours laboratory.

381 Hydraulic Engineering. (4) F, S
Fundamental principles and methods of fluid mechanics forming analytical basis for water resources engineering. Flow in conduits and open channels. Introduction to hydrology. Prerequisite: MAE 371. 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
Application of the principles of hydraulics and hydrology to the engineering of water resources projects; design and operation of water resources systems; water quality. 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.

511 Properties and Production of Portland Cement Concrete (3) F
Basic physical and chemical properties of portland cement and aggregates and the combination of these components to manufacture concrete. Two hours lecture, 3 hours laboratory. Prerequisite: CEE 513 or approval of instructor.

512 Special Topics in Portland Cement Concrete (3) S
Manufacture and chemistry of cement, microstructure of cement and concrete. Elasticity, shrinkage, creep, and durability of concrete. Two hours lecture, 3 hours laboratory. Prerequisite: CEE 511.

513 Aggregates for Use in Construction Materials (3) F
Properties of aggregates as related to production of portland cement concrete and bituminous mixtures. Mineralogy physical and chemical properties and production. Two hours lecture, 3 hours laboratory. Prerequisite: approval of instructor.

514 Bituminous Materials (3) F
Sources, production and properties of asphalt, tars, and modified and synthetic materials. Quality control, testing, specifications of bituminous materials. Two hours lecture, 3 hours laboratory. Prerequisite: approval of instructor.

515 Bituminous Mixtures. (3) S
Design, production, and maintenance of bituminous paving materials. Mixture design methods for hot and cold mixtures and surface treatments. Two hours lecture, 3 hours laboratory. Prerequisite: CEE 513 and CEE 514 or approval of instructor.

516 Design of Flexible Pavements. (3) F
Characteristics of loads, load distribution of stress analysis for airfields, highways, roads, and streets. Design of new systems. Two hours lecture, 3 hours laboratory. Prerequisite: CEE 351 and CEE 515 or approval of instructor.

517 Design of Rigid Pavements (3) S
Characteristics of rigid pavement systems. Conventional reinforced, unreinforced, and prestressed systems. Materials selection, design of new systems, maintenance of jointed systems. Two hours lecture, 3 hours laboratory. Prerequisite: CEE 351 and CEE 511 or approval of instructor.

521 Stress Analysis. (3) F
Advanced topics in the analytical determination of stress and strain.

524 Advanced Steel Structures. (3) S
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
Finite element formulation for solutions of structural, geotechnic, and hydraulic problems. Prerequisite: CEE 532.

527 Advanced Concrete Structures. (3) F
Elastic, ultimate strength and yield line theory. Deflection, torsion, shrinkage and plastic flow. Prestressed concrete; special systems.

528 Stability of Structures. (3) F
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
Classical and numerical investigations of linear and non-linear structures composed of flat and curved surfaces, and linear or curvilinear elements.

531 Theory of Structures. (3) F
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
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
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
Advanced topics including wind engineering, earthquake engineering, probabilistic concepts, optimization and behavior of structural systems.

552 Geological Engineering. (3) S
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
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
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
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
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
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
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
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
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
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
Methods used to establish rigid and flexible pavement thickness for highways and airports. Prerequisites: CEE 351, 372.

573 Engineering Interpretation of Land Forms. (3) S
North America by geographic regions and the engineering problems and characteristics of each area.

574, 575 Traffic Engineering. (3,3) F, S
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
Planning and design of airport facilities. Effect of aircraft characteristics, air traffic control procedures, and aircraft demand for runway and passenger handling facilities, on site selection, runway configuration and terminal design. Prerequisite: CEE 372.

577 Urban Transportation Planning. (3) S '84
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 '85
Highway transportation including design, operation, planning, environmental impact, economic feasibility and financing. Highways as a regional system.

579 Groundwater Hydrology. (3) F
Physical properties of aquifers; groundwater exploration, well construction and pumping; subsurface flow modelling; land subsidence, groundwater pollution and water rights. Prerequisite: CEE 381 or approval of instructor.

581 Surface Water Hydrology. (3) S '85
Hydrologic cycle and mechanisms, including precipitation, evaporation and transpiration; hydrograph analysis; flood routing; statistical methods in hydrology, hydrologic design. Prerequisite: CEE 381 or approval of instructor.

582 Free Surface Hydraulics. (2) S '85
Derivation of one-dimensional equations used in open channel flow analysis. Computations for uniform and nonuniform flows; unsteady flow; flood routing. Mathematical and physical models. Prerequisite: CEE 381.

583 Water Resources Systems Planning. (2) F '83
Philosophy of water resources planning; economic, social and engineering interaction; introduction to the theory and application of quantitative planning methodologies in water resources planning. Guest lecturers and case studies. Prerequisite: approval of instructor.

584 Foundations of Hydraulic Engineering. (2) F '84
Review of incompressible fluid dynamics. Flow in pipes and channels; unsteady and varied flows; wave motion. Prerequisites: CEE 381.

585 Principles of River Engineering. (2) F '83
Uses of rivers, study of watershed and channel processes. Sediment sources, yield and control; hydrologic analysis. Case studies. Prerequisites: CEE 381 or approval of instructor.

586 Water Resources Systems I. (3) S '84
Theory and application of quantitative planning methodologies for the design and operation of water resources systems; class projects using computer; case studies Corequisite: CEE 583 or approval of instructor.

587 Water Resources Systems II. (3) F '84
Advanced computer-oriented workshop in the application of quantitative planning techniques to the design and operation of water resources systems. Prerequisite: CEE 586.

588 Sedimentation Engineering. (2) S '84
Introduction to the transportation of granular sedimentary materials by moving fluids. Degradation, aggregration and local scour in alluvial channels. Mathematical and physical models. Prerequisite: CEE 585 or approval of instructor.

Special Courses: CEE 484, 494, 498, 499, 580, 584, 590, 591, 592, 594, 598, 599, 792, 799. (See pages 33-34.)

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) N
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. Prerequisite: ECE 304.

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 lectures, 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 lectures, 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 Prerequ sites: PHY 116; MAT 362.

360 Electromechanics. (3) F, S
The ac and dc operations of magnetic circuits, per manent magnets, transformers, incremental motion electromechanical systems, dc machines, nduction ma chines, synchronous mach nes, control of electrical ma chines Prerequisite: ECE 304.

396 Professional Seminar. (0) F, S
Topics of interest to upper d vision electrical engineers. Prerequisite: junior standing. One lecture.

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 pass ve filter design. Time and frequency domain approximations. Prerequisite: EEE 303 or equivalent.

406 Computer-Aided Design. (3) N, Zimmer
Principles and application of modern CAD techniques to solve engineering problems; includes independent proj ect. Prerequisite. EEE 303 or equivalent

411 Engineering Software Design. (3) N; O'Grady
Design of computer programs for engineering systems using higher level languages. Program design concepts. Interfacing the program with peripheral devices. Prereq uisite· EEE 322. Lecture and laboratory.

422 Digital Computer Design I. (3) F, S
Logical design and internal operation of processing and control units of a computer. Data representat ons Relation to memory and I/0 units. Prerequis te: EEE 322.

423 Digital Computer Design II. (4) F, S
Computer organization emphasizing interface to memory and I/0. Interrupt structures, bussing, I/0, memory technology and hierarchy Hardware/software interface Prerequisite: EEE 422. Three lectures, 3 hours laboratory.

424 Computer Structures I. (3) F, S
Evolution of main line architectures. nstruction sets, addressing modes, and control structures. Characterization of computer architectures Performance evaluation. Prerequisite· EEE 423.

425 Digital Systems Circuits. (4) F, S
Analysis of saturating and non saturating logic fami ies including TTL, Schottky TTL, ECL, MTL, NMOS and CMOS. Selected MSI/LSI parts including memories, A/D and D/A converters. Prerequisites: ECE 334; EEE 322. Three lectures, 3 hours laboratory.

427 Digital Switching Theory. (3) S; Robbins, Steinmann
Combinational logic, functional decomposition, NAND (NOR) circuit analysis and synthesis, logic arrays, iterative networks, fault diagnosis, sequential circuit representation, memory devices. Prerequisite: EEE 322.

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
Characteristics of analog and digital integrated circuits, emphasizing MTL bipolar technology, ADFL and DFET high-speed FET technologies. Prerequisite: ECE 334. Three lectures, 3 hours laboratory.

433 Analog Circuit Design. (4) A; Blackledge
Design of electronic circuits including amplifiers, mixers, waveform generators and active filters. Prerequis te: EEE 301 or equ valent Three lectures, 3 hours aboratory.

434 Quantum Mechanics for Engineers. (3) N; Kaufman, Sirk s
Probab lity, Schroedinger equat on, e genfunctions, har mon c oscil ator, per odic potential, superposit on, an gular momentum, scattering, tunne ing, perturbat on theory Prerequis te· EEE 340.

435 Microelectronics. (3) S; DeMassa
Practice of sol d state device fabr cat on techniques inc uding thin film and ntegrated circuit fabricat on pr nc p es. Prerequisite. EEE 436 or equivalent. Two lectures, 3 hours aboratory.

436 Fundamentals of Solid State Devices. (3) F S
Metal-semiconductor contacts, P N junct ons, l ght nteract ng dev ces, schottky diodes, b polar and fie d ef fect transistors, planar and thin film integrated circu t (I-C) dev ces. Prerequ site: ECE 352.

437 Introduction to Solid State Electronics. (3) F; Roedel
Crysta lattices, rec procal lattices, quantum stat st cs, lattice dynamics, equi ibrium and nonequilibr um processes in semiconductors Prerequis te· ECE 352.

438 Solar Cells. (3) F, S rk s, Wang
Photovoltaic dev ces including homojunctions and heterojunct ons Photogenerat on of carr ers, spectral response, e ectrical characteristics, effic ency. Prerequisite· EEE 436

440 Electromagnetic Engineering II. (4) F, S; Staff
Steady state and trans'ent behavior of transmission lines, impedance matching, d'spersion diagram, line losses, noise, ntroduction to microwaves Prerequisites. ECE 122 or CSC 182, ECE 304; EEE 340. Three lectures, 3 hours laboratory

441 Advanced Engineering Electromagnetics. (3) N, Kaufman, Sirkis
Polarizat on. Magnetization. H gh frequency impedance. Propagation. Ref ect on. Radiation. Guided waves. Slow waves Anisotropic med a. Resonators. Prerequis te. EEE 340.

443 Antennas. (3) N; Tice
Engineering princ ples, arrays, measurements, numerical computat ons Prerequisite· ECE 122 or CSC 182· EEE 340.

445 Microwaves. (4) N, Kaufman Sirkis, T ce
Systems, components, and measurements Prerequis te: EEE 440. Three lectures, 3 hours laboratory.

448 Fiber Optics. (4) F; Palais
Components and systems for fiber optical communications. Prerequisites: EEE 340, EEE 303. Three lectures, 3 hours aboratory.

451 Error-Correcting Codes. (3) N; Steinmann, Davis
App icat on of modern algebra to the analys s and synthesis of random error detecting and error-correcting block codes. Prerequisite: EEE 321.

455 Communication Systems. (4) F, S
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; Welch
System characteristics. Commun cations media. Communication codes. Data validity checking. L ne protocols, terminals, system configurations. Examples. Prerequisites. EEE 303, 322.

460 Introduction to Nuclear Engineering. (3) F, McKlveen
Neutron interactions with matter. Principles of neutron chain reacting systems. Neutron d ffusion and modera

tion. Heat removal from nuclear reactors. Point reactor kinetics. Prerequisite: PHY 361. (Also listed as MAE 430).

461 Health Physics Principles and Radiation Measurements. (3) S; McKlveen
Sources, characteristics, dosimetry, shielding and measurement techniques for natural and man-made radiation. Philosophy of radiation protection. Emphasis on instrumentation, detectors, and environmental monitoring. Two lectures, 3 hours laboratory. Prerequisite: ECE 304.

462 Reactor Safety Analysis. (3) S; McKlveen
Power reactor safety and licensing methodologies. Reactor transient and accident analysis. Time dependent solution to neutron diffusion equation. Use of industry codes to assess fission product build up, emergency core cooling behavior, reactivity, offsite releases and dose calculations. Prerequisite: EEE 430.

463 Electric Power Plant Systems. (3) F; Backus, McKlveen, Anderson
Nuclear and fossil fuel steam supply system, electrical generating system, and pollution control system design. Theory of machinery and component design. Power plant efficiencies. Prerequisites: ECE 304, 340.

464 Nuclear Engineering Experiments. (3) F; McKlveen
Theory and applied concepts in reactor design, instrumentation, electronics, and shielding. Experimental measurements of nuclear parameters using subcritical reactors and fusion neutron generator. Fast and thermal activation analysis. Primary coolant analysis. Mossbauer spectrometry. Two lectures, 3 hours laboratory. Corequisite: EEE 430.

465 Clinical Engineering I. (3) N; Staff
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; Staff
Continuation of EEE 465. Safety, research, and regulatory procedures with patient involvement. Prerequisite: EEE 465.

470 Power System Fundamentals. (3) F, S; Staff
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) F, S; Staff
Introduction to symmetrical components, faulted system analysis, protection and stability. Prerequisite: EEE 470 or equivalent.

473 Electrical Machinery. (3) F; Staff
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.

480 Feedback Systems. (4) F, S
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.

504 Filter Synthesis. (3) N
Synthesis of active and passive filters. Methods of approximation in the time and frequency domains. Sensitivity and optimization. Prerequisite: EEE 405 or equivalent.

505 Signal Processing of Time Series I. (3) F
Time and frequency domain characterization of deterministic time series. Linear operators, Fourier and z-transforms, digital filter synthesis, system modeling. Prerequisite: EEE 303.

506 Signal Processing of Time Series II. (3) S
Study of random time series, autocorrelation sequence, power spectral density, optimum filters, spectral analysis, rational modeling of stationary time series. Prerequisite: EEE 505.

508 Digital Image Processing I. (3) F
Digital image fundamentals, image transforms, image enhancement and restoration techniques, image encoding and segmentation methods. Prerequisite: EEE 303.

509 Digital Image Processing II. (3) S
Advanced analytical techniques applied to digital image processing problems. Prerequisite: EEE 508.

511 Hardware/Software Integration. (3) N
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
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
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
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. (Equivalent to CSC 525).

516 Digital Design Automation. (3) F, S
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
Organization of minicomputers, with "hands on" emphasis of one particular design. Prerequisite: EEE 423 or equivalent. Three lectures, 3 hours laboratory.

521 Minicomputers II. (4) S
Organization of minicomputer operating system with emphasis on the Unix operating system on the laboratory computer. Prerequisite: EEE 520. Three lectures, 3 hours laboratory.

522 System Design Using Microprocessors. (4) N
Hardware, software, and interface considerations in the design of microprocessor applications. Prerequisite: EEE 423 or equivalent. Three lectures, 3 hours laboratory.

523 Microprogramming. (3) N
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
Main-line computer architectures; multiprogramming,

timesharing, multiprocessing, hardware/software tradeoffs, memory hierarchies, input/output structures, communications. Prerequisite. EEE 424

525 Digital Circuit Design. (3) F
Analysis and design of Very Large Scale Integrated Circuits (VLSI). Physics of small devices, fabrication, regular structures, and system timing. Open only to graduate students.

526 Parallel Processing. (3) S
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
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
Hardware and software design of a bit-slice computer with writable control store. Prerequisite. EEE 423 or equivalent. Three lectures, 3 hours laboratory.

531 Semiconductor Device Theory I. (3) F
Junction diodes, junction and field-effect transistors; inhomogeneous 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
Semiconductor device phenomena including tunneling, light emission and absorption, negative resistance effects, metal-semiconductor, metal insulator and multiple junctions Prerequisite: EEE 531.

533 Integrated Circuit Design. (3) F
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 equivalent.

534 Small MOS Devices. (3) S
Subthreshold current, threshold voltage moduation, scaling and other small size limitations Prerequisite: EEE 532.

535 Advanced Bipolar Devices and Circuits. (3) S
Critical examination of new bipolar device and circuit technologies Performance tradeoffs, scaling effects, and modeling techniques Prerequisite: EEE 533.

536 Experimental Methods in Semiconductors. (3) S
Measurement techniques in semiconductor materials and devices, mobility, doping profiles, deep levels, lifetimes, luminescence, IR spectroscopy, defects Prerequisite. EEE 436

537 Semiconductor Optoelectronics I. (3) F
Electronic states in semiconductors, quantum theory of radiation, absorption processes, radiative processes, non-radiative processes, photoluminescence, photonic devices Prerequisite: EEE 434.

538 Semiconductor Optoelectronics II. (3) S
Material and device physics of semiconductor lasers, light emitting diodes, photodetector etc Emerging material and device technology in III-V semiconductors. Prerequisite. EEE 537.

541 Advanced Electromagnetic Fields. (3) N
Analytical techniques applied to electromagnetic field problems. Prerequisite: EEE 441 or equivalent.

543 Antennas. (3) N
Analysis and synthesis of selected radiating structures and systems. Prerequisite. EEE 443 or equivalent

547 Microwave Solid State Electronics. (3) N
Use of ferrite, semiconductor and piezoelectric materials in microwave systems. Prerequisites. ECE 352 and EEE 445, or equivalent

548 Optical Engineering. (3) N
Diffraction, lenses optical processing, holography, electro-optics, pulsed and high power lasers Prerequisite: EEE 448 or 441 or equivalent.

549 Laser Engineering. (3) S
Theory and design of lasers Prerequisite: EEE 448 or equivalent.

550 Transform Theory and Applications. (3) A
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
Fundamental theorems of information theory for sources and channels; convolutional and burst codes. Prerequisites. EEE 451, 554.

552 Coherent Communications. (3) N
Systems analysis and design of telecommunication systems using phase-locked loops Prerequisite: EEE 554

553 Pattern Recognition. (3) N
Pattern classification by distance functions and likelihood functions, deterministic and statistical approaches to trainable pattern classifiers syntactic pattern recognition Prerequisite: EEE 554. (Equivalent to CSC 572)

554 Random Signal Theory I. (3) F
Application of statistical techniques to the representation and analysis of electrical signals and to communication systems analysis Prerequisite: EEE 303

555 Random Signal Theory II. (3) S
Processing of signals in the presence of noise. Random signals, correlation, frequency spectra, estimation, filtering, noise, prediction, transients Prerequisite EEE 554.

556 Detection and Estimation Theory. (3) N
Combination of the classical techniques of statistical inference and the random process characterization of communication, radar and other modern data processing systems Prerequisites: EEE 455, 554

558 Modulation Theory. (3) N
Noise performance of analog and digital modulation systems. Emphasis on modern digital techniques in terrestrial and satellite communications systems Prerequisites: EEE 455, 554.

559 Computer Communication Networks. (3) N
Introduction to computer networks. Hardware elements Data link protocols Packet and message switching software elements Network control Examples. Prerequisites: EEE 459.

566 Advanced Medical Instrumentation. (3) N
Design and analysis of sophisticated components and systems for laboratory analysis, research, medical care and monitoring. Prerequisites: BSEE or equivalent

570 Symmetrical Components. (3) F '83
Power system parameters; analysis of phase and sequence impedances for lines, machines, and transformers. Prerequisite: EEE 471 or equivalent.

571 Fault Analysis. (3) S '84
Symmetrical component applications; changes in symmetry, simultaneous faults, two-component method, computer solution of faulted systems Prerequisite. EEE 570 or equivalent

572 Power System Protection. (3) F '84
Elements of protective systems, relays, relaying schemes, circuit interrupting devices, fault protection of radial feeders, network protective schemes, complex

loci n Z and Y P anes protect ve system rel abil ty. Pre requ s te EEE 571 or equiva ent

573 Power Systems Control. (3) S 85
Analytica concepts of econom c dispatch of e ectr c generation system frequency control, contro center funct ons, rea time contro concepts. Prerequ s te. EEE 470 or equivalent corequ site: EEE 480

574 Computer Solution of Power Systems. (3 F '83
A gorithms for d g ta computation for power flow and stabi ity ana ys s, spars ty programm ng, optim zation Prerequ s te· EEE 471 or equ valent

575 Power System Stability Modeling. (3) S '84
Mathemat cal mode ing of synchronous mach nes, excitat on systems, governors power p ants, and loads for dynam c analysis S mu at on of sma systems Prereq u s tes EEE 480 574

576 Power System Reliability. (3) F 84
Re abi ty functions, d stribut'ons Markov processes, recurs ve techniques, generation capac ty eva uation, sp nn ng capacity, frequency and duration method transm ss on rel ab ity composite systems. Prerequisite· EEE 471.

577 Power System Planning. (3) S '85
Load forecasting methods, energy forecasts, interconnected system re iabil ty, generat on cost analysis, transm ss on plann ng. Prerequ sites· EEE 574 576

578 Electric Power Distribution. (3) F 83
D str but on components oad characteristics, voltage ca cu at ons, primary and secondary systems transformers capacitor app cat ons Prequisite EEE 471 or equivalent, corequis te EEE 570.

579 Electric Power Transmission. (3) S 85
EHV des gn character st cs conductor conf gurat ons, corona phenomena and losses, radio no se, insu at on coord nat on switch ng surges ght ng phenomenon dc transm ss on. Prerequis te EEE 570.

580 Digital Control Systems. 3) S
Ana ys s and des gn of d g ta and samp ed data control systems nc uding samp ing theory z-transforms the state trans t on method stab l ty, design and synthes s Prerequis tes· EEE 550 582

581 Random Processes in Control Systems. 3) N
Stat st cal f ter ng, estimation, and contro w th empha s s on the Kalman f lter and its appl cations and com putational problems Prerequ sites. EEE 550 554, 582

582 Linear System Theory. (3) F S
State variab es, control abi ty and observab l ty state feedback and observers mu t var ab e systems. Prereq u site EEE 480

583 Real-Time Systems. (3) N
Des gn of computer systems for rea time app icat ons n s gnal processing graph cs, control, and s mulation Prerequ site. EEE 423 or equ va ent, EEE 428 or 433

586 Nonlinear Control Systems. (3 N
Stab l ty theory includ ng phase p ane, descr b ng function L apunov s method and frequency domain cr teria for cont nuous and discrete, non near and time vary ng systems. Prerequ s te· EEE 582.

587 Optimal Control Systems. (3) N
App icat on of ca cu us of var at ons Pontryag n s pr n cip e, and dynam c programm ng to contro prob ems Computat onal techniques for so v ng opt mal contro prob ems Prerequ site: EEE 582.

770 Advanced Topics in Power Systems. (3) N
Power system prob ems of current nterest, approached at an advanced techn ca eve for mature students Prerequisites· EEE 571 575 577 or equ valent and approval of instructor

771 Advanced Methods in Power System Analysis. (3) N
Topological concepts, contour theory, network tearing, nterconnections piecewise algorithms, multilevel dia koptics, power system app cations. Prerequisites: EEE 573, 574 or equ valent

772 Power System Transients. (3) N
Sw tching transients dc ne trans ents, e ectromagnet c phenomena travel ng waves, lightning, protect ve con cepts computer so utions of trans ent phenomena. Prerequis tes. EEE 570, 574, 579 or equ va ent.

773 Real-Time Control of Power Systems. (3) N
Real time control object ves and imitations, normal, alert, emergency, in extremis, and restorative control reg mes, security assessment; optim zation Prerequis tes EEE 573 580, 587 or equ valent

774 Distribution Planning. (3) N
Advanced concepts in d stribut on p anning, optim za t on techniques, load forecasting, econom c decision analysis, computer appl cations Prerequ sites: EEE 578, QBA 522 or equ valent.

775 Power System Stability. (3) N
Dynam c performance analysis of interconnected power systems. Dynamic equ valents Direct and time doma n methods of ana ys s. Effect of nonl near ties Prerequis tes EEE 575, 577, 582 or equiva ent

Special Courses: EEE 484, 494, 498 499, 590, 591, 592 594, 598 599, 792 799. (See pages 33 34)

Engineering Core

ECE 102 Introduction to Engineering. (2) F, S
Orientation, d mens ons, and units, presentation of problems graph ca representat on and ana ys s of data error ana ys s and engineer ng est mations, typ cal problems in engineer ng d sciplines foundations of the des gn process and design projects Lecture and rec ta t on.

104 Engineering Graphics and Design. (2) F, S
Sketch ng, spatia visualization, descriptive geometry, and modern eng neering drawing pract ces for design app icat on ntroductory concepts of computer graph cs perta n ng to eng neering draw ng Six hours ecture-laboratory

122 Computer Programming. (2) F S, SS
Def n tion, formulation and flow chart ng, leading to the solut on of comp ex prob ems by dig tal computer, using Fortran. Computer so ution s requ red for projects Corequ site MAT 115. (Also sted as CSC 182).

210 Engineering Mechanics I: Statics. 3) F, S, SS
Force systems, resultants, equ ibrium, distributed forces, area moments, fluid stat cs, nternal stresses, fr ction, energy criter on for equil brium and stabi ity Prerequ site· PHY 115, 117; corequ site· MAT 274 or ECE 380. Lecture and rec tat on

304 Electrical Network and System Analogies. (4) F, S, SS
ntroduction to electric networks and to a unif ed treatment of linear umped parameter mode s of phys ca systems Prerequ sites MAT 274 or ECE 380, PHY 116 118

312 Engineering Mechanics II: Dynamics. (3) F, S SS
Kinematics and k net cs of particles, trans at ng and rotat ng coordinate systems, r g d body k nemat cs, dy namics of systems of partic es and rigid bodies energy

and momentum principles, vibration and time response dynamics of non r'g'd systems. Prerequisit e: ECE 210 Lecture and rec tation.

313 Introduction to Deformable Solids. (3) F, S SS
Analysis requirements equ ibrium, geometric compat - bi ity, force-deformat on re at ons concepts of stress and strain, transformation equat ons measurement of stra n, stress-strain-temperature relations. Applications n var ous eng neer ng disc p nes Prerequisites: ECE 210· MAT 274 or ECE 380. Lecture and recitation

334 Electronic Devices and Instrumentation. (4) F S, SS
App ication of e ectr c network theory to semi-conductor d screte and integrated circu ts. Electronic dev ce and circuit app cat ons, aboratory c rcu t de sign, test ng and ver f cat on Prerequ site ECE 304. Lecture and laboratory

340 Thermodynamics. (3 F, S, SS
Work, heat and energy transformat ons, re at onsh ps between propert es laws concepts and modes of ana ysis common to a l app ication ons of thermodynamics n eng neering. Corequ s tes. ECE 312; MAT 274 or ECE 380. Lecture and recitation

350 Structure and Properties of Materials. (3) F S SS
Bas c concepts of mater al structure and ts relat on to propert es Application to eng neering problems Corequisite· ECE 340 Lecture and recitat on.

351 Engineering Materials. (3) F, S
Structure and behavior of c vi engineer ng mater a s Laboratory nvest gat ons and test cr teria. Prerequis te ECE 313. Two ectures, 3 hours laboratory.

352 Semiconductors and Devices. (3) F, S
Crystal ine nature of so ids c assical and quantum mechan cal descr ption of solids excess carr ers n sem conductors, junct ons transistors and ntegrated circuits. Prerequ sites. ECE 334; MAT 274 or ECE 380.

380 Ordinary Differential Equations for Engineers. (3) F, S
F rst order equations second and higher order near equations, ser es so ut ons, Lap ace transforms nu mer cal solutions, boundary value problems Prerequ s tes· ECE 122 or CSC 182, MAT 272 or MAT 291 Lec ture and recitat on

382 Linear Algebra for Engineers. (2) F S SS
Matr ces and systems of inear equat ons, determ nants, vector spaces, and eigenva ue problems. Prerequ s te. MAT 272 or MAT 291

383 Probability and Statistics for Engineers. (2) F S, SS
Probab l ty random variab es, d screte and cont nuous d stribut ons, descr ptive stat st cs and sampl ng d s tr butions Prerequisite· MAT 272 or MAT 291

384 Numerical Analysis for Engineers. (2) F, S
Numer ca so ut on of a gebraic and transcendental equat ons, and systems of l near equat ons Numer ca ntegrat on Curve fitt ng Error bounds and error propagat on. Emphas s on use of d g ta computer Prerequi s tes ECE 122 or CSC 182, MAT 272 or MAT 291

386 Partial Differential Equations for Engineers. (2) F S
Boundary value problems, separat on of var ab es, Fourier series as app ied to 'nitia -boundary value prob lems Prerequis te. MAT 274 or ECE 380

400 Engineering Communications. (3) F, S, SS
Planning and prepar ng engineering pub ications and oral presentations, based on d rected ibrary research related to current engineering topics Prerequisite: Senior stand ng in chosen techn cal f e d and demon strated Engl sh prof c ency.

Industrial and Management Systems Engineering

IEE 300 Economic Analysis for Engineers. (2) F S
Econom c eva uat on of a ternat ves for engineer ng de cisions emphasizing the time va ue of money.

330 Introduction to Data Base Design. (2) S
Data structures and techniques w th spec a attent on to DBTG standards. Design mp ementat on, contro and case stud es of data management systems Prerequisite ECE 122 or CSC 182

362 Work Analysis and Design. 3) F
Ana ys s and des gn of man-mach ne systems, emphas s on work p ann ng methods measurement job evalua t on. App cat ons n diversif ed f e ds. Two lectures, 2 hours aboratory Corequ s te· MAE 351 or approval of instructor

372 Facilities Analysis and Design. (3) F
Ana ysis and des gn of man-mach ne systems emphas s on facil ties oca on fac it es design mater al handl ng automat on App cat ons n d versif ed f e ds, Two lec tures 2 hours aboratory Prerequ s te EE 300 Coreq u site· MAE 351 or approva of nstructor.

374 Quality Control. (3 F
In depth ana ys s of contro chart techn ques Organiza tion and manager a aspects of qua ty assurance At- tr bute and var able acceptance samp ing p ans Prereq u s te. ECE 383

411 Engineering Economy. (3) S, Moor
Cash f ow mode , pr c ng, econom c production charts, econom c balance analys s prof tabi ity mode s. Prereq u s te IEE 300

422 Information Systems Design. (3) F Ba ey Moor, Smith
The design of nformation systems, emphasiz ng human information processing and methods of nformation ga- ther ng

431 Engineering Administration. (3) F SS, Ba ey Hoyt, Moor
Eng neering organ zat on and adm n stration introduc t on to decis'on mak ng, quant tative and qua tative ap- proaches to management and eng neer ng admin stra t on

437 Human Resources Engineering. (3) F, Moor Young
Study of peop e at work, design ng for human perfor mance effectiveness and productiv ty Cons derat ons of human phys o ogica and psychologica factors Prereq u site EE 362 A so sted as PSY 437).

461 Integrated Production Control. (3 F, S Ba ley Bedworth, Macku ak
Product on contro techn ques for the p ann ng analy s s, contro and evaluation of operat ng systems T me series forecast ng, network plann ng, schedu ng and contro Prerequis te ECE 383

463 Computer-Aided Processes. (3) F Bedworth, Macku ak, Young
Equ pment and programm ng requirements of computer systems wh ch nteract w th external physica processes Computer A ded Manufactur ng (CAM) emphasis Two ectures 3 hours aboratory Prerequis te ECE 122 or CSC 182.

464 Computer Integrated Design Applications. 3) F Staff
Use of computer graph cs and CAD for ndustr al en

g neering applications: Facility layout and design, human factors engineering, CAM. Upper division credit on y Prerequisite· CSC 182 or equivalent.

473 System Applications of Linear Programming. (3) F; Dean, Smith
Linear programming in a systems context. Emphasis on design aspects of linear programming mode s for a variety of problems involving transportation, al ocation and total ndustrial systems Prerequisite. ECE 382 or MAT 242

474 Reliability Assessment Techniques. (3) S, Anderson, Dean, Ro lier
Distr'butions encountered in rel ability assessment. Reliability testing and analysis Availability and maintainabil ty analysis. Prerequisite. IEE 374.

475 Introduction to Simulation. (3) F, Mackulak, Young
Digital s mulation and its use in the analysis and design of discrete systems. Transaction and d screte event orientat ons 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 so ving decision prob ems such as queueing, inventory, and rep acement. Prerequ site: ECE 383.

492 Project in Design and Development. (3) F, S, SS
Indiv dual project 'n creative design and synthesis

500 Systems Research Methods. (3) S
Scientif c and systems methods as applied to master's and doctoral degree research

501 Foundations of Industrial Engineering I. (3) F, S
Techniques for the analysis and design of man-machine systems. Emphasis on work planning, methods, measurements, material handling and facility des gn Not available for I.E. graduate credit.

502 Foundations of Industrial Engineering II. (3) F, S
ntroduct on to quantitative production control techn ques. p ann ng, forecasting, nventory control and MRP, scheduling. Influence of CAD/CAM and automat on on production contro process Not avai able for I E. graduate credit. Prerequisite· ECE 383 or equivalent.

510 Measurement of Productivity. (3) F
The engineer ng econom c audit and its use with appl cations to break-even analysis, variable budget control cost analysis, and product pricing. Prerequis te· ECE 383

511 Analysis of Decision Processes. (3) F
Methods of making economic decis ons, statistical decis on theory, effects of r sk, uncertainty, and strategy on managerla econom c decis ons. Prerequ site ECE 383

520 Topics in Human Engineering. (3) S
Human physiolog cal and psychological factors in the des gn of work environments and n employment of people in man machine systems. Two ectures, 2 hours laboratory. Prerequ site· IEE 362

531 Topics in Engineering Administration. (3) S
Consideration g ven to philosoph cal, psychological, pol tica and socia implicat ons of administrative deci sions.

533 Scheduling and Network Analysis Models. (3) F
Applicat on of sequencing a gorithms, determ n st c and stochast c network analysis and f ow a gor thms Top cs nc ude CPM, PERT, GERT, GERTS, and QGERTS Prerequisite. ECE 383

560 Data Base Concepts for Industrial Management Systems. (3) S
App cation of data base concepts to industrial systems problems. Topics nc ude data structures and data base management software.

561 Production Control Information Systems. (3) S
Development of system designs for production control. Topics include material requirement planning, scheduling, sequencing, and inventory control. On-line design concepts are covered

563 Systems Analysis for Distributed Systems. (3) N
Analysis and design of distributed systems for computer integrated manufacturing and information processing. Concepts of host driven microprocessors to collect, store and communicate data. Prerequisite: IEE 560 or approval of instructor.

564 Planning for Computer Integrated Manufacturing. (3) F
Theory and use of IDEF methodology in planning for flexible manufacturing, robotics, and real-time control. Simulation concepts applied to computer integrated manufactufing planning. Prerequisite: IEE 475 or approval of instructor.

565 Computer Integrated Manufacturing Research. (3) N
Determination and evaluation of research areas in computer integrated manufacturing including real-time soft ware, manufacturing information systems, flexible and integrated manufacturing systems, robotics, computer graphics. Prerequisite: IEE 463 or approval of instructor.

566 Simulation in Computer Integrated Manufacturing Planning. (3) S
Use of simulation in the planning of computer integrated manufacturing planning related to robotics, flex ble and integrated manufacturing systems. Use of computer graphics combined with simulation analysis for CIM decision support. Prerequisite. IEE 475 or approval of instructor.

567 System Simulation. (3) S
Use of simulation in the analysis and design of systems invo ving continuous and discrete processes, simulation languages; statistical aspects of simulation. Prerequisite· IEE 475

569 Nonparametric Statistical Inference. (3) S
Application of statistical inference procedures, based on ranks, to engineering problems. Efficient alternatives to c ass cal statistical inference constrained by nor mal ty assumptions Prerequisite. ASE 485.

570 Advanced Quality Control. (3) F
Stat stical des gn of sampling plans and procedures for attributes and variables data; operating characteristic curves, federal specifications and standards of quality. Prerequis te. IEE 374 or approval of instructor.

572 Engineering Statistics. (3) F
Analysis of variance and exper mental design. Topics nclude general design methodology, incomplete blocks, confounding, fractional replicat on, response surface methodology. Prerequ'site. ASE 485.

574 Applied Deterministic Operations Research Models. (3) F
Formulation, solution, analysis and application of deter ministic models in operations research, including those of inear programming, integer programming, and non-l near programming Prerequisite· ECE 382 or MAT 242.

575 Applied Stochastic Operations Research Models. (3) S
Application of stochastic models including inventory theory, queueing theory, Markov processes, stochastic programming, and renewal theory. Prerequisite: ECE 383.

576 Applications of Operations Research. (3) F
Case studies of application of linear and non-linear models and general types of search techniques Prerequisites IEE 574 or approval of instructor.

577 Information Systems Methodology. (3) F
Systems approach to the analys s, design and implementation of management systems Emphasis is on genera ized techniques. Concern g'ven to questions of user perceptions and systems effectiveness.

578 Advanced Decision Theory. (3) S
Advanced dec s on theory techniques for industr al sys tems. Topics include conjugate fami es of distr butions, value theory dec sions w th mu tiple objectives and goa programm ng Prerequ site: EE 511.

579 Time Series Analysis and Forecasting. (3) F
Forecasting t me ser es by the Box-Jenk ns and ex ponential smoothing techniques· ex st ng digital com puter programs are ut l zed to augment the theory Pre requisite· ASE 485.

Special Courses: IEE 484, 494 498 499, 590, 591 592, 598, 599, 784 790, 792 799 (See pages 33 34.)

Mechanical and Aerospace Engineering

MAE 315 Mechanics Laboratory. (2 S
Exper ments and demonstrat ons re ated to mechan cal systems Dig ta methods of data ana ysis One ecture, 2 hours laboratory. Corequ sites: ECE 312 313

317 Dynamic Systems and Control. (4) F S
Model ng and representations of dynamic phys ca systems: transfer funct ons b ock diagrams, state equations. Trans ent response. Pr nc ples of feedback control and near system ana ysis nc uding root ocus and frequency response. Introductory analog computer ab oratory. Prerequ sites ECE 304, 312

333 Internal Combustion Engines. (3) S, Ditsworth, Wood
Performance characteristics, combust on, carburetion, cool ng, and control of nternal combustion engines Prerequ site· MET 381 or 382 or approval of instructor

336 Air Conditioning and Refrigeration. (3) F; Wood
Refrigerat on cycles, refr gerant properties, heating, coo ing loads; psychrometry pur fication; temperature and humidity control Prerequisite. MET 381 or MAE 382 or approva of instructor

341 Kinematics and Force Analysis in Machinery. (3) F
Positions ve oc t'es, and acce erations of mach ne parts; cams, gears, flex b e connectors, roll ng contact· introduct on to synthes s. Prerequis te ECE 312

351 Production Processes. (3) F S
Production techniques and equipment Casting and mold ng pressure forming, mater al removal, jo n ng and assembly processes, automation and mater al han d ing. Prerequis te. ECE 104 or GRC 111.

355 Introduction to Metallurgy. (3) S
Elements of the structure of metals and alloys measurement of mechan ca properties, and optica metal ography. Fie d tr ps Lecture and laboratory. Prereq u site. CHM 114

371 Fluid Mechanics. (3) F, S
ntroductory concepts of flu d mot ons f uid stat'cs· control vo ume forms of basic pr nc'ples; introduction to loca pr ncip es Prerequ sites ECE 312, 340

372 Fluid Mechanics. (4) F, S
Appl cat on of bas c principles of fluid mechanics to prob ems n viscous and compress ble flow. Laboratory exper mentation and demonstrat ons. Prerequisites· ECE 122, 386 MAE 371.

382 Thermodynamics. (3) F S
App ied thermodynamics, gas mixtures, power cycles and reactive systems Laboratory experimentat on and demonstrat ons. Prerequis te· ECE 340

402 Introduction to Continuum Mechanics. (3) F· Rank n
App icat on of the princ ples of cont nuum mechanics to such fie ds as f ow n porous med a meteorology, biomechanics e ectromagnetic continua, magneto-flu d mechan cs. Prerequis tes ECE 313, MAE 371.

403 CAD/CAM. (3) F; McNei , Davidson, Rank n
Deve op new software use ex st ng software to aid n the des gn and manufactur ng of mach ne parts, PC boards etc Prerequ sites. ECE 122 and junior standing n eng neering.

404 Finite Elements in Engineering. (3) S B ckford Rank n
Introduct on to deas and methodology of fin te element ana ys s App cat'ons to so d mechanics, heat transfer, f u d mechan cs, vibrat ons Prerequ s tes. MAT 242, ECE 313.

405 Microcomputer-Aided Processes for Mechanical Engineers. (3) F, S H r eman, Cooperr der
M crocomputer and m croprocessor fundamentals. Ov erv ew of programm ng anguages, nput/output, nter fac ng and ana og/digital conversion data acquis t on control app icat ons Prerequ s te. ECE 122 or CSC 100.

410 Acoustics and Noise Control. (2) S; Wallace
Acoust c ana ysis and design Acoustic fatigue of aero space structures Aircraft traff c and ndustr al no se control Env ronmenta no se standards Arch tectural acoust cs. Prerequis te· PHY 116

413 Intermediate Dynamics. (3) S Avery
Rotating reference frames Lagrange s and Eu er's equat ons, gyroscop c mot on, aerospace veh c e fl ght mechan cs. Prerequis te. ECE 312.

415 Vibration Analysis. (3 F, S, Staff
Free vibrat on and forced response of single and mul t ple degree of freedom systems normal modes random vibrat ons. Lecture and aboratory Prerequi- s te ECE 313

417 Control System Design. (3) S; Limbert Cooperr der
Too s and methods of control system des gn and compensat on. s mu at on, response opt m zat on, frequency doma n techniques, state var able feedback, sensit vity ana ys s. ntroduction to non near and discrete t me systems Prerequ s te· MAE 317

418 System Identification. (3) N L mbert, Cooperrider
Transform methods for general zed system response. impulse convolution ntegral, frequency response random s gna response. Exper menta methods· frequency response, pu se testing, random signals para meter track ng mu t ple regress on and least squares. Prerequis te MAE 317

419 Vehicle Dynamics. (3) F; Cooperr der
ntroduct on to ground veh c e dynam cs Road and ra vehicles Roll ng contact suspens on dynam cs rid ng behav or road vehic e hand ing ra' veh cle stab l ty and gu dance. Prerequ s tes· ECE 312 MAE 317 or 415.

422 Mechanics of Materials.(3) F, S
Fai ure theories, energy methods, f n te element meth ods, p ates, rings, torsion of non-circular members, unsymmetrica bend ng, shear center, beam co umn. Lec ture and aboratory Prerequis te ECE 313.

426 Aerospace Structures. (3) S Avery
Loads, ana ys s of str nger-skin members, pressure ves sels rings, ribs and frames; ult mate ana ys s, buck ing tens on f e d beams, matr x methods Prerequis te: MAE 422.

430 Introduction to Nuclear Engineering. (3) F; Florschuetz, Roy
Neutron interact ons w th matter. Princip es of neutron cha n reacting systems. Neutron diffusion and moderation Heat removal from nuclear reactors Point reactor kinetics. Prerequisite PHY 361. (Also listed as EEE 460)

431 Nuclear Reactor Theory I. (3) N, Roy
Neutron transport theory, diffusion theory, applications. Reactor kinetics, app ications. Reactivity, interdependence between neutron cs and therma hydraul cs. Prerequis te· MAE 430.

433 Nuclear Plant Systems Design. (3) S, Florschuetz, Roy
Re evant thermodynamic cycles Conceptual design of commerc al f ss on-reactor systems (l ght water reactors, gas-coo ed reactors, fast breeder reactors) and fus on reactor systems Emphas s on thermal hydrau ic aspects. Prerequ sites· ECE 340; MAE 430.

435 Turbomachinery. (3) S, Logan
Design and performance of turbomachines including steam, gas and hydraul c turb nes, centrifugal pumps, compressors, fans and blowers Corequ sites· MAE 372, 382.

436 Combustion. (3) N; Hirleman, So, Wood
Thermodynam cs and chem cal kinet cs of combust on. Structure, propagation and stability of flames Ignition theor es; droplet and sol d part c e combust on Pol u tant formation. Prerequ site· MAE 382

437 Direct Energy Conversion. (3) F; Jacobson
Unconvent ona methods of energy conversion; fuel cel s, thermoelectrics, thermionics, photovoltaics, and magnetohydrodynamics. Prerequisites. ECE 340, 350

438 Solar Energy. (3) S; Evans, Wood
Solar radiation and nstrumentation, design and test ng of collectors, performance analyses of systems, thermal storage, photovolta cs, materia s and economic analy sis. Prerequisites: MAE 382, 488.

441 Principles of Design I. (3) F, S
Des gn procedures; use of fundamenta s to mode and analyze design problems, material failure modes and other design criteria, applications to se ected components. Prerequis tes· ECE 313, 350.

442 Principles of Design II. (3) S
Continuation of MAE 441 Application of engineer ng principles and techniques to the design of mechanical systems and components Model ng and design w th mechanical, electrica , hydrau ic and pneumatic com ponents. Prerequ site· MAE 441.

443 Engineering Design. (3) F, S
Group projects to design engineer ng components and systems. Prob em definit on deation, mode ing and analysis, dec sion mak ng and communication activities emphasized S x hours aboratory. Prerequisites· MAE 441; three of MAE 415, 422, 382, 317, 372, 488.

446 Thermal System Design. (3) A, Evans, Florschuetz, McNeil , Metzger, R ce, Wood
Appl cation of thermodynam cs f uid mechanics and heat transfer to the des gn of heat exchangers, cooling towers, power plants, and turbine engines. Steady state system simulation techniques studied. Prerequisites. MAE 382, 488.

447 Robotics and Its Influence on Design. (3) N; Dav dson Limbert
Robot app icat ons configurations, s ngular positions, and work space; modes of control; vision; programming exerc ses, design of parts for assembly Prerequisite: MAE 317.

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. Prerequ site· ECE 350

452 Manufacturing Engineering. (3) F; Shaw
Ana ysis and optimization of manufacturing processes. Prerequisite· MAE 351

453 Corrosion and Corrosion Control. (3) F; Hendrickson
Introduction to corrosion mechanisms and methods of preventing corros on. Topics· electrochemistry, polarization, corrosion rates, oxidat on, coatings, cathodic protection Prerequisite. ECE 350.

455 Physical Metallurgy. (4) F; Hendrickson, Stanley
Crystal structure and defects. Phase diagrams, metallography, sol dification and casting, deformation and anneal ng. Three lectures, 3 hour laboratory. Prerequisite: ECE 350.

460 Gas Dynamics. (3) N; Hassan, Logan, Jankowski, L u
Compress ble flow at subsonic and supersonic speeds; duct flow; normal and oblique shocks, perturbation theory Prerequisite. MAE 371.

461 Aerodynamics. (3) F; Hassan, Logan, Jankowski, L u
Aerodynam c characterist cs of airfoils, airfoils and wing body combinations in compressible flows; linearized theory of subsonic and supersonic flows; numerical techniques. Prerequisites· MAE 371; corequisite MAE 460

462 Dynamics of Flight. (3) F, Rajan, Logan
Aerodynamic forces and moments, static stability and control, equations of motion, stability derivatives, lateral and longitudinal mot on and control. Prerequisite: MAE 413

463 Propulsion. (3) F; Evans, Logan
Performance analysis of propulsion systems including turbojet, fanjet and turboprop engines, solid and liquid-fueled rockets, and ion propulsion devices. Prerequis te. MAE 460.

464 Aerodynamics Laboratory. (2); Hassan, Jankowski
Measurements of aerodynamic parameters in both subsonic and supersonic flows, flow over airfoils, wedges, and cones. Prerequisite: MAE 460; corequisite: MAE 461. Six hours laboratory

468 Aerospace Systems Design. (3) S
Prerequ sites. MAE 413, 426, 461, 463.

471 Numerical Fluid Mechanics. (3) S; Jankowski, Neitzel, Liu
Numerical solutions for selected problems in fluid mechanics. Prerequisite. MAE 372.

474 Dynamic Meteorology I. (3) F; Rankin
Basic equations of atmospheric motions, scale analysis, atmospheric and baroclinic models Prerequisites: ECE 380 or MAT 274, MAE 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: MAE 474.

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. Prerequisite: MAE 371.

489 Statistical Thermodynamics of Energy Systems. (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: MAE 382, ECE 334; corequisite: MAE 488. One hour lecture/three hours laboratory.

492 Projects. (2) F, S
Small group projects in fundamental or applied aspects of engineering; emphasis on experimental solutions to complex problems. Prerequisites: MAE 488; either MAE 491 or MAE 455. 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.

502 Computation Methods in Engineering Science. (3) F
Utilization of documented computer programs. Application in analysis, design and computer graphics.

503 Engineering Structures and Systems. (3) F
Principles of dimensional analysis and similitude with application to a wide variety of problems from several fields of engineering.

504 Laser Diagnostics for the Thermal Sciences. (3) S
Fundamentals of lasers and light scattering, laser velocimetry, particle and droplet sizing.

505 Perturbation Methods in Mechanics. (3) N
Nonlinear oscillations, strained coordinates, renormalization, multiple scales, boundary layers, matched asymptotic expansions, turning point problems, WKBJ method.

506 Advanced System Modeling, Dynamics, and Control. (3) F
Lumped-parameter modeling of physical systems with examples. State variable representations and dynamic response. Introduction to modern control. Prerequisite: MAE 317 or approval of instructor.

507 Modern Control Theory and Applications. (3) S
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: MAE 506.

511 Acoustics. (3) F
Principles underlying the generation, transmission and reception of acousitc waves. Applications to noise control, architectural acoustics, random vibrations, acoustic fatigue.

512 Acoustics Laboratory. (2) F
Experiments and measurements associated with architectural acoustics and noise control. Lecture and laboratory.

513 Advanced Dynamics. (3) F
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
Free vibration and forced response of discrete elastic systems. Finite elements. Analytical and computer methods of solution. Random vibrations. Prerequisite: MAE 415.

516 Vibrations: Continuous Systems. (3) F
Free vibration and forced response of continuous elastic systems. Variational methods. Exact and approximate methods of solution. Wave propagation. Prerequisite: MAE 415.

518 Dynamics of Rotor-Bearing Systems. (3) S
Critical speed and response analysis of rigid and flexible rotor systems. Bearing influence and representation. Stability analysis. Methods of balancing.

520 Continuum Mechanics. (3) F
Methods of continuum mechanics with applications to current research.

522 Variational Principles of Mechanics. (3) S
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
Large deflection and bending of plates. Membrane theory of shells. Bending theory of cylindrical shells. Shells of revolution. Approximate methods. Prerequisite: ECE 386 or MAT 462.

524 Theory of Elasticity. (3) F
Analysis of stress and strain in three dimensions. General theorems. Plane elastostatic problems. Bending and torsion, thermoelasticity, axi-symmetrical problems. Applications. Prerequisite: ECE 386 or MAT 462.

526 Biomechanics. (3) S
Mechanics of the human body. Mechanical and physical properties of tissues. Application to fields of interest including joint replacement, sports medicine.

527 Finite Element Methods in Engineering Science. (3) F
Discretization, interpolation, elemental matrices, assembly, computer implementation. Application to solid and fluid mechanics, heat transfer, time dependent problems. Prerequisite: ASE 582.

528 Fracture Mechanics. (3) F
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
General concepts; stability of discrete and continuous systems. Torsional and lateral buckling of thin plates. Dynamic justability. Prerequisite: ECE 386 or MAT 462.

532 Nuclear Reactor Theory II. (3) N
The neutron transport equation. One-speed transport theory. Neutron thermalization. Resonance absorption. One-group and multi-group problems. Reactor dynamics. Burnup problems. Prerequisite: MAE 431.

534 Reactor Design. (3) N
Heterogeneous reactor systems, perturbation theory, fuel burn-up. Introduction to transport theory. Kinetics, controls and feedback methodology. Prerequiste: MAE 532.

536 Combustion. (3) N
Kinetic theory, chemical kinetics and reaction rate theories. Ignition theories; droplet, coal and fluidized bed combustion. Laser diagnostics in combustion. Prerequisite: MAE 436 or approval of instructor.

544 Mechanical Design and Failure Prevention. (3) F
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: MAE 443.

547 Mechanical Design and Control of Robots. (3) N
Homogeneous transformations, three-dimensional kinematics, geometry of motion, solving kinematic equations, differential relationships, motion trajectories, dynamics, control, static forces.

548 Mechanism Synthesis and Analysis. (3) S
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.

550 Theory of Crystalline Solids. (3) F
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
Defect production and annealing. Irradiation enhanced diffusion. Irradiation embrittlement and swelling. Prerequisite: MAE 450.

553 Advanced Materials Characterization. (3) S
Analytical instrumentation for characterization of materials: SEM, SIMS, Auger, Analytical TEM and other advanced research techniques.

554 Metallurgical Thermodynamics and Kinetics. (3) S
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
Identification of types of failures. Analytical techniques. Fractography, SEM, nondestructive inspection, metallography. Mechanical and electronic components. Prerequisite: ECE 350.

557 Mechanics of Composite Materials. (3) S
Analysis of composite materials with applications. Micromechanical and macromechanical behavior. Classical lamination theory developed with investigation of bending-extension coupling.

558 Polymer Structure and Properties. (3) F
Relationships between structure and properties of synthetic polymers: glass transition, molecular relaxations, crystalline state, viscolasticity, morphological characterization, processing.

559 Electon Microscopy: Physics and Materials Analysis. (3) S
Microanalysis of the structure and composition of metals, semiconductors and ceramics using images, diffraction, and X-ray and energy loss spectroscopy.

560 Propulsion Systems. (3) N
Principles of gas dynamics with application to propulsion-system components. Air-breathing and chemical rocket engines.

565 Turbomachinery. (3) N
Design and performance of turbomachines including turbines, compressors, pumps, fans and blowers.

571 Fluid Mechanics. (3) F
Basic kinematic, dynamic and thermodynamic equations of the fluid continuum and their application to some basic fluid models.

572 Fluid Mechanics. (3) N
Continuation of unified treatment of MAE 571 emphasizing compressible and turbulent flows. Prerequisite: MAE 571.

573 Turbulence. (3) N
Prediction methods and experimental results for turbulent shear flows. Introduction to research methods and survey of current research activity. Prerequisite: MAE 571.

574 Mechanics of Viscous Fluids. (3) N
Laminar and turbulent incompressible fluid flows. Solution methods for boundary layers and occurrence of separation. Consideration of more general incompressible flows. Prerequisite: MAE 571.

575 Mechanics of Viscous Fluids. (3) N
Laminar and turbulent compressible fluid flows. Solution methods for velocity and thermal boundary layers and for some more general fluid flows. Free shear flows, boundary layer control, and unsteady fluid flows. Prerequisite: MAE 574.

576 Dynamic Meteorology. (3) S
Applications of fluid mechanics to atmospheric motions, diffusion processes and pollution modeling.

577 Turbulent Flow Modeling. (3) S
Reynolds equations and their closure. Modeling of simple and complex turbulent flows, calculations of internal and external flows and application to engineering problems. Prerequisite: MAE 571.

581 Thermodynamics. (3) F
Basic concepts and laws of classical equilibrium thermodynamics. Introduction to statistical thermodynamics. Applications to engineering systems.

582 Thermodynamics. (3) S
Continuation of MAE 581, including statistical and irreversible thermodynamics. Prerequisite: MAE 581.

583 Direct Energy Conversion. (3) N
Advanced selected topics in direct energy conversion, theory, design and applications. Prerequisite: MAE 581.

585 Heat Transfer. (3) F, S
Basic equations and concepts of heat transfer; applications to conductive, convective and radiative heat transfer. Prerequisite: MAE 488.

586 Heat Transfer. (3) S
Continuation of MAE 585, emphasizing convection heat transfer. Prerequisite: MAE 585.

587 Heat Transfer. (3) F
Continuation of MAE 585, emphasizing radiative heat transfer. Prerequisite: MAE 585.

594 Graduate Research Conference. (1) F, S
Topics in contemporary research. Required every semester of all Mechanical and Aerospace Engineering graduate students registered for 9 or more semester hours. Not for degree credit.

598 Special Topics. (1-3) F, S
Special topics courses, including the following which are regularly offered, are open to qualified students.

(a) Dynamics and Control
(b) Two-Phase Flow.
(c) Hydrodynamic Stability.
(d) Combustion Diagnostics.
(e) Aerodynamics
(f) Aeroelasticity

Special Courses: MAE 484, 494, 499, 500, 590, 591, 592, 598, 599, 792, 799. (See pages 33-34.)

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 and PHI 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; emphasis on methodology used to solve engineering problems. (Not for engineering degree credit.) Prerequisite: algebra.

310 Man and Machine. (2) S
Impact of technology as t extends and l mits ndiv dual se f determ nation Humanistic and mechanistic ap-proaches to understand ng ndiv dual dent ty. (Also l sted as HUP 310 and PHI 321.)

311, 312 Science and Technology in History I, II. (3 3) F, 311; S, 312
Development and appl catıons of sc ent f c knowledge and ts effects on human asp rations and values, from ancient t mes through ndustria Revolut on to pres ent. STE 311 ıs not a prerequ site for STE 312 (Also sted as HUP 311, 312 and PHI 322, 323)

402 Technology, Society and Human Values. (3) F S, SS We ch Stadmil er
Values wh ch motivate mank nd to create techno ogy. Areas of conf ct and resolut on between basic human va ues and techno og cal soc ety Reading and d scus-s on w th v s ting ecturers. (Also ısted as HUP 402 and PH 407. Prerequ site. jun or standing

411 Social Effects of Invention. (3) N, We ch Pastin
The role of science and nvent on, private sector and public sector n the deve opment and appl cation of techno ogy Persona and publ c respons b'lity of scien tists and engineers Prerequ site Jun or standing. (Also l sted as HUP 411 and PH 408).

Special Courses: STE 484 494, 498, 499 591.

Division of Technology

_____, Director

Purpose

The Division of Technology provides the opportunity for students to prepare themselves as technologists and industrial educators. The degree programs offered prepare students to be members of the total technology team com prised of scientists, engineers, technologists and technicians. The programs in teacher edu cation prepare students for instructional and administrative positions in secondary and post secondary educational institutions, technical institutions and industry.

The Division of Technology offers the following majors.

Engineering Technology
Industrial Technology
Computer Engineering Technology
Microelectronic Technology
Industrial Vocational Education

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. Within the majors approved by the Arizona Board of Regents (see above), the academic units within the Division of Technology offer the following areas of concentration:

Department of Aeronautical Technology
Aeronautical Engineering Technology
Aeronautical Industrial Technology

Department of Electronics and Computer Technology
Electronic Engineering Technology
Computer Engineering Technology (major)
Microelectronic Engineering Technology (major)

Department of Industrial Technology
Graphic Communications Engineering Technology
Graphic Communications Industrial Technology
Industrial Supervision
Technical Teacher Education
Vocational Teacher Education

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 205 and 206 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. Refer to page 210 for the approved list from which courses may be selected. Additionally, the Division requires 12 hours of science and mathematics and 8 hours of electives to fulfill the General Studies requirements.

General Information

See pages 18 22 and 36 for information regarding requirements for admission, transfer, retention, disqualification, and reinstatement.

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, mathematics, department core and field of specialization courses.

Department of Aeronautical Technology

ASSOCIATE PROFESSORS:
REED (TC 203), ROPER

ASSISTANT PROFESSORS:
BENDER, CARLSEN, NICHOLS, PEARCE, SALMIRS, SCHOEN

The Department of Aeronautical Technology provides two concentrations: Aeronautical En gineering Technology and Aeronautical Indus trial Technology, which prepare the graduate for entry into the aerospace industry in imme diately productive professional employment, or for graduate study. These curricula emphasize the recognized principles underlying the appli cations 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.

Aeronautical Industrial Technology includes two separate areas of emphasis:

Air Transportation Flight Technology
Air Transportation Management Tech nology

The two degree programs in Aeronautical Technology build upon a core of courses which are common to both and all areas of emphasis:

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 Mater als	3
MET	121	Prob em Solving	3
GRC	111	Technical Graphics	2
ELT	200	Applied Electr city/ Electronics	3
GRC	420	Technica Writing	3
AET	180	Aerospace Structures and Materia s	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 E ectronic 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 concentration, is necessary to qualify for graduation. Students planning to begin course work at another insti tution should consult an Aeronautical Tech nology 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 tech nologist 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 combus tion engines, combustion processes, tur bomachinery, 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 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: ELT 201, MAT 261; MET 116, 310, 311, 360, 380, 381, 407; AET 301, 309, 310, 414, 415, 417, 472, 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 ad visor.

Suggested Course Pattern for Freshmen

Fall Semester

			Semester Hours
ENG	101	Freshman Composition	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	Freshman Composition	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 combines 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 of 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 ad visor.

Suggested Course Pattern for Freshmen

Fall Semester

			Semester Hours
ENG	101	Freshman Composition	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	Freshman Composition	3
AET	181	Aerospace Systems	3
AET	183	Private Pilot Certificate	1
MET	101	Manufactur ng 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 prepare graduates for managerial and supervisory positions within the air transportation industry. 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 curricula.

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: AET 303, 311, 384, 391, 410, 411, 488, 489, 490; ACC 211, 212; 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 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	Freshman Composition	3
AET	180	Aerospace Structures and Materials	3
MAT	115	College Algebra and Trigonometry	4
MET	101	Manufacturing Processes and Materials	3
ACC	211	Elementary Accounting	3
Total Credit Hours			16

Spring Semester

ENG	102	Freshman Composition	3
AET	182	Aerospace Systems	3
MET	121	Problem Solving	3
PHY	111/ 112	General Physics	4
MAT	260	Technical Calculus I	3
Total Credit Hours			16

Department of Electronics and Computer Technology

PROFESSORS:
KANNEMAN (TC 301A)
ASSOCIATE PROFESSORS:
McCURDY, McHENRY, STRAWN, B.G. WOOD
ASSISTANT PROFESSORS:
EDWARDS, PETERSON, LICHT (Visiting)

Electronics and computers permeate every facet of our life as technology continues to serve mankind. These fields provide challenging career opportunities for the forward looking student. 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 including the concepts and applications of calculus. Utilizing 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 customer support to technical products and systems.

The Department of Electronics and Computer Technology offers three majors: Computer Engineering Technology, Microelectronic Engineering Technology and Engineering Technology with a concentration in Electronic Engineering Technology.

The Electronic Engineering Technology concentration emphasizes applied electrical science and electronics with emphasis areas in communication systems, digital systems, and electrical systems. The Computer Engineering Technology major combines applied electronics and computer hardware-software concepts and applications. The Microelectronics Engineering Technology major combines ap-

plied electronics, monolithic and hybrid integrated circuit processing and applications, and device and component fabrication and manufacturing. All three are directed to technical careers in industry, education or government, in support of engineering functions. Engineering technologists often need a basic background in business operations as well as background in applied mathematics, basic science, communications, humanities and social sciences. For students interested in a business emphasis, several supporting courses in business administration are recommended.

Several cooperative education and internship programs are available. These programs consist of formal agreements between the Department of Electronics and Computer Technology and electronics industries. Cooperative programs usually involve students at the junior or senior level in electronics/computers, 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 enrollment at ASU and part-time employment at a participating company. Graduation is usually extended by one or more semesters for either type of program. The department offers a rotational selection of evening courses to serve the part-time student.

A Master of Technology degree program, with a concentration in Electronics Engineering Technology is available for qualified B.S. graduates.

Courses offered by the Department of Electronics and Computer Technology are listed in the course section of the catalog, and are organized under the following course prefixes:

ELT: Electronic Technology

EET: Electronic Engineering Technology

CET: Computer Engineering Technology

UET: Microelectronics Engineering Technology

To aid freshmen and transfer students in planning their program, a suggested two-year pattern of courses applicable to all programs in the department is shown below. Complete curriculum and four-year course patterns for each B.S. degree program offered by the department are available from the department. Direct entry to any of the programs as a freshman student assumes three (3) years of high school math (Algebra I, II and Geometry). One year each of high school chemistry and physics is recommended. Students without the required math background must take appropriate deficiency courses prior to entry, or immediately upon enrollment at ASU. Associate degree transfer students are expected to have completed college algebra and trigonometry (MAT 115 or equivalent). See pages 18-22 and 36 for information regarding requirements for admission, transfer, retention, disqualification and reinstatement. Graduation requirements are covered in the Division of Technology section.

Suggested Course Pattern for First Two Years:

Freshman Year

First Semester			
ENG	101	Freshman Composition	3
MAT	115	Coll. Alg. & Trig.	4
MET	101	Man. Proc. & Mat.	3
GRC	111	Tech. Graphics	2
MET	121	Prob. Solving	3
		Total	15
Second Semester			
ENG	102	Freshman Composition	3
PHY	111	Gen. Physics I	3
PHY	113	Gen. Physics Lab I	1
MAT	260	Tech. Calc. I	3
CSC	182	Elem. FORTRAN Prog.	2
ELT	202	App. Elec. Sci.	3
ELT	203	App. Elec. Sci. Lab	1
		Total	16

Sophomore Year

First Semester			
PHY	112	Gen. Physics II	3
PHY	114	Gen. Physics Lab II	1
ELT	210	Active Devices	3
ELT	211	Elect. Cir. Lab I	1
ELT	208	Elec. Circuits	3
COM	100	Intro. Hum. Comm.	3
MAT	261	Tech. Calc. II	3
		Total	17
Second Semester			
UET	215	Elect. Fab. Prin. I	2
ELT	220	Elect. Ckts/Sys	3
ELT	221	Elect. Syst. Lab	1
CET	250	Dig. Sys. & Microproc.	3
CET	251	Dig. Sys. & Micro. Lab	1
ECN	201	Prin. Econ	3
		Hum/Soc. Science Elective	3
		Total	16

All departmental curricula are organized into specialty areas and general studies courses for a total of 130 semester hours mini-

mum. A minimum of 50 upper division hours are required, including at least 24 semester hours of ELT, EET, CET, or UET upper division hours to be taken at ASU. The specialty area must include appropriate upper division laboratory work (4-6 semester hours or equivalent). Complete program of study guides with typical four year patterns are available from the department for each program.

The specialty area consists of 84-85 semester hours, which for all programs require the following 28-hour common departmental core:

Common Department Core (28 semester hours)

GRC	111	Technical Graphics	2
MET	121	Problem Solving	3
MET	101	Manufacturing Processes and Materials	3
GRC	420	Technical Writing	3
ELT	202	Applied Electrical Science	3
ELT	203	Applied Electrical Science Lab	1
ELT	210	Active Devices	3
ELT	211	Electronic Circuits Lab I	1
ELT	208	Electric Circuits	3
UET	215	Electronics Fabrication Principles I	2
ELT	330	Electronic Instrumentation	2
ELT	331	Instrumentation Lab	1
ELT	496	Professional Orientation	1
		Total	28

The remaining 56-57 semester hours in the specialty area are special requirements of each major/concentration and are listed under the individual program descriptions.

The courses required in the general studies area common to all departmental programs are listed below.

General Studies (45-46 semester hours minimum)

ENG	101	Freshman Composition	3
ENG	102	Freshman Composition	3
		or ENG 105 Advanced Freshman Composition (3)	
Humanities and Fine Arts Electives*			6-10
Social and Behavioral Sciences Electives*			10-6
		Required: ECN 201 Principles of Economics (3) COM 100 Introduction to Human Communication (3)	
MAT	115	College Algebra and Trigonometry	4
MAT	260	Technical Calculus I	3
MAT	261	Technical Calculus II	3
PHY	111	General Physics I	3
PHY	113	General Physics Lab I	1
PHY	112	General Physics II	3
PHY	114	General Physics Lab II	1
CSC	182	Elements of Fortran Programming	2
PHY	460	Elements of Atomic Physics (3)	
	or	CHM 114 General Chemistry for Engineers (4)**	3-4
Total			45-46

*See page 210 for specific requirements and approved list.

**CHM 114 (or 113 and 116) is required for the Microelectronics Engineering Technology program.

In addition to the standard programs outlined above, some flexibility is available through the use of general studies electives, approved general electives and technical electives which allows students to take courses in business administration. Recommended courses are listed below, totaling 27 hours. This set of courses satisfies the College of Business Administration core entrance requirements for the M.B.A. for qualified graduate students.

Recommended Business Courses: ECN 201, 202; QBA 221; MGT 301; FIN 300; MKT 300; ACC 211, 212; ADS 305. (ECN 201 is required in the departmental general studies area; ECN 202 may be selected as a general studies elective).

Electronic Engineering Technology

(An engineering technology bachelor's degree program accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (TAC/ABET).)

The Electronic Engineering Technology concentration is available to students interested in applied electronics with emphasis on established electronic engineering design principles and application. This program is designed primarily to prepare students for employment in technical positions in industry, government or education in engineering-related activities. The program is also designed to interface with associate degree graduates in electrical/electronic technology.

The graduate typically finds employment in most major industries at various levels of responsibility including research and development support, design support, product

support, process control, fabrication, production, testing and evaluation, technical writing, test equipment and field engineering.

The program elements are summarized below.

1 General Studies	45
2. Common Departmental Core	28
3. Program (E ET) Core	24
4. Emphasis Area	27
5 Approved General Electives	6
Total min sem. hours	130

Specific requirements for categories 3 and 4 are listed below. Categories 1 and 2 are detailed in the introductory material for the department.

The required courses in the core (category 3) are:

EET	301	Electric Networks I	3
EET	310	Electron'c Circuits	3
EET	311	Electronic Circuits Lab II	1
EET	400	Electric Networks II	3
EET	472	Communication Systems	3
CET	350	D gital Log c Principles	3
UET	414	Appl ed Material Science for Electronics	3
UET	415	Electronics Fabrication Pr'nciples II	2
EET	483	Applied Calculus	3
		Total min. sem hours	24

Area of Emphasis (Category 4). The student must select an area of emphasis according to career interests within the field of electrical electronics. Each area of emphasis consists of 27 hours in an approved pattern which must include the equivalent of 4 6 hours of approved upper-division design-laboratory units in addition to laboratories required in categories 2 and 3. Required courses comprising the approved areas of emphasis are listed below:

Communication Systems Technology Emphasis:

Required Courses: EET 404, 470, 471, 476, 477; CET 250, 251 or 454, 455; CET 473, 475; plus an additional 8 hours of approved upper division technical electives.

Digital Systems Technology Emphasis:

Required Courses: CET 351, 452, 453, 454, 455, 456; EET 422, 423; plus an additional 11 hours of approved upper division technical electives.

Electrical Systems Technology Emphasis:

Required Courses: EET 340 or 440 or ELT 380; EET 406, 407, 430, 431; ELT 220, 221, or EET 460, 461; CET 408 or 486; CET 250, 251 or 454, 455; plus an additional 6 hours of approved upper division technical electives.

Computer Engineering Technology

The Computer Engineering Technology major is available to students interested in the applications and operations aspects of computer hardware and software. To support this combined hardware software emphasis, the program curriculum includes a basic electronics component, a hardware software oriented component, a software/programming component and a supporting area component which may be used to strengthen one or more of the preceding curriculum components or related areas. The major is designed to meet TAC ABET criteria for accredited programs in engineering technology and IEEE curriculum guidelines for computer engineering technology programs.

The graduates of this program will typically find employment in industry, government and education in the many areas where a combination of hardware and software background is important. The graduate is intended to work as a member of the computer science and engineering team consisting of computer scientists, computer engineers, computer engineering technologists, computer technicians, and other professionals which serve the diverse and rapidly expanding computer and computer related fields. The program is also designed to interface with two year associate degree graduates in computer technology as well as with two year associate degree graduates in electronic/electrical technology.

The program elements are summarized below:

1. General Studies	45
2. Common Departmental Core	28
3 Computer Hardware Technology Core	11
4. Computer Software Technology Core	30
5 Supporting Technical Area	16
Total min. sem. hours	130

Specific requirements for categories 3, 4 and 5 are listed below. Categories 1 and 2 are detailed in the introductory material for the department.

The required courses in the Computer Hardware Technology Core (category 3) are:

CET	250	Digital Logic and Microcomputers	3

CET	251	Digital Logic and Microcomputer Lab ..... 1 or 350 Digital System Principles (3) and 351 Digital Electronics Lab (1)*	
CET	454	Microcomputer Systems Principles 3	
CET	455	Microcomputer Applications Lab	1
CET	456	Minicomputer Systems and Programming 3	
		Total min. sem. hours	11

*CET 350, 351 are recommended in place of CET 250, 251 for the students who begin their work at ASU as freshmen.

The required courses in the Computer Soft ware Technology Core (Category 4) are:

CSC	100	Introduction to Computer Science I	3
CET	486	Computer Programming Applications ..... 3 or CSC 383 Applied Fortran Programming (3)	
CET	473	Digital Data Communication Systems ..... 3 or EEE 459 Data Communication Systems (3)	
CSC	210	Data Structures ..... 3 or IEE 330 Intro. to Data Base Design (2)	
CSC	309	High Level Languages ..... 3 or CSC XXX Higher Level Languages (3)	
CSC	470	Computer Graphics ..... 3 or Approved Computer Elective (3)	
IEE	463	Computer Aided Processes ..... 3 or Computer-Aided Design (CAD CAM), Robotics, Elective (2)	
CET	408	Analog-Logic Simulation ..... 3 or CSC XXX Elective (3)	
AET	472	Applied Linear Analysis	3
MAT	326	Intermediate Statistics I ..... 3 or QBA 221 Statistical Analysis (3)	
		Total min sem hours	30

The selection of particular course alternatives in category 4 will depend on prerequisite back ground. It is recommended that computer engineering technology majors first take MET 121, then CSC 182 followed by CSC 100.

The supporting technical area of 16 sem ester hours (Category 5) may include approved electives selected from EET, CET, UET, MET, CSC, IEE, EEE, MAT and CIS courses and may include 9 hours selected from MGT 301, FIN 300, MKT 300, ACC 211, 212, ADS 305, MKT 300. Students planning to take additional technical electives in EET, CET or UET should take CET 350, 351 (in place of CET 250, 251), and EET 301, 310, 311. EET 422, 423, 472, 475, UET 415, or equivalent are also recommended. Choice of electives will depend on prerequisite background and should be verified with the department or faculty offering the course.

Microelectronic Engineering Technology

The Microelectronics Engineering Technology major is available to students interested in the design, fabrication and manufacture of imprinted circuitry, monolithic integrated circuits (bipolar and MOS), and hybrid thick film and thin film circuitry, components and systems. The major combines elements of electronics, microelectronics and man ufacturing technology. The program is designed to meet TAC/ABET criteria for accredited programs in engineering technology.

Graduates of this program have various career opportunities in industry, particularly in semiconductor processing, fabrication, man ufacturing and device product application areas. The continuing explosion in semi conductor and related technologies and their applications to electronic and computer related products offers unique and challenging opportunities. Graduates of this program will tend to function in processing, manufacturing, operations and applications areas in industry as members of the diverse scientific engineering team consisting of engineers and scientists of various disciplines, technologists, electronic and manufacturing technicians and other professionals. The program is also designed to interface with two year associate degree programs in microelectronics as well as with two year associate degree graduates in electronic/electrical technology.

The program elements are summarized below:

1. General Studies	46
2 Common Departmental Core	28
3. Microelectronics Core	24
4 Manufacturing Technology Core	27
5. Approved General Electives	5
Total min. sem hours	130

Specific requirement for categories 3 and 4 are listed below. Categories 1 and 2 are detailed in the introductory material for the department.

The required courses in the Microelectronics Technology Core (Category 3) are:

ELT	220	Electronic Circuits and Systems (Or EET 310 Electronic Circuits (3)	3
ELT	221	Electronic Systems Lab . or EET 311 Electronics Circuits Lab II)	1
CET	250	D'gital Systems and Microprocessors .... (r CET 350 Digital Logic Pr nciples (3))	3
CET	251	D gital Systems and M'croprocessors Lab .... (or CET 351 Digital Electronics Lab (1))	1
ELT	406	Control System Technology... . .. (or MET 303 Machine Control Systems (3))	3
UET	414	Applied Materials Science for Electronics	3
UET	415	Electronics Fabrication Prnc ples II	2
UET	416	Monolithic Integrated Circu t Technology..	3
UET	417	Sol d State Device Processes Lab I...	1
UET	418	Hybrid Integrated Circuit Technology	3
UET	419	Solid State Device Processes Lab II	1
		Total min. sem hours	24

For the Manufacturing Technology core (Category 4) an approved pattern of 27 hours is required, as given below:

MET	301	Manufacturing Analysis ... . (or ESE 401 Manufacturing Eng neering (3))	3
MET	401	Quality Control .... (or IEE 374 Quality Con tro (3))	3
MGT	301	Pr nciples of Management (3) ... (or IEE 431 Eng neering Administration (3))	3
QBA	221	Statistical Analysis .. .. (or MAT 420 Introductory Applied Statist cs (3))	3
IEE	300	Economic Analysis for Engineers	2
IEE	463	Computer-A ded Processes . . ... (or approved elective in CAD CAM)	3
Approved Technical Electives.			10
		Tota min sem. hours	27

The 10 hours of approved electives should include CET 454, 455 if CET 350, 351 were used in category 3 for CET 250, 251. Also, EET 310, 311 is recommended if additional EET courses are to be selected. Other approved electives may be selected from EET, CET, UET, MET, CSC, IEE, EEE, CHE, CHM or PHY. Since courses selected will depend on prerequisite background, the department or faculty offering the course should be consulted.

The approved general electives (Category 5) provide for a maximum of 5 hrs. approved electives towards the 130 hour program total minimum. The CHM 113, 116 sequence is recommended in place of CHM 114 (Category 1) for students without high school chemistry. Thus CHM 113 can be applied to general electives, and CHM 116 used for CHM 114. PHY 460 is also recommended and may be used in either category 4 or 5.

Department of Industrial Technology

PROFESSORS

PRUST (TC 201H), BROWN, KIGIN, LITTRELL

ASSOCIATE PROFESSORS

HIRATA, PARDINI, WATKINS, WILLIAMS

ASSISTANT PROFESSORS

BROCKMAN, MATSON, SCHILDGEN

The Department of Industrial Technology includes the following majors: Engineering Technology, Industrial Technology and Industrial Vocational Education; and concentrations in: Graphic Communications Engineering Technology, Graphic Communications Industrial Technology, Industrial Supervision, Technical Teacher Education and Vocational Teacher Education. Even though the direction varies considerably, the applied aspects of industrial processes are predominant in all specializations.

Each offering has specific core courses required, 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 offering, 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

This concentration is designed to prepare the graduate for employment in technical positions which require engineering-related activities. These students receive educational experience in graphic communications, manufacturing, electronics and computer applica-

tions. Emphasis is placed upon the theory, design, and mathematical solutions to technical problems in all phases of production of printed material and media applications. Each student is also required to take the Engineering Technology Core as well as the General Studies courses.

A minimum of 130 semester hours of satisfactory credits are required to complete this program.

Required Core Courses

			Semester Hours
CHM	114	General Chemistry for Engineers	4
CSC	182	Elementary Fortran 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
PHY	111	& 113 General Physics	4

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:

			Semester Hours
First Semester			
ENG	101	Freshman Composition	3
GRC	111	Technical Graphics	2
MAT	115	College Algebra and Trigonometry	4
MET	101	Manufacturing Processes and Materials	3
		Technical Courses	6
		Total Credit Hours	18
Second Semester			
ELT	200	Applied Electricity/Electronics	3
ENG	102	Freshman Composition	3
MET	121	Problem Solving	3
PHY	111	& 113 General Physics	4
		Technical Courses	6
		Total Credit Hours	19

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 various processes of producing written and printed materials, such as newspapers, magazines, manuals, books, greeting cards, package printing and other visual materials are of major interest to students in the program as is the impact of these materials on 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	Elementary Fortran Programming	2
ECN	201	Principles of Economics	3
ELT	200	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	Freshman Composition	3
GRC	111	Technical Graphics	2
MAT	115	College Algebra and Trigonometry	4
MET	101	Manufacturing Processes and Materials	3
		Technical Courses	6
		Total Credit Hours	18

Second Semester

CHM	101	Intro. to Chemistry	4
ENG	102	Freshman Composition	3
MET	121	Problem Solving	3
		Technical Courses	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, 331, 332, 333, 334, 335, 336, 337, 339, 433, 435, 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	Elementary Fortran Programming	2
ECN	201	Principles of Economics	3
ELT	200	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:

			Semester Hours
First Semester			
ENG	101	Freshman Composition	3
GRC	111	Technical Graphics	2
MAT	115	College Algebra Trigonometry	4
MET	101	Manufacturing Processes and Materials	3
		Technical Courses	6
		Total Credit Hours	18
Second Semester			
CHM	101	Intro. to Chemistry	4
ENG	101	Freshman Composition	3
MET	121	Problem Solving	3
		Technical Courses	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 program is to prepare supervisors and higher level personnel for management functions in manufacturing. It requires a background with an emphasis in traditional technology and supervisory fields.

Contacting an advisor is suggested to coordinate the course selection for transfer to the Industrial Supervision concentration.

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 communi cations 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	200	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:

			Semester Hours
First Semester			
ENG	101	Freshman Composition	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	200	Electricity/Electronics	3
ENG	102	Freshman Composition	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 430.

Industrial Vocational Education

The Industrial Vocational Education programs of study consist of three concentrations: Industrial Arts Education, Technical Teacher Education, and Vocational Teacher Education.

Students in each of these concentrations 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

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. Automotive courses should be selected at a community college in consultation with an advisor.

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	Production Woods	3
IVE	160	General Metals	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 Management	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.

			Semester Hours
First Semester			
ENG	101	Freshman Composition	3
GRC	111	Technical Graphics	2
IVE	120	Production Woods	3
IVE	160	General Metals	3
MAT	115	College Algebra and Trigonometry	4
		Total Credit Hours	15
Second Semester			
ENG	102	Freshman Composition	3
GRC	135	General Graphic Arts	3
HIS	103	U.S. History	3
IVE	202	Industrial Arts Design	2

PGS	101	General Psychology	3
		Technical Course	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.

Industrial Arts Education students transfer to the Department of Secondary Education in the College of Education when they are classified as juniors. The student must meet the College of Education requirements.

Technical Teacher Education

The objective of the Technical Teacher Education is the preparation of technical educators for the post-secondary level. A technical area of emphasis is required. 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	200	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
		Computer Programming	2

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.

			Semester Hours
First Semester			
COM	100	Intro. Human Communication	3
ENG	101	Freshman Composition	3
MAT	115	College Algebra/Trigonometry	4
		Technical Courses	6
		Total Credit Hours	16
Second Semester			
ENG	102	Freshman Composition	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

The purpose of Vocational Teacher Education 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.

Pre-Vocational Industrial Education

This is a broad base curriculum with emphases in industrial areas which will meet requirements for pre-vocational industrial education. There are five emphases available: construction, manufacturing, transportation, visual communications, and electronic communications. Each of these represents a career cluster for which occupational preparation is found in Arizona schools.

Pre-Vocational Industrial Education Core

The following courses are required of all Pre-Vocational Industrial Education majors:

IVE	202	Industrial Arts Design	2
IVE	300	Industrial Enterprise	3
IVE	402	Occupational Analysis and Course Development	3
IVE	422	Facility Planning and Management	3
IVE	480	Teaching Industrial Vocational Subjects	3
STE	402	Technology, Society and Human Values	3
PGS	100	Introduction to Psychology	3
MAT	115	College Algebra and Trigonometry	4
		Physics, Chemistry	6
		Computer Programming	2

The suggested freshman pattern is as follows:

			Semester Hours
First Semester			
ENG	101	Freshman Composition	3
MAT	115	College Algebra/Trigonometry	4
PGS	100	Intro. to Psychology	3
		Technical Courses	6
		Total Credit Hours	16
Second Semester			
ENG	102	Freshman Composition	3
HIS	103	The United States	3
		Chemistry	4
		Technical Courses	6
		Total Credit Hours	16

Pre-Vocational Industrial Education students receive a Bachelor of Science degree and meet the State of Arizona requirements for teaching certification. Requirements established by the Arizona Department of Education include professional education courses and directed teaching.

In addition to the core, each Pre-Vocational Industrial Education student must select two areas of emphasis according to career interests (19 hours each). Industrial internships may be applied.

Construction:
Required: IVE 120, 222, 321, 424, plus an additional 7 hours of approved emphasis electives.

Manufacturing:
Required: IVE 120, 160, MET 200, plus an additional 10 hours of approved emphasis electives.

Transportation:
Required: IVE 377, 471, 478 plus an additional 10 hours approved emphasis electives.

Visual Communications:
Required: GRC 111, 135, 403, plus an additional 11 hours of approved emphasis electives.

Electronic Communications:
Required: ELT 200, 380, plus an additional 13 hours of approved emphasis electives.

Department of Manufacturing Technology

ASSOCIATE PROFESSORS:
SCHMIDT (T122), GRAHAM

ASSISTANT PROFESSORS:
KELLEY, KISIELEWSKI, KLEMENT, LINDNER

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 and 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 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 technology core courses listed below:

Manufacturing 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	300	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

			Semester Hours
First Semester			
ENG	101	Freshman Composition	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	Freshman Composition	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; PHY 111, 112, 113, 114; CHM 114; MAT 115, 260, 261; CSC 182, 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; MAE 333, 336; MET 303, 360, 380, 381, 418, 419, 440; PHY 111, 112, 113, 114; CHM 114; MAT 115, 260, 261; CSC 182; COM 100 or 300, plus approved technical electives.

Welding Engineering Technology. This concentration 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; PHY 111, 112, 113, 114; CHM 114; MAT 115, 260, 261; CSC 182, 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 Technology Department 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, propeller performance and airplane performance analysis. Prerequisites. AET 180, 287, 288, CSC 182; MAT 260, PHY 111, 112.

301 Applied Aerodynamics. (3) S
Wind tunnel and flight test theory, measurements and analysis. Aircraft stability and control. Prerequisites. ELT 200; MAT 261, 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, operation 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
Measurement system responses and the characteristics of experimental data. Methods of collecting and analyzing data. Prerequisites: ELT 200; MAT 261

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.

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 or instructor approval

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 Instrument 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) F Staff
Fuels and combustion bas c analysis of fuels chemistry and chemica kinetics of the combust on process. Pre requisites. AET 288, MAT 260 MET 380; PHY 112· CHM 114 or equ va ent. Two lectures, 3 hours laboratory.

415 Propulsion. (3) S Staff
Principals thrust, performance cyc es, combust on systems mechan ca mater al and other design cons dera tions, ram jets rockets, and advanced propuls on sys tems Prerequ site AET 414. Two lectures, 3 hours ab oratory.

417 Aerospace Systems Design. (3) F, Bender
Performance evaluation for rockets, miss es, and sate - l tes Introduct on to space gu dance and contro and fe support systems Prerequis tes. AET 300, MET 360

472 Applied Linear Analysis. (3) F S; Staff
Linear a gebra, l near programm ng, numerical meth ods computer a gor thms app ed to technica systems Prerequis tes. CSC 182, MAT 261

487 Aircraft Design II. 3) F S; Reed
Bas c aerodynam cs and a rp ane performance ana ys s methods app ied to pract cal des gn project. Prerequ s tes AET 300, CSC 182

488 The Air Transportation System. 3 F S N chols
Air commerce related to the transportat on system regu atory cl mate of a r ine, future operat ons career p ann ng. Prerequ sites· ECN 201 MGT 301

489 Airline Administration. (2) F S N chols
Adm n strative organizations economics of a r ne ad ministrat on, operat ona structure re at onsh p with federa government agenc es Prerequisite AET 488

490 Aerospace Systems Analysis II. (3) S; Staff
Solut on of aerospace management, p ann ng, and con trol problems us ng inear programm ng. Prerequis tes AET 372, 390

Special Courses: AET 484 494, 498 499 500, 580 583, 584, 590 591 592, 593 594, 598 (See pages 33-34.)

ELECTRONIC TECHNOLOGY

ELT 200 Applied Electricity/Electronics. 3) F, S
Introduction to princip es and applications of electr c ty and e ectron cs Prerequ s tes· MAT 115 MET 121 Not recommended for e ectronics majors

201 Applied Electricity/Electronics Laboratory. (1 F S
Bas c e ectricity electronics dev ces, c rcuits and app cations Laboratory techn ques nstruments Corequi s te ELT 200 Three hours laboratory

202 Applied Electrical Science. 3 F, S
Princip es of e ectr c c rcu t e ements. ntroduction to d c and a c c rcuit analysis Prerequ sites· MAT 115, MET 121 or CON 243

203 Applied Electrical Science Laboratory. 1) F, S
Bas c c rcu ts, laboratory techn ques and nstruments Corequ s te· ELT 202. Three hours aboratory

208 Electric Circuits. (3) F S
Graph cal and analytica ana ys s of e ectr c c rcu ts and components Appl cation of c rcuit theorems Trans ent and s nuso da exc tat on analysis Prerequ s tes ELT 202, MAT 115 Corequ s te. MAT 260.

210 Active Devices. (3 F, S
Active dev'ce character st cs, mode s and bas c e ec tron c circu t des gn pr nc p es Prerequ sites· ELT 202 203 Corequ site ELT 208

211 Electronic Circuits Laboratory I. (1) F S
Act ve dev ce character st cs and bas c e ectronic c r- cuitry D agnostic pr nc p es and nstrumentat on. Co requ site ELT 210 Three hours laboratory

220 Electronic Circuits and Systems. (3) S
Feedback pr nciples and applicat ons, d fferent al amp f ers, operational amplif ers, RF amplif ers osc lators, pu se circu ts Prerequisites ELT 210, 211

221 Electronic Circuits and Systems Laboratory. (1) S
Corequis te· ELT 220.

330 Electronic Instrumentation. (2) F
Theory and operat on of measurement circuits and electron c nstrumentat on. D agnost c and calibrat on pr nciples and techniques. Prerequ sites· ELT 210, 211 Corequ site ELT 331

331 Instrumentation Laboratory. (1) F
Corequisite· ELT 330. Three hours laboratory.

380 Electrical Systems. (3) F, S
ndustr al e ectr cal circu ts and systems, machines, transformers secondary d stribut on, grounding and related systems Prerequ sites. ELT 202, 203 (or 200, 201)

482 Industrial Practice: Internship and Cooperative Programs. (1-4) F, S SS
Spec ally assigned approved activ ties in selected electron c ndustr es. Report requ red Prerequ site Electron cs/Computer Techno ogy major enrol ed at junior sen or leve Max mum of 10 credits

490 Electronics Project. (1-4) F, S SS
Special ndiv dual or sma l group d rected projects n app ed aspects of electron cs w th emphas s on aboratory practice or hardware solut ons to pract cal problems Prerequisite approva of nstructor

496 Professional Orientation. (1 F, S
Techn cal, professional, econom c, and ethical aspects of e ectronics/computer engineering techno ogy practice and ndustria organ zation. Lectures f e d trips and projects Prerequ site senior standing in an E ectronics Computer technology program in semester pr or to graduation Corequ s te. GRC 420 or equivalent

Special Courses: ELT 294, 484, 494, 498 499, 580, 584, 591, 592, 593, 594 598, 599 (See pages 33 34)

ELECTRONIC ENGINEERING TECHNOLOGY

EET 301 Electric Networks I. (3) F S
Graph ca and ana ytica analysis of e ectronic networks using ca cu us essentia s. Trans ents. Steady state sinuso dal frequency response. Transfer funct ons Prerequ- sites. ELT 208, MAT 260

310 Electronic Circuits (3) F, S
Analysis and design of b polar and FET e ectronic cir cu ts using the model approach. Amp ifier and transfer funct on principles Prerequ sites. ELT 210 208.

311 Electronic Circuits Laboratory II. (1) F, S
Des gn and application of e ectronic circu ts Performance evaluation and laboratory techn ques Prerequis te ELT 211 Corequis tes. EET 310 Three hours aboratory rec tation.

340 Electric Circuits and Machines. (3) F
Pr nc ples and analysis of electrica power circu ts and components. Transformers Rotating machines and re ated contro equ pment Prerequ sites. ELT 208 or 380 (or ELT 200 and PHY 112 for non ELT majors)

400 Electric Networks II. (3) F, S Kanneman Peterson, Strawn
Graphica and ana yt ca analysis of e ectr cal networks. Time frequency and Lap ace transform doma n techn ques Waveform ana ys s Prerequ s tes· EET 301 MAT 261

404 Transmission Lines and Waveguides. (3) S; Strawn Young
Theory and appl cation of transmission lines wavegu des and m crowave components. Ana ysis and match ng using the Sm th Chart. Prerequ site· EET 301.

406 Control System Technology. (3) S; Kenneman
Control system components, analysis of feedback control systems, stability, performance, application. Prerequisite: EET 400 (or AET 472 or EET 483 for non majors).

407 Control Systems Laboratory. (1) S; Kenneman.
Corequisite: EET 406. Three hours laboratory.

410 Linear Electronic Circuits. (3) F; McCurdy, Kenneman,Strawn
Frequency response and feedback design of multistage electronic circuits and systems. Linear integrated circuitry. Prerequisites: EET 301, 310.

411 Linear Electronics Circuits Laboratory. (1) F; McCurdy, Kenneman, Strawn
Prerequisites: EET 311, ELT 331. Corequisite: EET 410. Three hours laboratory.

420 Operational Amplifier Theory and Application. (3) S; Kenneman, McCurdy, McHenry
Differential and operational amplifier circuitry, feedback configurations, op-amp errors and compensation, linear and nonlinear circuitry. Applications. Prerequisites: EET 301, 310.

421 Operational Amplifier Applications Laboratory. (1) S; McCurdy, McHenry
Linear integrated circuits and op-amp applications. Prerequisites: EET 311; ELT 331. Corequisite: EET 420. Three hours laboratory.

422 Electronic Switching Circuits. (3) S; McCurdy, McHenry, Kenneman
Analysis and design of electronic circuits operating in a switching mode. Waveshaping, timing, logic. Prerequisites: EET 301, 310; CET 350 or 250.

423 Electronic Switching Circuits Laboratory. (1) S; McCurdy, McHenry
Prerequisites: EET 311; ELT 331. Corequisite: EET 422. Three hours laboratory.

430 Instrumentation Systems. (3) S; McHenry, Kanneman, Wood
Measurement principles and instrumentation techniques. Signal and error analysis. Prerequisites: EET 301, 310; CET 350 or 250.

431 Instrumentation Systems Laboratory. (1) S; McHenry, Wood
Prerequisites: EET 311; ELT 330, 331. Corequisite: EET 430. Three hours laboratory.

440 Electrical Power Systems Technology. (3) S; Edwards, Kanneman, McHenry
Electrical power system analysis, transmission, distribution, instrumentation, protection, and related system components. Prerequisite: EET 301 or 340 or ELT 380.

460 Special Devices and Applications. (3) F; McHenry, Strawn
Analysis and design of electronic circuits using special active devices for linear and nonlinear applications. Prerequisites: EET 301, 310 or ELT 208, 220; MAT 260.

461 Special Devices Laboratory. (1) F; McHenry, Strawn
Prerequisites: EET 311 or ELT 221; ELT 331. Corequisite: EET 460. Three hours laboratory.

470 Communication Circuits. (3) S; Young, Peterson, Strawn
Analysis and design of passive and active communication circuits. Coupling networks, filters, impedance matching. Modulation and demodulation techniques. Prerequisites: EET 310, 400, 472; CET 250 or 350.

471 Communication Circuits Laboratory. (1) S; Peterson, Strawn, Young
Prerequisites: EET 311; ELT 331. Corequisite: EET 470. Three hours laboratory.

472 Communication Systems. (3) F, S; Peterson, Young, Strawn
Systems analysis and design of AM, FM, PCM and SSB communication systems. Noise and distortion performance of communication systems. Prerequisites: EET 301, 310 or ELT 208, 220; MAT 260.

476 Video Circuits and Systems. (3) F; Edwards, McHenry
Radio frequency selectors, video amplifiers, synchronizing circuits, kinescopes and color demodulators. Prerequisites: ELT 220 or EET 310; CET 250 or 350.

477 Video Systems Laboratory. (1) S; Edwards, McHenry
Prerequisites: EET 476; EET 311 or ELT 221; ELT 331. Three hours laboratory.

478 Communication Transmission System Design. (3) F; Peterson, Strawn, Young
Signal propagation, transmission. Antenna principles and applications. Cable TV and other communication transmission systems design. Prerequisites: EET 404, 472; CET 250 or 350.

479 Communication Systems Laboratory. (1) F; Peterson, Strawn, Young
Corequisite: EET 478. Three hours laboratory.

483 Applied Calculus. (3) F, S; Strawn, Kanneman, Young
Topics in applied calculus for technology with emphasis on computer aided analysis. Differential equations, transforms, numerical techniques, matrices. Prerequisites: MAT 261; CSC 182.

501 Network and Signal Analysis. (3) A
Network and signal analysis, theory, and applications. Transform and computer techniques. Applications. Prerequisites: EET 400; EET 483 or AET 472.

506 System Dynamics and Control. (3) S
Time, frequency and transform domain analysis of physical systems. Transfer function analysis of feedback control systems performance and stability. Compensation. Prerequisites: EET 400; EET 483 or AET 472.

508 Computer Process Control Technology. (3) A
Process computer control hardware, software. Sampled-data control systems, process modeling, microprocessor control techniques, computer-aided design, simulation. Process applications. Prerequisites: EET 406; CET 250 or 454.

510 Linear Integrated Circuits and Applications. (3) F
Analysis, design and applications of linear integrated circuits and systems. Prerequisites: EET 301, 310; CET 350.

530 Electronic Test Systems and Applications. (3) S
Analysis, design and application of electronic test equipment, test systems, specifications, documentation. Prerequisites: EET 301, 310; ELT 330; CET 350.

540 Electrical Power Systems. (3) S
Electrical power system analysis, transmission, distribution, instrumentation, protection, and related system components. Prerequisite: EET 301 or 340 or ELT 380.

560 Industrial Electronics and Applications. (3) A
Analysis, design and application of special electronic devices, and systems to industrial control, power, communications and processes. Prerequisites: EET 301, 310; CET 350.

570 Communication Circuits and Applications. (3) S
Selected topics in electronic communication circuits. Applications to analog and digital communication. Filter design. Prerequisites: EET 310, 400, 472; CET 350.

578 Communication Transmission Systems. (3) A
Electromagnetic signal propagation and transmission,

antenna principles and application Cable TV and other commun cation transmission systems. Prerequisites. EET 404, 472

Special Courses: EET 294, 484, 494, 498, 499, 580, 584, 591, 592, 593, 594, 598 and 599). (See pages 33-34.)

COMPUTER ENGINEERING TECHNOLOGY

CET 250 Digital Systems and Microprocessors. (3) S
Fundamentals and applications of digital computers and microprocessors, with emphasis on SSI and MSI applications Prerequisites ELT 200 or 202, CSC 182

251 Digital Systems and Microprocessors Laboratory. (1) S
Corequisite. CET 250 Three hours laborabory.

350 Digital Logic Principles. (3) F, S
Binary logic, combinational design and minimization Introduction to sequential circuits. Introduction to digital computer principles Prerequisites· CSC 182, junior standing

351 Digital Electronics Laboratory. (1) F, S
Prerequisites. ELT 210, 211. Corequisite· CET 350. Three hours laboratory.

408 Analog-logic Simulation. (3) S, Kanneman
Analog logic simulation of dynamic physical feedback systems Programming and scaling techniques for linear and nonlinear simulation. Prerequisites CET 250 or 350, EET 400 or AET 472 or MAT 262 or EET 483.

452 Digital Systems Logic and Applications. (3) S, Kanneman, McCurdy, McHenry
Analysis and design of sequential logic networks System design techniques using complex building blocks, programmed logic Prerequisites CET 350 and CSC 182

453 Digital Systems Logic Laboratory. (1) S; McCurdy, McHenry
Prerequisite· CET 351 Corequisite· CET 452. Three hours laboratory

454 Microcomputer Systems Principles. (3) F, S, McCurdy, Wood, Kanneman
Analysis and design of small computer systems. Computer organization and hardware. Machine language fundamentals and operations Prerequisites· CET 350 or 250, CSC 182 or 101

455 Microcomputer Applications Laboratory. (1) F, S, McCurdy, Wood
Prerequisite. CET 351 or 251 Corequisite· CET 454 Three hours laboratory

456 Minicomputer Systems and Programming. (3) F, S, Kanneman, McCurdy, Wood
Assembly language programming Input-output and off line diagnostics. Utility software Prerequisites· CET 454; CSC 182

457 Microcomputer Systems and Applications. (3) F; McCurdy, Kanneman, Wood
Applications of mini-and/or micro-computer hardware and software Special purpose controllers. Interface design and applications. Prerequisites. CET 454, 455

473 Digital/Data Communication Systems. (3) F, Wood, Strawn, Young
Signals, distortion, noise, error detection/correction Transmission and system design Interface techniques and standards Digital hardware. Applications. Prerequi sites· EET 472; CET 250 or 350

475 Communication Systems Laboratory. (1) F, Strawn, Wood
Prerequisites· EET 472, CET 250 or 350 Corequisite CET 473 Three hours laboratory.

485 Computer Systems Technology. (3) F, Wood, Kanneman
Hardware/software aspects of computer architecture, operating systems, programming resources, graphics, automated testing and analog/digital interfacing Prerequisites. CET 456 or equivalent.

486 Computer Programming Applications. (3) A, 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.

522 Digital Integrated Circuits and Applications. (3) A
Analysis, design and applications of integrated circuits and systems. Prerequ sites: EET 301, 310; CET 350

552 Digital Systems and Applications. (3) A
Analysis, design and applications of digital networks and systems. Prerequisites· CET 350, 454

556 Computer Software Technology. (3) A
Assembly language programming techniques and oper ations, operating system characteristics, systems software applications Prerequisite. CET 456 or equivalent.

557 Microcomputers and Applications. (3) F
Applications of small computer systems, mini- and micro-computer hardware and software. Prerequisites· CET 454, 455.

Special Courses: CET 294, 484, 494, 498, 499, 580, 584, 591, 592, 593, 594, 598, 599 (See pages 33-34)

MICROELECTRONICS ENGINEERING TECHNOLOGY

UET 215 Electronic Fabrication Principles I. (2) F, S
Layout, documentation and fabrication techniques for design and manufacture of electronic components and equipment. Project required. Prerequisites: ELT 210, 211 Four hours lecture/recitation/laboratory. Field trips.

414 Applied Materials Science for Electronics. (3) F, S; Peterson, Normington, Strawn, Young
Introduction to mechanical, thermodynamic and elec tromagnetic properties of materials used in electronic technology applicat ons, semiconductor physics, transducer physics, heat transfer. Prerequisites. PHY 111, 112; ELT 220 or EET 310, MAT 260

415 Electronics Fabrication Principles II. (2) F, S; Normington, Wood
Electronic equipment design and fabrication principles and practice. Completion of electronics hardware design project and report. Prerequisites. UET 215; ELT 220, 221 or EET 310, 311; CET 250 or 350, senior standing. Four hours lecture/recitation/laboratory. Field trips

416 Monolithic Integrated Circuit Technology. (3) F, Peterson, Normington
Processing and fabrication of monolithic bipolar and MOS integrated circuits Prerequisite. UET 414

417 Solid State Device Processes Lab I. (1) F; Peterson, Norm rgton
Wafer cleaning, resistivity/conductivity measurements, oxidation growth, predeposition and drive-in diffusion, photo lithography, vacuum deposition and device fabrication Corequisite: UET 416. Three hours laboratory.

418 Hybrid Integrated Circuit Technology. (3) S, Peterson, Normington
Layout, fabrication, design and manufacture of thin and thick film hybrid circuits. Prerequisite· UET 414

419 Solid State Devices Processes Lab II. (1) S; Peterson, Normington
Thick and thin film techniques and processes with a comprehensive IC project, field trips and demonstra tions. Corequisite. UET 418. Three hours laboratory.

513 Microelectronics Technology. (3) A
Special processes, techniques and advances in monolithic and hybrid technology. Emphasis on manufacturing practice and product application Prerequisite· approval of instructor

516 Monolithic Integrated Circuit Technology and Applications. (3) A
Processing, fabr cat on and manufactur ng of monol thic ntegrated c rcu ts. Applications Prerequ s tes. UET 414, 416 or approva of instructor.

518 Hybrid Integrated Circuit Technology and Applications. (3) A
Theory, processing fabrication and manufactur ng of hy br d microelectronics dev ces and products App ications Prerequ sites. UET 414, 416 or approva of instructor.

Special Courses: UET 294 484 494, 498 499 580, 584 591, 592, 593, 594 598, 599. (See pages 33 34)

INDUSTRIAL TECHNOLOGY
GRAPHIC COMMUNICATIONS

GRC 111 Technical Graphics I. 2) F, S
Appl cat ons or ented study of the bas cs of standard- zed draft ng systems processes practices spat a visual zat on, project on theory equipment media and draw ng techn ques Six hours ecture and laboratory

135 General Graphic Arts. (3) F, S
Bas c graph c arts ndustr al process. Two hours ecture and 4 hours aboratory Field tr ps.

136 Graphic Arts Processes. (3) S
Screen process, p anography, embossing photo fabr cat on, presswork, photographic and bas c produc tion techniques Two hours ecture and 4 hours aboratory F e d trips. Prerequ site. GRC 135

212 Technical Geometry. (3) N
n-depth study of the pr nc ples of descr pt ve geometry to obtain graph ca solutions and ana ys s of mathematical, structural and spat al related prob ems Prereq u sites. GRC 111 or equiva ent Two hours ecture 4 hours aboratory.

236 Screen Process Printing. (3) S
Theory and study of industria appl cations re ating to the technology and uses of screen process pr nt ng Prerequis te. GRC 136. Field tr ps Six hours lecture and aboratory.

237 Image Preparation. (3) F
Basic princ p es of typographic layout Preparat on of thumbnails, roughs, comprehensives and mechanica s Six hours lecture and aboratory.

238 Instruments and Controls. (3) F
Instrumentat on and methodologies for materia s test ng and quality control. Prerequ s te· GRC 136

311 Technical Illustration. (3) N
Techn cal i lustration for presentat ona drawing purposes pictor'al drawing, shades and shadows, mu t -med a rendering techn ques, matt ng/mounting Prerequisite· GRC 111 or equivalent Two hours lecture, 4 hours laboratory.

312 Computer-Aided Technical Drafting I. (3) F
Fundamental principles of nteract ve computer graph ics and the practica app cat on of CADD as a tech no ogical tool in the industrial environment Prerequ site· GRC 111 or equivalent. Two hours lecture, 4 hours laboratory.

314 Machine Drawing. (3) F, S
Design and working drawings for machine mechanisms, conf gurat ons, etc n accordance with standardized draft ng, to erancing and industria process ng methodolog es Prerequ s te: GRC 111 or equ valent. Six hours lecture and laboratory

315 Geometric and Positional Tolerancing. (3) A
Standardized precision dimensioning techniques and practices of geometric and pos tional tolerancing ap plied n ndustr al/m itary spec f cat ons and production manufacturing Prerequisite. GRC 111 or equiva ent. Two hours ecture, 4 hours aboratory

331 Substrates and Inks. (3 F
Techn ca study of nk and paper w th pr nting capab ity stressed. F e d tr ps. Prerequ s te· approva of n structor

332 Stripping and Platemaking. 3) F
Str pping negat ves and pos t ves ne, ha ftone duo tone fu l color, contact ng f ats to and prepar ng image carriers Fie d tr ps Prerequ s te GRC 136 Two hours lecture and 4 hours aboratory

333 Offset Lithography (Presswork). (3) F
Funct on of the offset press E ements required for press operat on, chem cals nks carr ers b anks and so vents. Prerequ site GRC 136 or approva of n structor. Two hours lecture and 4 hours aboratory

334 Offset Lithography (Camerawork). (3 F
Production of ne, ha ftone and specia effects photograph c negat ves and pos t ves Two hours ecture and 4 hours laboratory

335 Binding and Finishing. 3 F
Operat ons, nvo ving cutt ng, tr mming perforating stamp ng, d e cutt ng, lam nat ng emboss ng and b ndery process Prerequ s te GRC 333

336 Color Separation. (3 S
Methods of produc ng separat on negatives and pos t ves Prerequis te. GRC 334

337 Production Management. (3) S
P ann ng and controll ng work flow of graph c arts prod ucts. F eld tr ps Prerequ s te: GRC 136.

339 Estimating and Cost Analysis. (3) F
Est mating pr nt ng operat ons and materia s, e ements of cost f nding us ng se ected systems Prerequis te GRC 136

403 Drafting Applications. (3) S Brown
Survey of drafting clusters. arch tecture b uepr nt reading construction developments, furn ture, sketch ng Prerequ s te: GRC 111. S x hours lecture and aboratory.

412 Computer-Aided Technical Drafting II. 3) S, Matson
Advanced study in CADD with direct emphas s on the management, p ann ng and implementation of specia ized computer-generated graph cs in the ndustria en- v ronment. Prerequ site GRC 312. Two hours ecture, 4 hours laboratory

420 Technical Writing. 3) F S; Brockmann
Wr ting techn ques organ zat on of material research methods for technica wr ters. Prerequ site Junior or senior stand ng only

433 Production Techniques. (3) S· Wi iams
Systematic product on p ann ng experience Six hours lecture and laboratory Prerequ sites: GRC 333, 334

435 Plant Management. (3) F; Prust
Independent documentary research, equ pment personne , p ant s te se ection and p ant management problems. F eld tr ps Prerequis te. GRC 337

436 Web Press Operations. (3) S; W I ams
Theory of web press operat ons for pr nting plant pro cess

437 Advanced Color Reproduction. (3) F; Prust
Ana ys s of co or reproduct on systems. F eld tr ps. Prerequisite GRC 336

438 Graphic Arts Techniques and Processes. (3) F, S SS Prust
Relating mater als to graph c arts printed products production practice Prerequ site Junior status S x hours ecture and laboratory

439 Photocomposition. (3) S; Prust
Detailed study of modern image preparation equipment. Prerequisite GRC 237

512 Advanced Computer-Aided Technical Drafting. (3) N
Research oriented study in CADD, to include training documentation management, systems evaluation, and industry related research/project development and implementation Prerequisite: GRC 312 or 412 or equivalent, and instructor approval. Two hours lecture, 4 hours laboratory

536 Technical and Research Problems. (3) F '84
Individual activities involving investigation and experimentation using graphic communications processes.

537 Web Press Problems. (3) S
Directed group study of selected web press problems.

Special Courses: GRC 484 494, 498, 499, 500, 580, 584, 590, 591, 592, 593, 594, 598 (See pages 33-34.)

INDUSTRIAL VOCATIONAL EDUCATION

IVE 120 Production Woods. (3) S
Product design, cost estimating and fabrication of wood products Emphasis on production support functions Field trips Six hours lecture and laboratory.

160 General Metals. (3) F, S
Machine tools, welding, casting and sheetmetal. Two hours lecture and 4 hours laboratory. Field trips

202 Industrial Arts Design. (2) F, S
Technical sketching project design principles, lines, color and blueprint reading. One hour lecture, 3 hours laboratory.

222 Wood Technology. (2) S
Physical, structural and mechanical properties. Analysis of adhesives, preservatives and hybrid materials Field trips Six hours lecture and laboratory

300 Industry Enterprise. (3) S
Comprehensive study of industries related to construction, manufacturing transportation, visual communications, electronic communications occupational emphasis

321 Light Building Technology. (3) S
Principles and practices as related to light construction inclusive of preliminary considerations and functions through postconstruction concern Field trips. Prerequisite: approval of instructor Two hours lecture 4 hours laboratory

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
Engine principles, design, performance testing, fuels Field trips Six hours lecture and laboratory Prerequisite: approval of instructor

402 Occupational Analysis and Course Development. (3) A, Littrell
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 84; Brown
Methods, evaluation, industrial practices, drafting problem sequences, and equipment. Prerequisite GRC 111

421 Production Wood Technology. (3) S '84, 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 '84, 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, 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'85, Brown
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

451 Materials Control. (3) S, Watkins
Activities of material handling including purchasing, receiving, warehousing, traffic, plant layout, inventory and production control and shipping relating to technical procedures.

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, Pardini
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 metalwork ing processes Prerequisite: IVE 160 Six hours lecture and laboratory.

470 Improving Instruction in Automotives. (3) F'84, Hirata
Strategies, curriculum, teaching aids, lab activities, equipment maintenance, new products Selected skill development. Field trips Prerequisite: approval of instructor.

471 Power Transmission. (3) S 84, Hirata
Principles and servicing of clutches transmissions, differentials, steering and suspension. Prerequisite approval of instructor. Six hours lecture and laboratory.

478 Engine Analysis. (3) F'81, S 85; Hirata
Automotive emission control, air conditioning operation, performance testing ignition and fuel control. Field trips. Prerequisites: approval of instructor

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
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'83
Evaluative factors such as attitudes, behavioral factors, skills, technical information, instrument construction; evaluation of program effectiveness.

541 Vocational Education for Special Needs. (3) F'84
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
Evolution of modern programs, current concepts, future trends.

544 Industrial Processes in Special Education. (3) S
Emphasis on task analysis in development of manipulative activities for special needs learners.

545 Legal Aspects of Occupational Education. (3) F, SS
Interpretation of federal and state acts, regulations, and responsibilities related to vocational education programs

546 Post-Secondary Occupational Education. (3) F'84
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)
Improving instruction, fund and material control, student personnel problems, curricular patterns

549 Research Techniques and Applications. (3) F 84 S'85
Selection of research problems analysis of literature, individual investigations, preparing reports, proposal writing.

Special Courses: VE 484 494, 498 499, 580, 584, 590, 591, 592 593 594 598, 599, 780, 783, 784, 790, 791, 792, 799 (See pages 33-34.)

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) S
Oxy-acetylene, arc, brazing resistance, and gas tungsten arc welding procedures for ferrous and nonferrous metals Six hours ecture and aboratory

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.

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

300 Applied Metallurgy. (3) F
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.

301 Manufacturing Analysis. (3) S
Introduction to the organizational and functional requirements for effective production. Includes writing product 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 ecture and aboratory

304 Casting and Forming Processes. (3) F'84
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, fr ction, equi br um centroids and moment of nertia Prerequ sites: PHY 111, MAT 260.

311 Applied Mechanics-Materials. (3 F, S
Deformat on of members and bodies under stress Pre requ site. MET 310 Four hours ecture and laboratory.

320 Welding Survey. (4) F
Theory and app ication of ndustr a we ding processes ntroductory weld ng metal urgy and we dment des gn, SMAW GTAW, GMAW, oxy-acety ene, braz ng experi ences Three hours ecture, 3 hours laboratory Prereq u site upperclass standing or nstructor's approva

321 Welding Processes. (3) F 84
Theory and appl cat on of the arc weld ng processes and oxy fuel cutt ng, fixturing procedures safety, codes and experimenta techn ques are covered. Pre requ s te PHY 112, MET 320 S x hours ecture and ab- oratory.

322 Welding Processes. (3) F 82
Theory and app icat ons of EBW LBW, sol d state bonding braz ng and solder ng. Prerequ site PHY 112; MET 320. S x hours ecture and laboratory

325 Welding Power Source Analysis. (4) F 83 S 85
Des gn and operat ng character st cs of we d ng power sources and re ated equ pment Equipment se ection setup, and troubleshooting procedures covered Pre- requisites PHY 112 ELT 200, 201 MET 320 Six hours ecture and aboratory.

343 Material Processes. (3) S
Industr a processing as appl ed to ow, medium and h gh vo ume manufacturing Basic and secondary pro cess ng, fasten ng and jo n ng, coating qual ty control Not for construction, eng neer ng or technology degree credit Same as ND 343) Prerequ site ND 350

354 Mechanics of Materials. (4) F
Vectors, force systems, fric on, equ l br um centroids, and moment of inert a. Concepts of stress, string, and stress ana ysis applies to beams, co umns, and com b ned oading Not for construction eng neering tech no ogy or production design degree credit. (Same as ND 454) Prerequ sites. PHY 111 MAT 115.

360 Applied Mechanics-Dynamics. (3) S
Masses, mot on k nematics, dynamics of mach nery Prerequ s te· MAT 261 MET 310

380 Applied Thermodynamics. (3) F S
Thermodynam cs of eng nes, compressors turb nes and re ated components Not open to engineer ng students Prerequis tes MAT 120, PHY 112

381 Applied Thermodynamics and heat Transfer. (3) F S
Gas m xtures vapor cycles, gas and vapor mixtures. Fundamenta s of conduction radiation and convection Prerequisite MET 380.

401 Quality Control. (3) S· Graham
ntroduction to statistical qua ty control methods as ap pl ed to to erances process contro sampl ng and rel a bil ty. Prerequis te MAT 115

402 Specialized Production Processes. (3) F 84, Schmidt
Non trad tional manufacturing processes emphasizing EDM, ECM ECG, CM, PM, HERF, EBW, LBW, etc. Pre requ site MET 101

403 N/C Computer Programming. (3) F'83, S'85 Ke ley
Theory and app cat on of computer a ded N/C lan guages with programming emphas s w th APT and suitable postprocessors. Six hours lecture and pro- gramm ng aboratory Prerequ sites MET 306; CSC 182

405 N/C Continuous Path Programming. (3) S, Kelley
Numerical Control continuous path programming re- lated to two- three-, and four-axis systems Emphasis on mil and lathe systems. Six hours ecture and labo- ratory. Prerequis te MET 306.

406 Machinability Theory. (2) S'84, F 85; Schmidt
Appl cation of machinability theory to practice, implica- t ons to adapt ve control systems, product on costs, too wear, surface f n sh. Experiments conducted. Pre- requ sites MET 305 300. Four hours ecture and labo- ratory.

407 Aerospace Materials. (2) F'84· Graham
Materials used for aircraft powerp ants and airframes; emphasis on cr teria for selection n terms of me chan ca properties and manufacturing processes. Pre- requ s te MET 101 or equ valent

408 Production Tooling. (3) F '84 Schm dt
Fabr cation and design of jigs fixtures and specia in- dustrial tool ng related to manufacturing methods Pre requ site MET 200 305. Six hours ecture and labo ratory.

410 Welding Metallurgy. (4) F'83, S'85, Graham
Meta lurg ca pr nc ples appl ed to structura and a loy stee and a um num weldments, laboratory emphasis on we d ng experiments meta lography and mechan cal test ng Prerequis tes: CHM 114 MET 320 and 300. S x hours lecture and aboratory.

411 Welding Metallurgy. (3) S,84, Graham
Meta urgica pr nciples as applied to stainless steel, super-al oy, t tanium and other refractory metal weld- ments and braze jo nts Prerequis te· MET 410

412 Design of Weldments. (3) S, K sielewski
Design of welded structures and machine elements in terms of allowable stresses joint conf gurat ons, pro cess capabil ties and cost analysis, welding procedures emphasized Prerequ sites. MET 320, 311

415 Welding Codes. (2) F'83, S 85; Kisielewsk
Fami ar zation with and applicat on of the various codes, standards, specificat ons applicable to weld ments. Prerequis te. MET 320 or equivalent.

418 Machine Design I. (4) F Klement
ntegration of materials mechan cs, and drafting ski ls into engineer ng des gns or modifications. Prerequis tes. MET 360, 380, GRC 314 Six hours lecture and labo- ratory

419 Machine Design II. (4) S; K ement
Integration of materials mechan cs, and drafting skills into engineer ng designs or modificat ons Prerequ site, MET 418 S x hours lecture and laboratory

440 Fluid Mechanics. (3) F, Klement
Stat c and dynam c properties of fluids Flow measure- ment and fluid control des gn. Prerequis tes. MAT 261; PHY 111. Four hours ecture and aboratory.

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 related fine arts areas, 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 any accredited junior or community college will be accepted up to a maximum of 64 semester hours Community college students planning to transfer at the end of their first or second year should plan their community college courses to meet the requirements of the Arizona State University curriculum selected. Students attending Arizona Community Colleges 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. Arizona students are urged to refer to the *Arizona Higher Education Course Equivalency Guide* for transferability of specific courses from Arizona Community Colleges. Copies of the guide are available in counselors' offices. In choosing courses at a community college students should be aware that a minimum of 50 hours of work taken at the University must be upper division credits While attending a community college, it is suggested that students elect General Studies and lower division courses in the major field.

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 as approved by the faculty.

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, the chair or director of the department or school, and dean of the College in which the course is offered.

Honors Programs. The honors Program in the College of Fine Arts is intended for the distinguished Bachelor of Arts degree student (Art, Dance, Music, and Theatre majors) whose interests and specific curriculum indicate that definite advantages may accrue from a program emphasizing individual study. Admission to the program requires a minimum grade point average of 3.5 and junior standing (completion of 55 credit hours). The program includes colloquia, independent study, and honors thesis. For further details consult with the Honors representatives in your school or department or the assistant dean.

Certificate of Merit. The Certificate of Merit, awarded by the College of Fine Arts upon recommendation of the faculty of the School of Art, recognizes excellence in some aspect of studio art. The Certificate of Merit seeks to identify outstanding accomplishment and may or may not be awarded every year.

Performer's Certificate. The Performer's Certificate, awarded by the College of Fine Arts upon recommendation of the faculties of the School of Music and Department of Dance, gives special recognition to excellence in interpretation and technical proficiency in music or dance performance. Specific information may be obtained by contacting the Department of Dance or School of Music. The Performer's Certificate parallels the Certificate of Merit in intent and may or may not be awarded every year.

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.

Baccalaureate Degrees.

Bachelor of Arts (B.A.):
- Art, Music, Dance or Theatre

Bachelor of Fine Arts (B.F.A):
- Art:
  - Concentrations in Art Education, Ceramics, Drawing, Fibers, Graphic Design, Intermedia, Jewelry, Painting, Photography, Printmaking, Sculpture, Wood
- Dance:
  - Concentrations in Performance and Choreography, Dance Education
- Theatre:
  - Concentrations in Theatre Education, Performance/Production

Bachelor of Music (B.M.):
- Choral-General Music
- Instrumental Music
- Music Therapy
- Performance:
  - (Voice, Keyboard, Guitar, Orchestral Instrument, Piano Accompanying, Jazz, Music Theatre)
- Theory and Composition

Graduate Degrees.

Master of Arts (M.A.):
- Art, Music History and Literature, or Theatre

Master of Fine Arts (M.F.A.):
- Art:
  - Concentrations in Ceramics, Drawing, Fibers, Jewelry, Painting, Photography, Printmaking, Sculpture, Wood
- Dance:
  - Concentration in Performance and Choreography
- Theatre:
  - Concentration in Child Drama

Master of Music (M.M.):
- Choral 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

Doctor of Musical Arts (D.M.A.):
- Choral Music, Instrumental Music, Solo Performance

Doctor of Philosophy and
Doctor of Education (Ph.D, Ed.D.):
- Major in Secondary Education with concentrations in Art Education, Music Education, Choral Music, General Music or Instrumental Music)

Undergraduate Degrees.

The three baccalaureate degrees differ in curricula with respect to the amount of specialization permitted in the major field. The Bachelor of Arts degree provides a broad, scholarly, humanistic program, while the other two programs place greater emphasis upon the major field. General Studies play an integral role within the educational mission of the University and as such comprise an important component of all undergraduate degrees in the College of Fine Arts. Included in the General Studies program are studies in fine arts, humanities, social behavorial sciences, and science mathematics. See below for General Studies requirements.

In cooperation with the College of Education, certification is available at the secondary level in the disciplines of art, dance, music, and theatre for students preparing for a teaching career in the public schools. Students should, with the advice and counsel of their arts education advisors, fulfill the requirements for the appropriate area of specialization under the Bachelor of Fine Arts or Bachelor of Music degrees.

Graduate Degrees

Master's programs range from 30-60 semester hours dependent upon the degree chosen. Doctoral programs vary in scope and curricula. See the *Graduate Catalog* for specific requirements for the M.A., M.F.A., M.M., D.M.A., Ph.D., and Ed.D. degrees.

Undergraduate Degree Requirements. In addition to the general information given below, consult the sections of this catalog listed under School of Art, Department of Dance, School of Music, or Department of Theatre for specific degree requirements.

Bachelor of Arts Degree (B.A.). The Bachelor of Arts degree requires 45-60 semester hours of credit for the major. Dependent on the major, 18-24 credits must be selected from upper division courses (300 or 400 level). The credit hour requirements in the major are distributed between a field of specialization (30-45 credits) and one or more related fields (an additional 15 credits). The exact content of the major is selected by the student in consultation with his/her advisor under rules and regulations of the department or school concerned.

Bachelor of Fine Arts Degree (B.F.A.). The Bachelor of Fine Arts degree requires 65-85 semester hours of credit for the major. At least 30 of these credits, dependent on the major, must be selected from upper division courses (300 or 400 level). The curriculum for the major is designed as pre-professional study in art, dance, or theatre. Auditions and/or interviews are required for admission to the B.F.A. program in dance or theatre. Consult these departments for specific information.

Bachelor of Music Degree (B.M.). The Bachelor of Music degree requires 84 semester hours of credit for the major. The required number of upper division courses (300-400 level) is dependent on the area of specialization. The curriculum for the major is designed to provide a broad, yet concentrated, preparation with a choice of specialization among the areas of music performance, music theatre, jazz, music therapy, piano accompanying, theory-composition, instrumental music, or choral/general music. Entering undergraduate music majors, regardless of area of specialization, must perform an entrance audition in their primary performing medium (voice or instrument).

General Studies

To meet the General Studies requirement a minimum of 54 semester hours (exceptions: 48 semester hours for the Bachelor of Arts in music degree and 36 to 42 semester hours for the Bachelor of Fine Arts degrees and the Bachelor of Music degrees, depending on the major) must be completed.

A minimum of six hours of course work must be completed in humanities, to be selected from architecture, communication, English (except English 101, 102, 105, 107, and 108), foreign languages, humanities, philosophy, and religious studies; a minimum of six hours of course work in any fine arts course outside of the major department or school, to be selected from art, dance, music, and theatre; a minimum of six hours of course work must be completed in the social and behavioral sciences, to be selected from anthropology, economics, geography (GCU only), history, political science, psychology, and sociology; a minimum of six hours of course work in science and mathematics, to include one laboratory science selected from biology, botany, chemistry, geography (GPH only), geology, physical science, physics, and zoology. It should be noted that specialization minimum requirements may be higher in certain departments/schools.

General Studies electives may be selected from the above areas as well as interdisciplinary studies in fine arts or liberal arts (FIA and LIA), journalism and telecom-

munication, and physical education (except activity courses). 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. Additional electives to complete the total of 126 may be taken in any area of the university.

In addition, the student will meet the University English proficiency requirement: ENG 101 and 102 (six hours) or ENG 105 (three hours). These courses may not be used to meet General Studies requirements.

Foreign Language Requirement. All Bache or of Arts degrees require the equivalent of 16 semester hours of credit in one foreign language. (Exception: The Bachelor of Arts degree in studio art strongly recommends but does not require foreign language study). Course work may be selected in any language and must follow the sequence of language courses 101, 102, 201, and 202. This requirement may be fulfilled at the secondary school level or by examination. If acquired in second ary school, two years of instruction in one fore'gn language is considered the equivalent of one year of college instruction. Transfer students will be placed in language study at the level above completed work. Candidates for the Bachelor of Music degree in voice performance may elect more than one foreign language chosen in conference with his/her advisor. There is no foreign language requirement for other areas of specialization of the Bachelor of Fine Arts or Bachelor of Music degrees.

Interdisciplinary Studies in Fine Arts. Courses listed under the prefix FIA represent interdisc'p inary studies in art, dance, music, and theatre. Consult the *Schedule of Classes* for selection of topics. Course work is available to the general student as studies in the nterrelationships of the visual and performing arts as well as seminars and colloquia designed for students enrolled in the Honors Program. FIA: 294, 493, 494, 497, 498, 499.

Graduation Requirements. The minimum graduation requirement is the completion of 126 semester hours of credit with a minimum cumulative scholarship index of 2.0. Of these 126 credits at least 50 must be selected from upper division courses numbered 300 to 400. Many professional programs within the Col lege of Fine Arts require additional semester hours of credit for graduation To be ac ceptable as graduation credit, all course work in the major discipline must show an earned grade of C (2.0) or higher.

School of Art

PROFESSORS:
LEHRER (ART 102), BRECKENRIDGE, BROADLEY, CHOU, FINK, GASOWSKI, GOO, GRIGSBY, HAHN, HALE, HELLER, JACOBSON, LINDERMAN, MAGENTA, SCHAUMBURG, STULER, J. J. TAYLOR, WAGNER, WOODS

ASSOCIATE PROFESSORS:
DEMARSCHE, deMATTIES, ECKERT, GILLINGWATER, GULLY, JAY, JENKINS, KIMBALL, KOTROZO, KRONENGOLD, PILE, PIMENTEL, SCHMIDT, SHARER, J. R. TAYLOR, WATSON, WHITE, YOUNG

ASSISTANT PROFESSORS:
BRITTON, FARNESS, HAJICEK, KAIDA, OTIS-FRONSKE, RABINER, RISSEEUW, SHIPP, UMBERGER, 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 the 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 stu dio 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, Renais-

sance, 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; or lower division non Western equivalent, 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 the completion of two years' study at the college level. For specific courses, see Foreign Languages Department.

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, drawing, fibers, graphic design, intermedia, jewelry, painting, photography, printmaking and sculpture, wood.

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, when approved by the advisor and the School of Art, may be applied to the major if deemed appropriate to the students' 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, a 400-level ARH 20th Century course, and a 400-level ARH elective; 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, drawing, fibers, jewelry, painting, photography, print making, or sculpture, wood. 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

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
Emphas s on compos tion exploration of drawing media Prerequ s te· ART 211, 214 and approva of n structor S x hours a week

314 Intermediate Life Drawing I. (3) F, S
Draw ng from the model w th greater reference to struc tura graph c and compos t ona concerns Prerequ site. ART 214 or approva of nstructor. Six hours a week

315 Intermediate Life Drawing II. (3) F, S
The human f gure as the subject for drawing Emphasis on conceptua alternatives and management of mate- r a s Prerequis te ART 314 or approval of instructor. S x hours a week

411 Advanced Drawing. (3) F S
Visual and nte ectual concepts through problem solv ng and ndependent study Emphasis on the ind - v dua creat ve statement May be repeated for credit Prerequis tes ART 311 and approval of instructor. Six hours a week

412 Drawing Techniques of the Old Masters. (3) N
Techniques of drawing from ear y Renaissance to the present, si ver point, bistre ink, qu l pen pastels and chiaroscuro drawings May be repeated for cred t. Pre requ site approva of nstructor S x hours a week

414 Advanced Life Drawing. (3) F S
Var ous med a and techn ques on an advanced evel. The human f gure as an express ve vehicle in various contexts May be repeated for credit Prerequis te ART 315 or approval of instructor Six hours a week

415 Art Anatomy. (4) N
Study of human anatom ca structures as appl ed to the pract ce of f gure oriented art. Prerequis te ART 214 Three hours ecture, 5 hours stud o a week

PAINTING

ART 223 Beginning Painting. (3) F, S, SS
Fundamental concepts and materia s of traditiona and exper mental paint ng media. Emphasis on preparation of paint ng supports, compos t on and color. Prerequi s tes ART 111, 112 113 and 115 Six hours a week

227 Beginning Watercolor. (3) F S
Pa nt ng n al water-so uble med a Emphasis on tech n ques, compos t on and co or. Prerequis tes. ART 111, 112 113 and 115 S x hours a week

323 Intermediate Painting I. (3) F, S
Development of competency in skil s and express on. Ass gned prob ems involve ight, space, co or form and content. Prerequis tes. ART 223 and approval of in structor S x hours a week.

324 Intermediate Painting II. (3) F S
Continuat on of ART 323. Prerequ sites. ART 323 and approval of instructor S x hours a week.

325 Figure Painting. (3) F S
The human f gure c othed and nude as the subject for paint ng n se ected media. Prerequ sites. ART 314 and 323 S x hours a week

327 Intermediate Watercolor. (3) A
Explorat ons us ng a var ety of surfaces, and a com b nat on of med a and materials Prerequ site· ART 227. S x hours a week

421 Painting Materials and Techniques. (3) A
Trad t ona and modern materia s and techn ques of paint ng Experimenta prob ems in tempera encaustic case n emulsions Maroger s Med um and synthet c me dia Prerequ site approva of instructor S x hours a week.

423 Advanced Painting. (3) F, S
Cont nuation of ART 324. May be repeated for credit Prerequis te ART 324 S x hours a week

425 Advanced Figure Painting. (3) F, S
Continuation of ART 325 May be repeated for credit. Prerequ sites ART 315, 324 and 325 Six hours a week

427 Advanced Watercolor. (3) F, S
Continuation of ART 327. May be repeated for credit. Prerequis te. ART 327 S x hours a week.

INTERMEDIA

ART 340 Intermedia. (3) F, S
Experimental, conceptual and inter-disciplinary studio art with emphasis on new media and technologies. Prerequis tes· ART 111, 112, 113 and 115 and six hours add t onal studio requirements or approval of instructor. Six hours a week May be repeated once for credit.

341 Mixed Media. (3) A
Exploring visual effects by combining traditional and non-traditional methods, techniques and concepts Repeatable once for credit. Prerequisites. ART 111, 112, 113, 115 and six hours addit onal stud o requirements or approval of instructor. Six hours a week.

440 New Media Concepts. (3) F, S
Continued exper ments with new med a and nterdisc p inary concerns in art. Repeatab e once for credit. Prerequis te ART 340 S x hours a week

PHOTOGRAPHY

ART 201 Beginning Photographic Art. (3) F, S
Development of sk ls and techniques of black and wh te 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 exp ora- t on nto personal photographic esthetics Prerequisites· ART 111, 112, 113, 115, 201 or approval of instructor S x hours a week

304 Advanced Photography. (3) F, S
nterpretat on and man pulation 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
App ication of color transparenc es and prints to photographic art. Prerequis tes. ART 304 and approval of in structor S x hours a week

306 Photo Techniques. (3) F, S
Exp oration of camera and darkroom techniques with emphasis on creative control for the well crafted black and white print. Prerequis tes. ART 205 or 206 and ap proval 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 commun cation of deas. Prerequ site. 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 photograph c medium. May be repeated for credit. Prerequis te. ART 304 and approval of instructor. Six hours a week

403 Black and White Photography. (3) F, S
Advanced exploration of experimental, interpretive, and stra ght photography. May be repeated for credit. Prerequisites· ART 304 and approval of instructor Six hours a week

404 Portraiture Photography. (3) F, S
Photographing people Critical discussions and slide lectures on ssues in portraiture. May be repeated for

credit. Prerequisite: ART 304, 306 or 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.

459 Monoprinting. (3) F, S
The non-multiple printed image using a variety of technical approaches. Prerequisites ART 311 or 323 or any 300-level printmaking class and 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. May be repeated once for credit. 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. May be repeated once for credit. Prerequisite: ART 231 and 360. 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

272 Beginning Jewelry. (3) F, S
Emphas s on fabricat on n jewelry mak ng. Bas c tech n ques of forming cutt ng and p erc ng forg ng and so der ng. Six hours a week

274 Beginning Wood. (3) F S
Fundamenta woodworking techn ques to produce crea tive functional three d mensional ob ects. Six hours a week.

276 Beginning Fiber Arts. (3) F, S
Structura use of f ber ut lizing a var ety of techniques Surface treatment nc ud ng batik, block print ng, fo d and t e dye S x hours a week

372 Intermediate Jewelry. (3 F S
Fabr cated approach to jewe ry mak ng Techniques in stone setting and surface embell shment Prerequ s te. ART 111 112 113 115, and 272 or approva of n structor S x hours a week

373 Metalworking. 3) A
Compress on, d e and stretch form ng as app ied to ho - low form construction Hot and cold forg ng techn ques as appl ed to smith ng Prerequ site ART 111 112, 113 115, and 272 or approva of nstructor Six hours a week

374 Intermediate Wood. 3 F, S
Indiv dual and d rected prob ems in wood, related to the product on of un que funct ona art objects. Prerequ - s tes· ART 111, 112, 113, 115, and 274 or approval of instructor. S x hours a week

376 Intermediate Fibers: Loom Techniques. 3 A
Investigat on of oom contro led techn ques. Pla n weave, double weave tapestry w l be explored Prereq uis tes ART 111, 112 113 and 276 or approva of n structor Six hours a week

377 Intermediate Fibers: Surface Design. (3) A
Surface des gn techn ques s lk screening paint ng, stamping dye ng on fabr c w l be exp ored Prerequi- s tes ART 111, 112 113 and 276 or approval of n structor Six hours a week

378 Furniture I. (3) A
Design and bu d ng of contemporary furniture. Exp ora t on n the technique of joinery am nation carving and f n sh ng procedures Prerequ sites· ART 111 112 113 115 and 274 or approva of nstructor Six hours a week.

472 Advanced Jewelry. 3 F S
Jewe ry mak ng w th emphas s on deve op ng persona statements and craftsmansh p May be repeated for cred t Prerequis te. ART 372 and approva of n structor S x hours a week

473 Advanced Metalworking. 3 A
Forg ng and form ng techn ques n ind v dua ized direc t ons May be repeated for cred t Prerequ s tes ART 373 and approva of nstructor S x hours a week

474 Advanced Wood. 3) F, S
Extended exper ence and advanced techn ques n the use of wood to create funct ona works of art May be repeated for credit Prerequ site. ART 374 and approval of nstructor. Six hours a week

476 Advanced Fiber Arts. (3) F S
Exper mentation with advanced techn ques in fiber and fabr c May be repeated for credit Prerequ s te: ART 376 and approval of nstructor Six hours a week.

478 Furniture II. (3) A
Form concepts are explored in construct on of inventive furn ture Emphas s on media experimentation May be repeated for credit. Prerequ s te: ART 378. S x hours a week

GRAPHIC DESIGN

ART 282 Illustration I. (3) F, S
Media and methods of contemporary il ustrat on. Pre- requis tes ART 283, 284 and approval of instructor. May be taken concurrently with 384 S x hours a week.

283 Lettering and Typography I. (3) F, S
Fundamentals of type des gn, composit on and ndica tion Exp orat on of creative and techn ca aspects of typography as a means of communicat on. Prerequ s tes ART 111, 112, 113, 115 and approva of in structor. Six hours a week.

284 Graphic Design I. (3) F, S
Esthet c, techn ca and professional fundamenta s of graph c des gn Creative prob em solv ng n visual com mun cations ut lizing i ustrat on, typography, and gra- ph c magery. Prerequ sites. ART 111 112, 113, 115 and 283 wh ch may be taken concurrent y and approval of instructor S x hours a week

380 Lettering and Typography II. (3) F S
Advanced use of existing letterforms and design of type for creative applicat on to specif c graph c problems Prerequis tes ART 283, 284 and approva of nstructor S x hours a week.

382 Illustration II. (3) F S
Continuation of ART 282. Prerequis tes ART 282, 384 and approva of nstructor May be repeated for cred t. S x hours a week.

383 Reproduction Design. 3 F, S
Des gn, preparat on of art for print ng, reproduct on, pasteups mechan cals, co or separat ons, graphic de- s gn cons derat ons, preparation for reproduct on pro cesses Prerequisites. ART 283 284 and approval of n- structor S x hours a week.

384 Graphic Design II. 3 F, S
Cont nuat on of prob ems and deve opment of sk lls in troduced in ART 283 and 284 Prerequis tes ART 283, 284 and approva of instructor. May be taken con current y with 380 S x hours a week

481 Portfolio Preparation. 3) F, S
Development, or entat on and preparat on of a portfolio for the graph c des gn profess on Prerequ sites· ART 382 482 and approva of nstructor S x hours a week.

482 Graphic Design III. (3) F S
Cont nuation of ART 384 Prerequis tes. ART 380, 384 and approva of nstructor S x hours a week.

485 Graphic Design Workshop. (3 6) F S
Profess onal graph c des gn experiences in actua cl ent/des gner s tuations Involvement n the comp ete graph c des gn process from concept to f n shed p ece Advanced graphic design majors only Prerequ sites. Portfolio presentation and approva of nstructor Six to twe ve hours a week

SPECIAL STUDIO COURSES

ART 621 Studio Problems. (3) F, S, SS
Advanced study in the fo low ng areas·

(a Draw ng	f Ceram cs
b Pa nt ng	g Jewe ry
Photography	h Wo d
d Pr ntmak ng	F ber Art
e Scu pture	Stud o A t

Prerequ s te approva of nstructor. May be repeated for cred t S x hours a week each sect on

680 Practicum: M.F.A. Exhibition. (1-15) F, S, SS
Studio work n preparation for required M.F A. exh bi- tion. Publ c exhibit to be approved by the student's su pervisory comm ttee and accompanied by a final oral

examination Photograph c documentat on and wr tten statement of prob em Prerequ s te approval of the student s superv sory committee

Special Courses: ART 294 484, 493 494, 498 499 591, 592 594, 598 (See pages 33 34)

ART EDUCATION

ARE 300 Educating in the Visual Arts. 3) F, S
Studio experiences and inqu ry into the ways peop e earn in art An introduct on to the terature in art and art educat on. Two lectures, 2 hours studio

301 Art in the Elementary School. (3) F S
(For non-majors on y.) Self understand ng through the use of art, concurrent with the study of ch dren s art work from early ch ldhood to m d-ado escence One e ture, 4 hours studio

302 Child Art and Artists (3 F, S
(Majors on y.) Curriculum development instruct ona re sources, learn ng and the psychology of the chi d cur rent issues n art nstruction and c assroom manage ment Prerequisite. ARE 300 or approval of instructor Two hours lecture, 2 hours studio

420 Crafts for the Elementary School Teacher. (3 F, S
Practical aboratory exper ences stress ng a variety of media and act vit es for classroom teach ng Not for MA cred t in Art Educat on). One lecture 4 hours stu dio.

480 Adolescent Art and Artists. (3 F, S
Strategies for teaching art understanding design and exploring concepts re ated to art and art sts in schoo and commun ty art programs Two hours ecture, 2 hours stud o. Prerequ s tes ARE 300, 302 484 or ap proval of instructor

485 Women's View of Art. (3 A
Study of women v sua artists, their l ves, and the soc al, po itical, esthetic and educat ona issues related to the r art Lecture-d scuss on, read ngs and stud o exper ences Prerequ s te· approva of instructor Three hours a week.

488 Critical Inquiry in Art: Art Education. 3) F S
nvestigation of the ideas under y ng art from a crit cal and h stor cal perspect ve as they re ate to curr culum and nstruction Prerequis tes ARE 300, 302, 480 484, or approva of nstructor.

490 Instructional Resources in Art. (3) F, S
Deve opment of audiovisua mater als in art and inqu ry into strateg es for their mp ementat on. Two ectures 2 hours studio Prerequ s tes ARE 412 or approva of n structor

510 Art in the Self-Contained and Open Classroom. (3) A
A ternate teaching/ earning strateg es, art concepts, and sk s relevant to e ementary schoo art exper ences for teachers

511 Issues in Art Education. (3) A
nvest gat on of issues n art education

515 Foundations of Art Education. (3) A
Behaviora foundat ons of education as re ated to art educat on. Emphas s on psychologica and ph losoph cal frame of reference

520 Creativity in Art Education. (3) A
The nature of creative behav or, espec a ly as it app es to the teach ng of the visua arts

525 Art and Society. (3) A
Interrelationsh p of art, soc ety, and social change and the r re evance to areas such as government, museums, and technology

540 Instructional Resources, Art Education. (3 S
Deve opment of aud o v sua mater a s in art and nquiry nto strategies for the r mp ementat on

545 Perception and Learning. 3 A
Concepts of percept on and learn ng in art nstruct on

550 Esthetic Inquiry. (3 F
L terature on esthet cs, methods of nqu ry and mp ica t ons for art educat on

570 Criticism, Issues in Contemporary Art. 3) N
Issues n contemporary art cr t c sm and their impl ca t ons for art educat on

575 Curriculum in Art and Education. 3) F S
L terature n art educat on and educat on on ex st ng strateg es for deve op ng curr cu um, the ssues and prob ems of differ ng curr cu um or entat ons

610 Issues and Trends in Art Education. 3 N
Doctora leve nvest gation of h stor ca and contem porary issues re ated to teach ng and research n art educat on

611 Curriculum Development in Art Education. 3 N
Doctoral evel nqu ry into the ph losophica psy-cholog ca and sociolog cal foundations of curr cu um development

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 33-34

ART HISTORY

ARH 100 Introduction to Art. (3) F, S SS
Deve opment of understand ng and enjoyment of art and ts relationship to everyday l fe through the study of pa nt ng, scu pture, arch tecture and des gn May not be taken for credit by student who has comp eted ARH 300 nor used as art h story cred t by art majors.

101 History of Art from the Dawn of Civilization to the Renaissance. 3 F, S, SS
Anc ent Near Eastern Egypt an, Greek, Roman and me d eva European art to the Rena ssance Lecture dis cussion

102 History of Art from Renaissance to the Present Day. 3 F S SS
Western art dur ng the Rena ssance manner st, ba roque, rococo neo c assic romant c, and modern ep ochs. Lecture discuss on

201 Art of the Non-Western World. 3 F
An h stor ca survey of the v sua arts n Afr can Ocean c, East As an China Japan Southeast Asian, pre Co umbian Nat ve Amer can nd an, slam c cul tures Prerequ sites ARH 101 and 102 or approva of nstructor

300 Introduction to Art. (3) F S, SS
Course content same as ARH 100 but requires a h gher level of accomp shment and comprehension May not be taken for cred t by student who has comp eted ARH 100 nor used as art history credit by art majors

401 American Art I. 3 F
History of art in the Un ted States from European settle-ment f the New Wor d to the Columb an Expos t on of 1893 Prerequ sites. ARH 101 and 102 or approva of n structor

402 American Art II. 3) S
History of art n the Un ted States from the ast decade of the 19th century to World War I Prerequ s tes ARH 101 and 102 or approva of nstructor.

403 Pre-Columbian Art I. 3) A
Architecture, scu pture, ceramics, manuscr pt, pa nt ng and other arts of Mesoamer ca pr or to European con-tact Prerequ s te approva of nstructor

404 North American Indian Art. (3) A
Native American Art forms of the United States and Canada from prehistor c times to present Prerequi s tes ARH 101 and 102 or approva of nstructor.

405 Southwest Indian Art. (3) A
American Ind an art in the southwestern states from ts or gins to the present day. Prerequisites· ARH 101 and 102 or 110.

406 Mexican Art. (3) A
Art of Mexico and re ated Centra Amer can cu tures from the prehistor c to the contemporary schools. Pre requ sites. ARH 101, 102 and 110 or approva of n- structor

408 Pre-Columbian II. 3) A
Arch tecture scu pture ceram cs text es and metal- work of Centra and South America pr or to European contact Prerequis te· approval of nstructor

409 History of Printmaking. 3) A
H story of the pr nt as an art form and its relat on to other modes and forms of art st c express on Prerequi- s tes· ARH 101 and 102 or approva of nstructor.

410 Ancient Near Eastern Art. (3) N
H story of pa nting sculpture and arch tecture n Meso- potam a, Egypt, and the Aegean Prerequ sites· ARH 101 and 102 or approval of instructor

411 Greek Art. (3) A
Art and architecture of Greece and the Hellen st c Em pire Prerequ sites· ARH 101 and 102 or approva of in structor

412 Roman Art. 3) A
Art and arch tecture of Etrur a Rome, and the Roman Emp re Prerequ s tes ARH 101 and 102 or approval of nstructor

414 Early Christian and Byzantine Art. (3) A
Art and arch tecture of the early church and the Byzan t ne Empire from the 4th to the 15th century Prerequi s tes. ARH 101 and 102 or approval of instructor

420 Early Medieval Art. 3) A
Arch tecture, sculpture and pa nting in the Latin West from the 7th century to the end of the Ottonian Period Prerequis tes ARH 101 and 102 or approva of n structor

422 Romanesque Art. 3 A
Sculpture paint ng, arch tecture, and m nor arts n western Europe dur ng the Romanesque per od Prereq u sites: ARH 101 and 102 or approval of nstructor.

424 Gothic Art. (3 A
Pa nting scu pture and arch tecture in western Europe dur ng the Gothic per od Prerequ sites ARH 101 and 102 or approva of nstructor

428 Art of the Renaissance in Northern Europe. (3) A
Paint ng, sculpture, and arch tecture dur ng the 1400s and 1500s north of the Alps Prerequis tes ARH 101 and 102 or approval of nstructor

432 Early Renaissance Art in Italy. (3) A
Pa nt ng sculpture and arch tecture n taly from 1300 to 1500 Prerequis tes ARH 101 and 102 or approval of instructor.

434 Art of the Italian High Renaissance and Mannerism. (3) A
History of ta an art dur ng the 16th century, includ ng the achievements and influence of Leonardo da V nc Raphael and Miche ange o Prerequis tes ARH 101 and 102 or approva of nstructor.

440 Art of the 17th Century in Southern Europe. 3) A
Baroque pa nting, sculpture and arch tecture in Ita y and Spain. Prerequ sites ARH 101 and 102 or approva of nstructor.

442 Art of the 17th Century in Northern Europe. (3) A
Baroque painting, sculpture and architecture in Flan ders, the Netherlands, France and Eng and Prerequi- s tes ARH 101 and 102 or approval of instructor

444 Art of the 18th Century. (3) A
H story of pa nting, sculpture architecture graphic arts and the decorative arts from 1700 to the French Revo lution (1789). Prerequ sites: ARH 101 and 102 or ap- prova of nstructor.

450 Art and Revolution. (3) A
Impact of American and French Revo utions and the Napoleonic epoch on v sual arts Concentration on Goya, David Ger cau t Blake etc Prerequ sites. ARH 101 and 102, or approval of instructor.

451 Romanticism and Realism. (3) A
H story of the visual arts n the first half of the 19th cen tury Prerequis tes ARH 101 and 102 or approva of in structor

452 Impressionism and Late 19th Century Art. (3) A
H story of pa nt ng, sculpture and graph c arts in atter ha f of the 19th century Prerequ's tes ARH 101 and 102 or approva of nstructor

454 Art of the 20th Century. (3) A
Deve opments and directions in art between 1900 and Wor d War Prerequ s tes. ARH 101 and 102 or ap proval of nstructor

456 Art Since 1940. (3) A
Art since World War II with considerat on of new con cepts and experimentation w th media and modes of presentation Prerequis tes 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 persona it es, processes, mages, and ideas Prerequis te ARH 101, 102 or approva of nstructor.

462 20th Century Photography. (3) A
Persona ties, processes, images and deas n pho tography from 1914 to present Prerequisites ARH 101 and 102 or approva of instructor

466 Photographic Publications of the 19th Century. (3) N
Photographs for magazine and book i lustrations from Fox Ta bot s *Pencil of Nature* to Stieg itz's *Camera Work*. Prerequis te. ARH 460 or approval of instructor.

470 Art of India. (3) N
Paint ng sculpture and arch tecture of nd a and Southeastern As a Prerequ sites. ARH 201 or approva of nstructor

471 Art of China. (3) A
Study of major forms n Ch nese art ritua bronze, scu pture, ceramic ca igraphy, pa nting and arch tec- ture Prerequ sites. ARH 201, or approva of nstructor.

472 Art of Japan. (3) A
Japanese art from the Joman per od to the present. Prerequisite ARH 201 or approva of nstructor

474 Chinese Painting. (3) A
From Ku K'a chin to Ch Pai shih Major artists, sty es and movements n Ch nese pa nt ng Prerequis te· ARH 201 or approval of nstructor

480 Research Methods. (3) F, S
Methodo ogy and resource material for art h storical re- search Techn ques of scholarly and cr tica writ ng and eva uation of b b iographic sources. Prerequis tes ARH 101 and 102 or approval of instructor

482 History of Visual Arts Criticism I. (3 N
H story of theories of criticism of the visua arts Read ings from visua arts critical iterature from Plato to 18th century. Prerequisites: ARH 101 and 102

483 History of Visual Arts Criticism II. (3) N
Continuation of ARH 482, focus ng on various theor es of criticism of the visual arts from late 18th century to present. Prerequis te. ARH 482.

486 Twentieth Century Art Criticism. (3) N
Sem'nal, influential wr t ngs in development of modern art cr ticism Role of art crit c, art journa s in relat on to art commun'ty. Prerequ s te ARH 454, 483 and/or approval of nstructor.

488 Art Criticism Writing. (3) N
Traditiona and contemporary approaches to the cr t - cism of art. Students wil wr te crit cal essays. The latter ha f of the semester wi l stress the criticism of contemporary art n various media. Prerequisites ART 486 and/or approval of instructor

498 Pro-Seminar. (3) A
Undergraduate sem nar in topics se ected from the fo low ng Prerequisite: approval of instructor
Prob ems or critic sm n

a) Ch nese Art	(f Modern A t
(b) Ancient Art	g Amer ca nd an Art
(c) Med eva Art	h Pre Co umb a Art
d) Rena ssance Art	( ) Photograph c H tory
(e) Baroque Art	

591 Seminar. (3) A
Graduate sem nar in topics se ected from the fol owing Prerequ site· approval of nstructor
Prob ems or crit c sm n

a Ch nese Art	f Modern Art
b Anc ent Art	g Amer can nd an Art
(c Med eva Art	(h Pre Co umb a Art
(d) Rena ssance Art	(Photograph c H tory
(e Baroque Art	

Special Courses: ARH 294 484, 492, 493 494, 499 500 590, 592, 598, 599 (See pages 33 34.)

AUXILIARY COURSES

ARA 202 Introduction to Photo Aesthetics. (3)
S ide ecture course in understand ng photography as a fine art form.

454 Museum Studies I. (3) A
H story of the or gins and development of museums Topics covered will be the history of collecting, con noisseurship and conservation Prerequ site. Approva of instructor

456 Museum Studies II. (3) N
Pract ca operation of museums; methodo ogy. theory /practice including organization administration, fund raising grant proposals, co lecting reg strat on, budgets personnel and education programs Prerequ site ARA 454

460 Gallery Exhibitions. (3) F S
Pract ca experience in al phases of department ga ery operations and preparation of ga ery publ cations Pre requ sites. approval of instructor. May be repeated for cred t.

Special Courses: ARA 294, 484, 494, 498 584, 591 594, 598 (See pages 33-34)

Department of Dance

PROFESSORS:
LESSARD (PEBE 115), NAGRIN

ASSOCIATE PROFESSOR:
JONES

ASSISTANT PROFESSORS:
CHLISTOWA, GREGORY, HUSKEY, LUDWIG, MAR ON

INSTRUCTORS:
JACOBY, MATT

Departmental Major Requirements

For advisement purposes, all students regis tering 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 401, 402, DAN 130, 131†, 134, 135, 232, 234†, 235, 261†, 262, 334 and 464. Fifteen additiona hours approved by an advisor must be in no more than two related fields. Two years of credit or equivalent in one foreign language is required. For specific courses see page __. Additional requirements are listed on the departmental check sheet.

At least 50 credit hours, including 24 in the ma or, must be upper d vision. Grades in classes required for the major must be C or better. F rst semester students should take DAN 134 Modern; DAN 135 Ba let; ENG 101, MUS 100; and two General Studies elec tives.

Bachelor of Fine Arts Degree Curriculum

Dance Consists of 65 to 85 hours of credit with a concentration in either Performance and Choreography or Dance Education. Core courses required are· DAH 401, 402; DAN 130, 131†, 134, 135, 230†, 232†, 234†, 235, 261, 262, 263†, 334†, 464†, 465†, 490† For the concentration in Performance and Chore ography additional requ rements include DAN 331, 332†, 335, 371†, 434†; MUS 100; MUS 347 or 355 or 356, THP 101. For the specializ tion in secondary education, DAN 360, 361

and 367 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: DAN 134 Modern; DAN 135 Ballet; ENG 101; MUS 100; and two General Studies electives.

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 100 Introduction to Dance. (3) F, S
Orientation to the field of dance with particular reference to trends.

300 Introduction to Dance. (3) F, S
Course content same as DAH 100 but requires a higher level of accomplishment and comprehension. May not be taken by student who has completed DAH 100.

301 History and Philosophy of Dance. (3) N
Dance from ancient times to the present. Consideration of dance as an art in relation to other arts; primitive, preclassic, and modern forms.

401 Dance History I. (3) F
Cultural and theatrical development of dance from prehistoric times through the Renaissance.

402 Dance History II. (3) S
Cultural and theatrical development of dance from the Renaissance through contemporary times.

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.)

Special Courses: DAH 500, 580, 590,591, 593, 594, 598. (See pages 33-34.)

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: MUS 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: MUS 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) S
Investigation and practice of contemporary styles of choreography. Prerequisite: DAN 261, or approval of instructor.

490 Senior Performance in Dance. (2) F
Original choreography for solo or group performance with analysis and critique of problems encountered in production. Must 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) N
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) N
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 33-34.)

School of Music

PROFESSORS:
UMBERSON (MUSIC 183), ANDRESS, ATSUMI, BOSWELL, BRITTON, CARROLL, CLARK, COHEN, ENGLISH, HAMILTON, HOOVER, LOMBARDI, LoPRESTI, MAGERS, McLEOD, McEWEN, PERANTONI, RUCCOLO, SEIPP, SKOLDBERG, SPINOSA, STRANGE

ASSOCIATE PROFESSORS:
DEBENPORT, DOAN, FLEMING, HAEFER, HANNA, HICKMAN, HOFFER, KLIEWER, LOCKWOOD, RAUSCH, RAVE, REYNOLDS, SHINN, SMITH, STALZER, STOCKER, SWAIM, WELLS

ASSISTANT PROFESSORS:
BARROLL, COSAND, CROWE, DeGROOTE, DeMARS, HACKBARTH, HARRIS, HOLBROOK, KOONCE, MAROHNIC, METZ, MEYER, OLDANI, SHAW, SUNKETT, WILLIAMSON, WILSON, WYTKO

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 pages 36 and 40 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. 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. 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. Areas of study may include music history, ethnomusicology and music theory. At least 23 credit hours, 12 in field of specialization, 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. MHL 341, 342

Conducting: MUP 209, 339

Music Education. MUE 110, 313, 315, 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, 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: MHL 341, 342

Conducting: MUP 210, 340

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: MHL 341, 342, 447

Repertoire and Pedagogy: MUP 451 or 452, 481 or 482

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: 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 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

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: Four different semesters of large ensembles, plus five credit hours of ensembles within five 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: 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: 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: 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, 321, 327, 441

Music History: MHL 152, 341, 342, 352

Conducting: MUP 210

Pedagogy: MUP 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, 335, 336

Improvisation: MUP 141, 142, 217, 218, 417, 418

Ensemble. Eight semesters including two semesters of MUP 386 and six semesters of MUP 379 (CME: Jazz)

Recital Attendance: Six semesters of MUP 100

Music Therapy

Music Theory. MTC 125, 221, 222, 223, 327, 422

Music History: 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, 385, 386, 387, 388, 441, 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. Six semesters of participation with at least four semesters in large 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 plus three elective hours.

Music History: MHL 341, 342, 447 and three 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

Final project: MTC 495

Recital Attendance: Six semesters of MUP 100

Music Minor

Elementary Education Major

Music Theory. MTC 100, 101

Music History: MUS 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 (voice, keyboard, instrumental, piano accompanying, pedagogy, music theatre direction, music theatre performance), choral music (choral music, general 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 symbolic literacy to begin work in the field of musical learning No credit for music majors

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. (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
Musical space in the theatre, viewed in terms of historical importance and relative function

357 Esthetic Perception in Music Performance. (3) F, S SS
ntroduces the nonmusic major to the esthetics of performance by stressing their physical and emotional involvement in the direction, motion intensity and color spectrum of music

Special Courses: MUS 294, 494

MUSIC EDUCATION

MUE 110 Orientation to Music Education. (1) F
The larger field of music education. Objectives and instructional procedures in music teaching In school observations

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
Orientation to pre-clinical experience with an emphasis on observation skills, assessment, goal setting and professional ethics Required off campus observations. 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.

315 Music in the Junior High School. (2) A
Student characteristics, curriculum, and teaching strategies for choral and general music. For music majors only.

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
Teach ng and playing ski ls for music therap sts and music minors. Three hours per week.

329 Educational Methods for Brass. (1) S
Teach ng and playing sk ls for music therap sts and mus c minors Three hours per week.

339 Educational Methods for Woodwinds. (1) F
Teaching and p aying skil s for mus c therapists and music m nors Three hours per week.

361 Music Therapy II. (3) F
Influence of music on behav or; princip es and practices of mus c therapy and psychiatr c c ients Prerequ site MUE 261. Mus c Therapy majors only

362 Music Therapy III. (3) S
Organization, adm nistration and use of music in rehabi tation with various c ient populations. Prerequisite. MUE 361 Music Therapy majors only

381 Music Therapy Research. (2) S
Statistics and research design appropriate for nvestiga t ons in music therapy

384, 385, 386, 387, 388 Therapy Pre-Clinical I-V. (1) F, S
Paired students w l prov de mus c therapy for small groups at a community agency for mental y retarded, ger atrics or phys cal y d sabled clients for a m nimum of ten c ock hours. Prerequisites: MUE 211 and 261

441 Psychology of Music. (3) S
Psycholog cal and phys o og cal aspects of mus c emphas zing musica behav or funct on, perception and earning Prerequ site MUE 362

475 Therapy Practicum. (1) F
Act vit es for mus c therapy ma ors, professional writing sk lls professional cons derat ons Prerequ sites: MUE 362. Music Therapy ma ors only

476 Internship in Music Therapy. (1) F, S
A six-month residency n an approved c inica institu t on

480 Choral Music Practicum. (3) S
Methods of nstruct on, organ zat on and presentat on of appropriate content n choral mus c classes. Must be majoring n secondary educat on.

481, 482 Instrumental Music Practicum. (5, 5) F, S
nstrumental mus c as a means of develop ng mus c sk lls understand ngs and attitudes in elementary and secondary school students Must be majoring in sec ondary education

549 Foundations of Music Education. (3) A
A treatment of histor cal perspectives, ph losophy aesthetics dentif ed w th mus c educat on, and earn ng theor es appl ed to music teach ng/ earning. Bas c re search and wr t ng sk lls appropriate to graduate stud es in music education

550 Studies in Music Curricula. (3) A
Scope and sequence of musica experiences. Development of criteria for the eva uat on of mus c curricu a

551 Advanced Studies in Elementary School Music. (3) A
For exper enced teachers; organ zat on and content of the general music classes in k ndergarten and the first six grades of elementary school Emphas s on teaching music reading and ear train ng to young ch ldren.

552 General Music, Music Theory and Music History Classes in the Junior and Senior High School. (3) N
Organization and content of schoo music c asses which are not performance oriented

553 Contemporary Elementary Music. (3) F
Ident f cation and development of materials and techniques for teaching special units of music study to elementary (K 8) children.

560 Teaching Contemporary Music.(3) N
Strategies for using contemporary music w th school music classes and organizations.

564 Instrumental Music, Advanced Rehearsal Techniques. (3) A
An n depth analysis of nstrumental techniques in preparat on for a thorough discuss on of band tuning prob- ems and solutions D scussion of productive conducting and rehearsal techniques for schoo music teachers

566 Instrumental Literature for Schools. (3) N
Comprehensive study and analysis of a l types of nstrumental music

568 Choral Music, Advanced Rehearsal Techniques. (3) A
Musical and voca techn ques necessary for presentation of choral l terature Analysis and experimentat on with psychological, acoust cal and other problems of re hearsa and performance.

570 Choral Literature for Schools. (3) A
Comprehens ve study and ana ysis of choral music for the h gh school w th special emphasis on octavo l terature.

579 Psychology of Music. (3) N
The nature of musical ty and its evaluation. A rev ew of recent research.

585 Vocal Acoustics and Production. (3) A
An in depth approach to the
psycho og ca /physio og cal work ngs of the vocal mechanism

733 Experimental Projects and Recent Trends in Music Education. (3) S
Recent trends and research deve opments which cha - enge tradit ona pract ces.

744 Major Problems in the Education of Music Teachers. (3) F
Patterns of music teacher education and a projection of course outl nes designed to accommodate the most comprehensive demands of the changing school music curr cu um.

755 Philosophy and Esthetics in Music Education. (3) SS
Phi osophy and esthetics as they inf uence 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 33 34)

MUSIC HISTORY

152 Jazz Listening. (1) S
An introduction to jazz forms, idioms, and major innovators

341, 342 Music History. (3) F, S
Western mus c from the Greeks to the present day. Prerequ site. MTC 221. Need not be taken in sequence.

352 The Evolution of Jazz. (3) A
Origin, deve opment and styles of jazz music and its exponents Prerequis te MTC 223.

438 Music in the Classic Era. (3) N; Rave
Development of the classic style of the 18th century, major works of Haydn, Mozart, and Beethoven. Prereq uisites: MHL 341, 342, MTC 327.

439 Music in the 19th Century. (3) N; Oldani
European art music after Beethoven Prerequisites: MHL 341, 342, MTC 327

441 Music of the Baroque Era. (3) N, Oldani
Works of major composers and styl st c tendencies of the period Prerequisites: MHL 341, 342, MTC 327

447 Music Since 1900. (3) F, SS, Rave
Survey of the works by major composers and sty istic trends. Prerequis tes: MHL 341, 342; MTC 327.

466 North American Indian Music. (3) N
Various styles of ndian mus c in the United States Canada and Mexico. Open to mus c majors and non majors.

532 Music Bibliography. (3) N
Major h storica and ana yt cal writings; systematic and h storica collections of mus c Reading knowledge of a foreign language recommended

535 Medieval Music. (3) N
Music of Europe n the M dd e Ages, Gregor an chant, re igious and secular monophony and po yphony to 1430.

536 Music of the Renaissance. (3) N
Mus cal thought in Europe, with emphasis on stylist c concepts and changes c. 1430 1580.

544 World Music I. (3) N
Music of traditional and folk cultures of Africa, Europe, and the Amer cas

545 World Music II. (3) N
Traditional, folk, and art music of the Pac fic Near East, and Asia.

547 Topics in American Music. (3) S
Se ected topics in the h story of music composers work ng in the Americas w th emphasis upon mus c since 1900

575 History of Choral Music. (3) F, SS
Major choral works

Special Courses: MHL 294, 492, 493, 494, 498, 499, 583, 590, 591, 592, 594 598, 599 690, 691, 693, 783. (See pages 33 34.)

MUSIC THEORY AND COMPOSITION

MTC 125 Basic Music Theory. (3) F, S
For mus c majors designed to develop aural and nota- tional skil s. Meets da ly

221 Music Theory-18th Century. (3) F, S
Mus c from the 18th century w th a v ew toward deve op ng students' abi it es to analyze, theor ze, perform and create examples within the style Development of re ated aural, v sual and keyboard skil s. Prerequisite MTC 125

222 Music Theory-19th Century. (3) F S
Mus cal compositions chosen from the ate 18th and 19th centuries. Harmonic progress ons, melodic con- struct on and rhythmic developments; development of re ated aural, v sual and keyboard ski ls. Prerequ site MTC 221.

223 Music Theory-20th Century. (3) F, S
Representative 20th century compositions with particu lar emphasis on those elements of melodic, harmonic and rhythmic treatment wh ch break w th past conven tions Development of related aural, visua and key board skills. Prerequisite: MTC 222

315 Modern Arranging. (2) F
Techniques in arranging for the contemporary jazz, radio, telev sion, and studio orchestra. Prerequ site: MTC 223.

316 Modern Arranging. (2) S
Cont'nuation of MTC 315 Prerequisite: MTC 315

317 Composition for Non-Composition Majors. (2) N
Phrase and period structure, melod c composit on and accompan ment, composition of smal forms. Not to be elected by compos t on majors Prerequ s te: MTC 223. May be repeated once for credit

320, 321 Counterpoint. (2 2) F, S
First semester, strict counterpoint in modal style, sec ond semester, str ct and free tonal counterpoint. Pre- requ site. MTC 221 Need not be taken n sequence.

323 Composition. (2) F S
Creative writ ng in the sma ler forms including the use of harmonic textures and contrapuntal devices Prereq- u s te MTC 223 May be repeated for credit

324 Survey of Jazz Styles. (2 A
Large ensemble compos tions and recorded improvised solos Prerequis te MHL 352

327 Form and Analysis I. (2) F, S
Organ z ng elements n the most mportant contrapuntal and homophonic musical forms from the Rena ssance through the 19th century. Prerequisite MTC 223.

422 Musical Acoustics. (4) F, S
Propert es of sound and tone. Harmonic series instru ments, the ear, auditorium acoustics, and the reproduc t on of sound A thorough knowledge of mus cal nota t on, intervals, scales and harmony, or two years of mu sic theory wi be assumed.

425 Studies in 20th Century Theory. (3) F
Continued development of analytica techniques and aural sk l, with an examination of theoretical systems appl cable to 20th century music. Prerequisite MTC 223.

428 Form and Analysis II. (2) S
Organiz ng principles of the large forms of musica com position in the 19th and 20th centur es. Prerequisite MTC 327.

429, 430 Canon and Fugue. (2,2) N
Polyphonic stud es in form and techn que Prerequisite MTC 321

431 Choral Arranging. (2) S
Practical studies n ed ting and arranging for choral or gan zat ons Preparation of suitable materia s for young cho rs and advanced groups Study of accompan - ments. Prerequis te MTC 223

433 Orchestration. (3) N
Theoretica and pract cal study of scoring for orchestral instruments n var ous combinations, ranging from sma l ensembles to symphonic orchestra and concert band Prerequ site: MTC 223.

436 Electronic Studio Techniques. (2) F S
Pr nc p es of e ectronic music systems and their app cat ons in the composition and record ng of electronic music May be repeated for credit Cannot be used to fu f ll theory requirements on graduate degrees

441 Jazz Composition. (3) F
Creat ve writing n the smaller forms and n the id om of jazz Prerequ site. MTC 321

495 Final Project. (0) F S
A half rec ta of compos tions or approva of a large sca e composition or a research paper.

501 Theory Techniques. (2) F S
Two hours a week Credit cannot be applied toward the graduate theory requirement

520 Advanced Analytical Techniques. (2) S, SS
Ana yt cal techn ques systemat cally app ed to mus c. Concentrat on on structura and compos t ona proce dures

523 Advanced Composition. (2) F, S
Creative writing in the larger forms for chorus orches tra and band Prerequis tes MTC 323, 428, MHL 447 or equ va ent. May be repeated for credit

525 Pedagogy of Theory. (3) N
Pract ces and pr nc p es of teaching mus c theory Em phas zes most des rable and pract cal offerings pos- s ble Comparative stud es of existing practices.

527, 528 Evolution of Musical Theory. (3,3) F, S
Theory from Pythagoras to the present. Need not be taken in sequence

553 Advanced Choral Arranging. (2) F
Choral techniques in composit on and arrang ng Vocal writ ng through ana ys s of choral works. Projects n both arrang ng and composit on.

554 Advanced Scoring Problems. (2) N
Instrumentat on P ay ng characteristics of each nstru- ment writing and arranging diomatic music for the n strument. Projects in both scoring and compos tion

Special Courses: MTC 294, 484, 492, 493 494, 498, 499 580 590 591, 592, 594, 598, 599, 690, 693 783 (See pages 33-34.)

MUSIC PERFORMANCE

MUP 100 Concert Attendance. (0) F S
Requ red of a l music majors for s x semesters n 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 P acement audi- t on required. P ano, organ, harpsichord vo ce, harp, flute, oboe, c arinet saxophone, bassoon, trumpet, cor net horn, euphon um guitar, trombone tuba, percus sion violin, v o a cello, contrabass May be repeated for credit M nimum contact of one hour plus stud o class weekly. May not be taken for audit

121, 321, 521 Studio Instruction. (1 1,1) F, S SS
For secondary or minor nstrument nstruction and non majors in the un vers ty Placement exam nation and au d tion requ red. Piano, organ, harpsichord vo ce harp flute, oboe guitar, clarinet, saxophone, bassoon, trum pet, cornet, horn euphon um, trombone, tuba, percus sion viol n, v o a, cel o, contrabass May be repeated for credit M nimum 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 Bache or of and Master of Mus c degree programs only P acement exam nat on and aud tion requ red. Piano, p ano accompanying or gan, harpsichord, vo ce, harp, flute, oboe, c arinet, gu tar, saxophone bassoon trumpet, cornet, horn eu phon um, trombone tuba, percuss on, v o in viola, ce o, contrabass May be repeated for cred t Minimum contact of one hour p us stud o c ass week y. May not be taken for audit

131, 132, 231, 232 Class Piano. (1 1,1,1) F, S
A four semester sequence of courses des gned for those lack ng p ano experience and those who need p ano as a classroom tool Emphasis on keyboard tech nique sight reading s mp e accompan ments and im provisat on Two hours a week. May not be taken for aud t

133, 134, 233, 234 Class Voice. (1,1,1 1) F S
Open to a l students nterested n the deve opment of basic s nging techniques Two hours a week May not be taken for aud t

141 Jazz Fundamentals. (1) F
Principles methods and theory of jazz performance, especia ly designed for the smal jazz ensemb e Two hours per week

142 Jazz Fundamentals. (1) S
Continuat on of MUP 141 Two hours per week.

209 Beginning Choral Conducting. (1) F, S
Essent a s of choral conducting techniques. Two hours a week

210 Beginning Instrumental Conducting. (1) S
Essent als of nstrumenta conducting techniques. Two hours per week

211 General Conducting. (2) S
Essentia s of conducting chora and instrumental music des gned for music therapy and theory composition ma- jors. Three hours per week

217, 218 Improvisation Workshop. 2,2) F, S
Emphas s on bas c jazz l terature chord symbol read ng, me odic patterns, ear training, melod c con cepts and analys s of improvised solos. Prerequisite· MTC 125, one semester of MUP 111. Must be taken in sequence May not be taken for audit.

235, 236 335, 336 Jazz Piano. (1, 1 1, 1) F, S
A four semester sequence designed for jazz keyboard exper ence Emphas s w ll be on chord symbol read ng, s mp e improv sat on and voicing. Prerequis te: MUP 132 Two hours per week.

250 Diction for Singers. (1) F S
Use of phonetics n the study of song and opera iterа- ture Language emphas s d ffers each semester. May be repeated for credit

301 Advanced Class Piano. (1) F
Requ red for chora general and therapy majors. Pre- requ s te. MUP 232 or proficiency Open to other music majors who have completed MUP 232. Emphas s on ac- compan ments, ensemble playing, score reading, ad vanced harmonizations, reperto re, technique, and m prov sation. P acement examinat on required. May not be taken for aud t. Two hours per week.

302 Advanced Class Piano. (1) S
Requ red for choral, general and therapy majors. Open to other mus c majors who have completed MUP 301 A sequent al continuation of MUP 301 skil s which include both group and stud o nstruction Prerequis te. MUP 301 or profic ency P acement examination requ red. May not be taken for audit Two hours per week

328 Fretboard Harmony and Pedagogy. (3) S
Application of tradit ona me odic and harmon c con cepts to the f ngerboard. Method books and peda- gogica approaches Prerequisite· MTC 223.

337 Studio Instruction-Piano Accompanying. (2) S
Lessons for accompanying majors only Repertoire to be se ected from vocal and instrumental iterature. P acement exam nat on required One hour lesson a week. May be repeated for cred t.

339 Choral Conducting. (2) F, S
E ements of choral conduct ng technique and inter- pretat on Prerequ site. MUP 209 or MUP 211. Three hours a week

340 Instrumental Conducting. (2) F
Fundamentals of score reading and interpretation of nstrumenta mus c Prerequisite MUP 210 or MUP 211 Three hours a week.

341 Jazz Pedagogy. (3) S
Tra n ng and superv sed practice in conducting jazz en semb es w th emphas s on terature, programming and rehearsa techniques. Prerequis te MUP 210. Two class hours and two f eld experience hours each week

344 Chamber Orchestra. (1) F, S
Membership by audit on. Important masterpieces from all periods of music wi l be performed throughout the year. May be repeated for credit.

345 Symphony Orchestra. (1) F, S
Open to all students who can qual fy on the basis of auditions with the director Over a four year period, the student is introduced to the masterp eces of symphony orchestra literature. Three times a week. May be repeated for credit

350 Choral Union. (1) F, S
Open to all students n the University and to nterested singers n the commun ty by aud tion Preparation and performance of the arger chora works Two hours per week May be repeated for credit

352 Concert Choir. (1) F, S
Membersh p chosen by audition May be repeated for credit. Four hours a week.

353 University Choir. (1) F, S
Membership chosen by aud tion May be repeated for cred t Four hours a week

355 Men's Chorus. (1) F, S
Open to all male students in the Un versity who can qual fy on the basis of auditions Rehearsal and perfor mance of mus c for ma e voices Two hours a week May be repeated for credit

357 Women's Chorus. (1) F, S
Membership chosen by aud tion. Two hours a week May be repeated for cred t.

361 Marching and Concert Bands. (1) F, S
Open to a l students who can qua ify on the bas s of auditions w th the director. Staging of format ons and dri ls for footba games and other events (Fal), master p eces of symphon c band literature (Spring) Meets dai y. May be repeated for cred t

362 Concert Bands. (1) F
Night rehearsa s. Membership chosen by aud tion. May be repeated for credit

370 Music Theatre: Techniques. (1) F, S
Exercises and improvisat ons for the sing ng actor em phas zing body awareness, so at ons and freedom of the vocal and breath mechan sms Sect on 1 Interpreta tion); Section 2 (Expression), Sect on 3 (Movement for S ngers) Each section: Three hours per week. May be repeated for credit

371 Music Theatre: Workshops. (1) F, S
Development of spec fic skil s for musica dramat c in terpretation Sect on 1 (Role Preparat on), Section 2 (Styles) Sect on 3 (Opera Scenes)· Section 4 (Mus cal Comedy) Sect on 5 (Revue Ensembles). Each section One ecture demonstration, 1 laboratory per week. May be repeated for cred t.

372 Music Theatre: Orchestras. (1) F, S
Open to all students who can qualify on the basis of au ditions with the instructor. Participation in Lyr c Opera Theatre productions Section 1 (Opera Orchestra), Sec tion 2 (Chamber Opera Orchestra), Section 3 (Opera Chamber ensemble) May be repeated for cred t.

373 Music Theatre: Performance. (1) F, S
Open to all students who can qual fy on the bas s of au ditions w th the instructor. Partic patron n Lyric Opera Theatre productions. Section 1 (Princ pal Roles); Sec tion 2 (Opera Chorus). May be repeated for credit

374 Music Theatre: Production. (1) F, S
Participat on in Lyric Opera Theatre productions. Sec tion 1 (Vocal Performance), Sect on 2 (Technical Music Theatre), Section 3 (Problems in Product'on) to be taken concurrently w th MUP 373, Section 2. May be re peated for credit.

379 Chamber Music Ensembles. (1) F, S
String, brass, woodwind, percussion, keyboard, voca and mixed ensembles. Prerequ s te· approval of in structor Two hours a week. May be repeated for cred t

382 Collegium Musicum. (1) F, S
Singers and nstrumenta ists specializing in the perfor mance of early and unusual music. Prerequisite: ap prova of instructor. Two hours a week May be re peated for cred t

383 New Music Ensemble. (1) F, S
Rehearsal and performance of mus c wr tten in the last 20 years Prerequisite approval of nstructor May be repeated for credit

384 Brass Choir. (1) F, S
Spec al zing in publ c performance of mus c written for brass nstruments. Prerequisite· approval of nstructor Three hours a week May be repeated for cred t.

385 Percussion Ensemble. (1) F, S
Rehearsal and performance of standard and origina repertoire for the percuss on ensemb e and related instruments. Membersh p by approva of the instructor Two hours a week. May be repeated for credit

386 Stage Band. (1) F, S
Rehearsal and performance of l terature for the stage band Membersh p by approva of the instructor Four hours a week May be repeated for credit

388 Piano Accompanying. (1) F, S
Accompanying majors (others at the discret on of n structor) Piano accompaniments found n voca and nstrumenta l terature discussion of sty es and perfor mance pract ces; experience n pub c performance. May be repeated for credit Two hours a week.

417, 418 Advanced Improvisation. 2,2) F, S
Emphas s on analysis and performance of advanced jazz iterature, composit on n contemporary sty es Pre requis te. MUP 218 Must be taken n sequence May not be taken for aud t.

451 Repertoire. 2 F, S
L terature ava ab e for performance in a l perform ng media Prerequ site jun or stand ng in major performance field. May be repeated for cred t

452 Piano Repertoire II. (2) S
Continuat on of MUP 451 (Piano) Romantic and con temporary keyboard iterature. Prerequisites Junior standing as p ano major approval of instructor.

453 Song Literature. (2) A
American, Russ an Span sh, Scandinavian and contemporary song.

454 Song Literature. (2) A
Early ta an, Eng ish German and French art song.

481 Performance Pedagogy and Materials. (2) F, S
Pr nc ples and methods of performance techniques for each performance f e d. Prerequ s te· senior standing or approval of nstructor. May be repeated for cred t

482 Piano Pedagogy II. (2) N
Cont nuat on of MUP 481 (Piano) Problems and tech niques of teaching ntermediate to advanced p ano stu dents Prerequ s tes. Junior standing as p ano major; approval of instructor

487 Piano Accompanying. (1) F, S
Keyboard majors Piano accompaniments found in vocal and nstrumenta l terature, discussion of styles and performance pract ces, exper ence n pub ic perfor mance May be repeated for credit. Two hours per week. May not be taken for audit.

495 Solo Performance. (0) F S
For Bachelor of Mus c and Bachelor of Arts in Education degree cand dates where one-half recital s a graduation requ rement.

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

540 Advanced Conducting. (3) F
Score preparation and conducting techniques for instrumental music. Concentration on study of historical styles

541 The Art Song. (3) N
Solo song from its beginning to the present day

544 Chamber Orchestra. (1) F, S
Membership by audition. Important masterpieces from all periods of music will be performed throughout the year. May be repeated for credit

545 Symphony Orchestra. (1) F, S
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
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
Literature available for performance in a performing medium. May be repeated for credit.

552 Concert Choir. (1) F, S
Membership chosen by audition. May be repeated for credit. Four hours a week

553 University Choir. (1) F, S
Membership chosen by audition. May be repeated for credit. Four hours a week.

555 Men's Chorus. (1) F, S
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
Membership chosen by audition. Two hours a week. May be repeated for credit

561 Marching and Concert Bands. (1) F, S
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
Membership chosen by audition (Fall). May be repeated for credit

570 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.

571 Music Theatre: Workshops. (1) F, S
Development of specific skills for the musical dramatic interpretation. Section 1 (Role Preparation), Section 2 (Styles); Section 3 (Opera Scenes); Sect on 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
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
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
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
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
Principles and methods of performance techniques for each performance field. May be repeated for credit.

582 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

583 New Music Ensemble. (1) F, S
Rehearsal and performance of music written in the last 20 years. Prerequisites: approval of instructor. May be repeated for credit

584 Brass Choir. (1) F, S
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
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
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
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
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
For DMA candidates only. May be repeated for credit. Minimum contact of one hour per week.

796 Solo Performance. (1-5) F, S
For DMA candidates only. May be repeated for credit.

Special Courses: MUP 294, 484, 494, 498, 499, 580, 591, 594, 598, 690, 693, 783, 784, 791, 792. (See pages 33-34.)

Department of Theatre

PROFESSORS:
AKINS (GHALL 232), DOBKIN, DOYLE, WITT, WRIGHT, YEATER

ASSOCIATE PROFESSOR:
VINING

ASSISTANT PROFESSORS:
BARTZ, ENGEL, KARASZ, KUPKA, SALDAÑA, THOMSON

Departmental Major Requirements

For advisement purposes, all students regis tering in a Theatre degree program will enroll through the College of Fine Arts. Special advisement check sheets, providing complete information regarding requirements and sug gested 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 semes ter 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. See page 293 for approved areas of study and distribution of hours as required by the College of Fine Arts (exception: only upper division courses in Foreign Languages may be used in fulfillment of the Humanities requirement).

Foreign Language Requirement Knowledge of one foreign language equivalent to the com pletion of two years' study at the college level is required. For specific courses, see Foreign Language Department. Courses taken to satisfy the foreign language requirement may be cross-listed as General Studies electives.

Bachelor of Fine Arts Degree Curriculum

Admission to the B.F.A. program is by audi tion 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 early admission to the B.F.A. program will be accepted from ASU 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 candi dates 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 con sidered 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 critic sm. 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.

500 Research Methods. (3) F
Introduction to graduate study in theatre.

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 Performance Theory. (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
(b) Design Technical
(c) History
(d) Criticism

591 Seminar. (3) A
Selected topics in children's drama, community theatre, and theatre history. Prerequisite: written approval of instructor.

Special Courses: THE 294, 492, 494, 498, 499, 500, 590 592, 594, 598 599 (See pages 33-34.)

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, including laboratory/rehearsal period.

113 Makeup. 3) F, S
Techniques of theatrical make up. One hour lecture; 2 hours laboratory.

213 Introduction to Technical Theatre. (3) F, S
Principles of technical theatre production and demonstration. Topics include design and construction of scenery, lighting, and properties. Two 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, including laboratory/rehearsal period.

311 Creative Drama. (3) F, S, SS
Theories, procedures, and materials for creative drama

in the elementary and junior high schools Related dra ma activities storytelling and choral speaking Not open to freshmen.

312 Puppetry With Children. A
Construction and manipulation of puppets, practice in performance skills. Emphas s on educational and recreational uses of puppetry by and with children. Prerequi site: THP 311 or approval of instructor

315 Directing: Workshop. (3) A
Rehearsal and public performance of scenes and short p ays. May not be taken concurrently with THP 310 Prerequisites: THP 215 and/or written approval of in structor Six hours a week, including laboratory/rehear sal period.

318 Theatre for Children. (3) A
Dramatic literature for children Experience in acting, directing, and production techniques for chi d audiences. Prerequisite: written approval of instructor.

330 Introduction to Costuming. (3) F, S
History of theatrical costume. Laboratory experience in construction of costumes Three lectures, 2 hours la boratory.

331 Costume Construction. (3) A
Uses of materials and techniques for stage costumes with actual construction of period apparel. Prerequ site 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, ntegrating voice/body/emotion, creative vocal characterization; advanced phonetics. Emphasis on ndividual 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 Prerequ sites 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 wr tten approval of in structor Six hours a week.

410 Acting: Advanced Workshop. (3) A
Rehearsal and performance of period, classical, and non real stic plays Emphasis on delivery of poetic lan guage. 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 part cipat on with chi dren. 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 concurrent y with THP 410 Prerequisite THP 315 and/or approval of instructor Six hours a week, ncluding laboratory/rehearsal period

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, 345 and 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

461 Playwrights Workshop. (3) F, S
Staged readings and discussion of completed works and works in progress by advanced students of playwriting Prerequisite. THP 460 or written permission of instructor. May be repeated for credit

470 Advanced Stage Speech. (3) A
Major dialects for the stage Knowledge of the International Phonetic Alphabet is required Prerequisites THP 270, 370; B F.A and graduate students only, written approval of instructor

475 Advanced Stage Movement. (3) A
Physical movement for period, classical, and nonrealistic plays Prerequisites THP 275, 375; B F A. and graduate students only; written approval of instructor

494 Special Topics. (1-4) 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 in Performance
(e) Playwriting for Children
(f) Drama Residency in the Schools

498 Pro-Seminar: Children's Theatre Tour. (1-7) S
Prerequisite. written approval of instructor

511 Creative Drama in Professional Practice. (3) A
Survey of current research and literature, with emphasis on professional applicat ons of creative drama techniques; empirical research projects required Prerequisites THP 311, 411, and/or approval of instructor

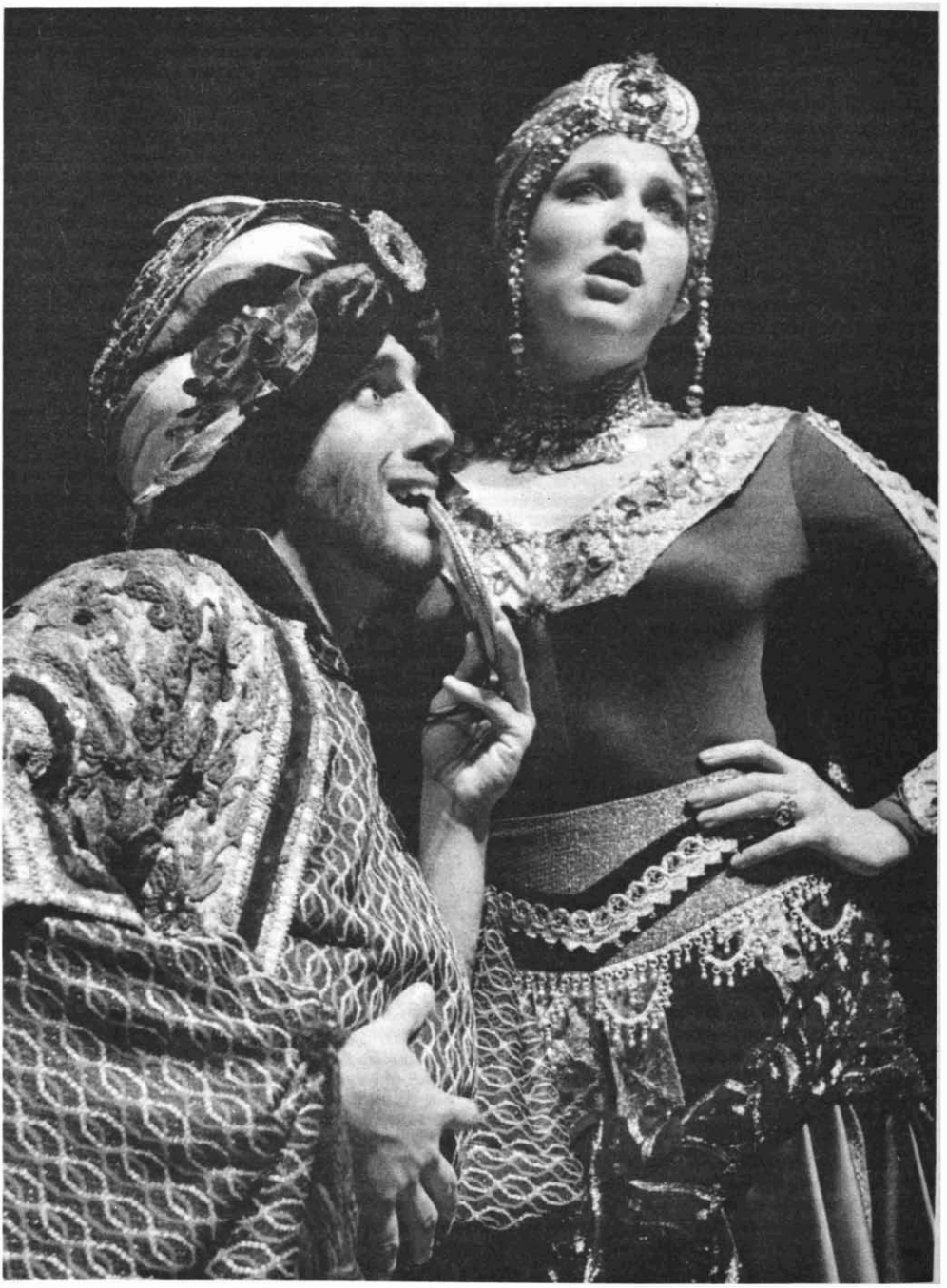
515 Problems in Directing. (3) A
Analysis of common directing problems Topics include creating the ensemble, conceptual unity; metaphor; non-literal strategies, organizational responsibilities of the director. Prerequisites THP 215, 315, 415, and/or approval of the instructor.

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.

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, 492, 498, 499, 580, 584, 590, 591, 592, 593, 594, 598, 599. (See pages 33-34.)



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 assign ments. In addition, the College has the respon sibility to contribute to the quality of justice administered in our society.

Juris Doctor Degree

The College of Law offers a three-year pro gram of professional studies at the graduate level leading to the degree of Juris Doctor and entry into the many branches of the legal pro-fession and careers in government, business, fi nance, 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) Satis-faction of residency requirements for the Col lege 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) Comple tion of all required College courses. (5) Com pletion 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 se-mesters or their equivalent. A semester in resi-dence is earned where a student has been en rolled 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 de-gree.

Admissions

First-year students are admitted only for the fall semester The formal requirements for ad-mission to the College of Law are: (1) An un-dergraduate degree from an accred ted four year college or university (B.S., B.A., or equivalent) (2) A score on the Law School Admission Test (administered by the Law School Admissions Services, Box 2000, New-town, PA 18940, in centers throughout the country). Both are to be at a level of achieve-ment giving the applicant reasonable prospect for success in law study.

The deadline for completed applications, college transcripts on all completed course work, the Law School Data Assembly Service Report and the Law School Admission Test score, including a typed two page writing sample, is April 1.

Each year many more students apply than can possibly be accommodated within the edu cational program of the College. Accordingly, the admission process is selective. Basic fac-tors 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 admis sion requ rements are flexible and other evi dences of ability and an applicant's prospect for significant contribution to the educational program of the law school and to public ser vice will be carefully considered by the Admis sions Committee with the object of selecting those who are likely to succeed in aw study. As a state institution, the College weighs resi dency 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

College of Law 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 colleges 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, AZ 85287.

Law

PROFESSORS:
MATHESON (AH 102D), ALTMAN, ARTERIAN-FURNISH, BARTELS, BERCH, DAHL, EFFLAND, ELLMAN, FURNISH, KADER, KARJALA, KAYE LEE, LESHY, LOWENTHAL, MISNER, MORRIS, PEDRICK, PULASKI, ROSE, SCHROEDER

ASSOCIATE PROFESSORS:
BROWN, CALLEROS, GOLD, MORGAN, STANTON

DIRECTORS:
CIVIL CLINIC, RYAN
PUBLIC DEFENDER CLINIC, STAFF

LAW 515 Contracts I. (3) F
Contract doctrines and their role n the jud c a process Judicial doctr nes and, where app cab e the Uniform Commercial Code are studied n the context of contracts covering employment, personal and fam y ar rangements, build ng and construct on, the sale of goods, oans, ass gnment of wages and accounts receivable.

516 Criminal Law. (3) F
Legislative and judicial formulations designed to dea with anti-socia activity, the substant ve e ements of particular crimes, problems n the admin stration of criminal law and the pena system

517 Torts. (3) F
Protect on through the judic al process of personality, property and relational interests against phys cal, appropr ational and defamatory harms.

518 Civil Procedure. (3) F
The nature of judic al power, v ewed in the context of h storical development and constitutiona grants and l mitations.

519 Legal Research and Writing I. (2) F
Techniques of research; use of the aw ibrary, preparation of legal memoranda

520 Contracts II. (3) S
Cont nuation of 515

521 Criminal Procedure. (3) S
The nature of the criminal procedural system with spe cial focus on constitutional protections for the excused

522 Constitutional Law I. (3) S
Role of courts in the federa system, distr but on of powers between state and federa governments role of procedure in itigation of constitut onal questions.

523 Property. (3) S
Law of real and personal property, various legal and eq uitable estates in land life estates, remainders, con current interests, executory interests, limitat ons on cre ation of future interests Modern concepts of property.

524 Legal Research and Writing II. (2) S
Cont nuation of 519.

600 Administrative Law. (3) A
Administrative process, emphas zing nature of powers exercised by administrative agencies of government, problems of procedure and scope of judic al rev ew

601 Antitrust Law. (3) F, S
Legislation and its implementation to prevent monopoly and business practices in restraint of trade, inc ud ng restrictive agreements involving price-f xing, trade as sociation activities and resale price maintenance.

603 Conflict of Laws. (3) A
Prob ems ar sing when the operative facts of a case are connected w th more than one state or nat on Choice of law, bases of jurisd ction, effect of foreign judgments, underly ng federa and const tutional issues

605 Evidence. (3) A
Pr nc p es and practice govern ng the competency of witnesses and presentat on of ev dence inc ud ng the rules of exc us on and roles of awyer, judge and jury under the adversary system

606 Federal Income Taxation. 3) F S
Federal ncome tax n relation to concepts of ncome property arrangement, business activity and current tax prob ems with focus on the process of tax eg slat on and admin stration

607 Advanced Civil Procedure. 3) F S
Obtaining and exchanging nformat on n advance of tria solat ng the area of controversy, d spos ng of cases or ssues w thout tr a def n ng the scope of it ga tion in terms of part es and subject matter and the relat onsh p between success ve l t gat ons. L t gat on through appea , nc ud ng ur sdict on right to jury selection of jury, withdraw ng case from jury nstructing jury verd cts judgments appe ate review

608 Business Associations I. 3) A
Partnersh ps, l mited partnersh ps and sma l bus ness corporat ons nc udes a br ef ntroduction to account ng Deta ed ana ysis of the prob ems of form ng a close corporation state law duties of care and oya ty management, div dends and redemptions, ssuance of stock, internal dispute resolution d sso ut on and the general law of derivat ve act ons.

609 Business Associations II. (3) A
nterre at onship of federal and state aw and a br ef ntroduct on to corporate finance 1933 Act) A broad ov erv ew of arge company regu at ons inc ud ng report ng rules, proxy regu at on nsider trad ng, sale of control, tender offers and takeovers and go ng pr vate. Prereq u s te LAW 609

610 Advanced Criminal Procedure. (3 A
Top cs n cr minal procedure, w th emphasis on legal constra nts on grand jury nvest gations, po ice prac t ces pre-tria re ease, prel minary hearings, prosecu torial discretion and plea barga n ng

611 Estate Planning I. (3) A
Tax laws relating to transfer of wealth both at death and during l fetime including federal estate tax g ft tax and income taxation of estates and trusts

612 Family Law. (3) A
Legal and nonlegal prob ems which an ind v dual may encounter because of a situat on as a fami y member.

613 Federal Courts. (3) A
Federal judicial system relationship of federa and state law, jurisdiction of federa courts and the r relation to state courts

614 Labor Relations. (3 A
Co lective bargain ng, nc ud ng the r ght of employees to organize and to engage n concerted activ t es reso ution of questions concerning the representation of employees; duty of employers and un ons to barga n admin stration and enforcement of co lective bargain ng agreements

615 Public International Law. (3) A
Role of law in nternational disputes Drafting and inter pretat on of treaties and multilateral conventions wi l be considered.

616 Jurisprudence. (3) A
Introduct on to lega ph losophy, w th read ngs on the nature of law and lega reasoning, the relationship between law and morality, and equa ity and soc al just ce.

617 The Legal Process. (3) N
Institutions and processes of the American legal system and their interrelationships

618 Trusts and Estates I. (3) A
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) A
Continuation of 618.

620 Civil Rights Legislation. (3) S
Coverage of the rights and remedies provided by federal civil rights legislation, principally, the key provisions of the Reconstruction Era Civil Rights Acts, portions of the employment discrimination legislation and voting rights legislation

621 Commercial Law—Sales and Negotiable Instruments. (3) A
Transactions in the sales of goods and mechanisms for payment and credit. Subjects include: contract information, warranty, risk of loss, damages and documentary transactions in sales of goods under Uniform Commercial Code Article 2. the use of checks, promissory notes, letters of credit and other instruments under UCC articles 3, 4, and 5; related banking practices and credit transactions.

622 Commercial Law—Secured Transactions. (3) A
Secured transactions under Article 9 of the Uniform Commercial Code and other relevant sections. An overview of the creation, perfection and priority effects of security interests. Financing of business enterprise and consumer credit.

623 Commercial Torts. (2) A
Involves an analysis of actionable wrongs against a business entity or against proprietary rights held by that entity, covering the entire spectrum of private remedies for competitive wrongs.

624 Community Property. (1,2) A
Property rights of husband and wife; the Arizona community property system; homestead

625 Constitutional Law II. (3) A
Fundamental protection for person, property, political and social rights.

626 Consumer Protection. (3) N
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

627 Corporate Taxation. (3) A
Problems in taxability of the corporation, corporate distributions and corporate reorganizations.

628 Creditor-Debtor Relations. (3) A
Creditors' remedies in satisfaction of claims and debtors' protection and relief under bankruptcy, other laws.

629 Criminal Trial Process. (3) A
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.

630 Employment Discrimination. (2) A
Focus on Title VII of the Civil Rights Act of 1964 which forbids discrimination in employment based upon race, religion, national origin or sex. The substance and procedural aspects of Title VII are covered in detail including coverage, administrative procedures, burdens of proof, special problems of religious and sex discrimination, statutory and court created defenses, seniority systems and remedies.

631 Environmental Law. (3) A
Litigation, administrative law and legislation relating to problems of environmental quality Topics covered may include air and water pollution, toxic substances, pesticides and radiation.

632 Indian Law. (3) A
Inquiry into legal problems special to American Indians and tribes.

633 Insurance. (3) N
Current trends in the business of insurance; role of government in the insurance field.

634 Judicial Remedies. (3) A
The nature and limits of injunctive, restitutionary and compensatory remedies for the protection of personal, property, political, and civil rights.

635 Juvenile Justice System. (3) N
Special problems in the juvenile system.

636 Land Use Regulation. (3) N
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.

637 Lawyering Process. (3) N
Roles and responsibilities of lawyers, as advocates negotiation, witness examination (direct and cross), and argument.

638 Legal Profession. (2) F, S
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.

639 Public Land and Resource Management. (3) A
Examines the constitutional basis for federal land management and the different kinds of public lands management schemes (e.g., parks, forests, wildlife refuges), emphasizing acquisition of right to, and regulation of, the different uses of public lands and resources (e.g., mining, grazing, timber wildlife habitat, recreation).

640 Securities Regulation. (2) A
Selected problems arising under the major statutues concerned with regulating the securities market.

641 State and Local Government. (3) N
Legal problems involved in the organization and administration of governmental units including the city, county, town, village, school district and special district.

643 Water Law. (3) A
Acquisition of water rights; water use controls; interstate conflicts.

644 Intellectual Property. (3) A
The protection of intellectual property and encouragement of creativity—trade values, trade secrets, patents, copyrights, performing arts, and visual arts.

701 Arizona Criminal Code. (2,3) A
In-depth study of the substantive law and sentencing provisions of the 1978 Arizona Criminal Code.

704 Corporate Finance. (2,3) N
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.

707 Corrections and Sentencing. (2,3) A
Justifications for punishment, the effect of punishment

upon the indiv dual and soc ety, statutory basis for sentencing n Ar zona and the ro e of the awyer in the sentencing process.

708 Law and Science. (2,3) N
Legal control and support of science and technology and the use of sc entific techn ques n the legal process Top cs may nclude the economics of air po ut on su person c transport a rcraft, recomb nant DNA research b omedical interventions n reproduction and stat st ca theory.

709 International Human Rights. (2,3) N
International ru es and procedures govern ng the protect on of human r ghts.

714 Law and Social Science. (2,3) N
Investigat on of the use of socia sc ence research and methods n the egal system Top cs nc ude· psycho ogy of eye-w tness dentif cat on, soc al psychologica stud ies of decision mak ng, stat st cal evidence of d scr m nat on econometr c stud es of the deterrent effects of capital punishment and cl n ca pred ctions of v o ent behavior

715 Professional Sports. (2,3) A
Unique legal prob ems re at ng to professiona sports nc uding the r relationsh p to ant trust laws the nature of the player contracts and associated tax prob ems

717 Legislative Process. (2 3) N
Explore both the lega and the pract ca context w th n which the leg slat ve process operates w th a ma or component of the course be ng a legislative draft ng project.

718 Non-Profit Corporations. (2,3) N
Tax, corporate and trust egal problems nvo ving the nonprofit corporation and compar son with for-prof t counterparts as to eff cacy n performing certain eco nom c funct ons.

720 Problems in Evidence. (2 3) N
An examinat on of the use (and abuse) of statist cal methods n proving facts and n studying ru es of ev dence and procedure Prerequisite or corequ s te· LAW 605.

721 Education and the Law. (2,3) A
Current egal problems affecting institut ons of higher educat on facu ty students and governing boards

724 Selected Problems in Tort Law. (2,3) N

727 Federal Income Tax Policy. (2 3) N
Advanced cons derat on of federa personal ncome tax policy with reference to se ected prob ems, includ ng the income-sheltering process Prerequisite LAW 606

731 Professional Skills: Interviewing and Counseling. (2,3) N
Ski ls and techniques nvo ved n nterview ng and coun se ing inc ud ng interd sc pl nary mater a s from other fie ds such as psychology and psychiatry

733 Professional Skills: Negotiation. (2,3) N
Theoretical models of negot at ons; techn ques, strate gy, examinat on of the barga ning process

735 Estate Planning II. (2,3) N
Preparat on of actua estate p ans and mp ement ng le gal documents for a variety of typ cal private c ents Both tax and nontax e ements n preparat on of the plans will be considered Prerequis te LAW 611

736 Planning for the Business Client. (2,3) F S
Planning transact ons nvolv ng business organ zations w th spec a emphasis on income tax and corporate considerations

737 Planning Private Real Estate Developments. (2,3 N
Lega aspects of real estate deve opment, including ne got ation, lega dev ces for f nanc ng, promot on of sales eas ng prob ems and comp ance with lega con trols as well as creation of pr vate contro s over land use

738 Practice Court. (2 3) A
Students act as awyers n conduct ng a case through a stages of tria , from commencement of the act on to f na judgment

739 Techniques of Advocacy. (2 3) N
Designed to fam i ar ze students w th the sk ls of the advocate by observat on nstruct on and part c pation

740 Problems of Litigation. (2 3) N
Current deve opments n the fie ds of pract ce, proce dure and evidence

741 Freedom of Speech. 2 3) A
Freedom of speech n competit on with a number of governmental and nd v dua interests. Problems ar s ng from governmenta contro of information, with part cu ar emphas s upon regulation of the mass media

742 Equality in Modern Society. (2 3) A
D scrim nat on, its soc al and ega effects and remed es Focus on const tut onal, statutory and private organ za t ona attacks upon d scrim nat on on the bas s of race rel g on, sex or other c ass f cat ons

745 The Supreme Court. (2 3) A
Intens ve exam nation of selected current decisions of the U S Supreme Court

751 Problems in Labor Law. 2 3 N
Advanced quest ons n the co ect ve barga n ng area.

757 The Legal Monopolies: Patent, Copyright and Labor. (2,3 A
Legal y created and sanctioned monopolies wil be ex amined and compared on the basis of the r just f ca tions, object ves and im tations

758 The Competitive Economy. (2,3) A
Lega and econom c character st cs of selected prob lems of the ndustr a organ zat on n the modern econo my Prerequ site LAW 601

761 Selected Problems in Antitrust. 2,3 A
Analys s of the pr vate enforcement techn ques n an titrust. Review and ana ys s of the var ous defenses procedural prob ems and damage issues

763 Selected Problems in International Law. 2, 3) N
Advanced cons derat on of se ected prob ems

767 Selected Problems in Developing Nations. (2 3 N
The effect of aw n soc a change and development through agrarian reform, ndustr al development, eco nom c ntegration Emphas s on Lat n Amer ca

768 International Business Transactions. (2 3) N
Prob ems and po cy cons derat ons nvo ved in nterna t ona trade, tar ffs nternationa monetary controls de velopment oans, etc

770 Law Journal. (1, 2 F, S
Academ c credit for successful completion of work by a member of the staff of *Arizona State Law Journal* 5 credit hour max mum

771-779 Internships in Law. 3, 6) F S
C v l, defender or prosecutor p acement and re ated classroom component

780 Moot Court. (1 3 F, S
Academ c credit for successful complet on of work as a member of the Moot Court Board of Directors, 3 cred t hour max mum

781-782-783 Individual Study. (1 3) F, S
W th the approva of a facu ty member, a student may research a ega subject of specia interest and prepare a paper su table for pub cat on

784 Moot Court Competition. (1 3) S
Successful part c pation and comp et on of a nat ona moot court competit on

785 Externship. (1-10) S, F, S
Supervised, practical lawyering in an external placement proposed by the student or established by a sponsoring agency and approved by the law school. In addition, an associated academic component is established by the student with a member of the faculty.

790 Field Work. (1-6) F, S
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. (1-10) F, S

College of Nursing

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 professional nursing major. The first two years of the four-year baccalaureate program consist of required pre-professional 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. In addition to the day program, an evening division of the bacclaureate program is offered to accommodate Registered Nurses who wish to pursue a Bachelor of Science in Nursing degree.

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 abili ties. 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 assess ment, 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 63 semester credit hours required before entering the professional nursing major. The professional nursing major consists of 53 semester credit hours. There are 10 semester credit hours of additional free electives required to meet the minimum num ber of credits for graduation.

Up to 9 credit hours of the aforementioned 10 free elective hours may be in approved nursing courses. A limit of 6 credit hours in approved professional nursing 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 in that course. A limit of 3 semester credit hours for experiential courses in physical education may be applied toward the minimum 126 semester credit hours required for the Bachelor of Science in Nursing.

Fifty of the 53 semester credit hours in the professional major sequence, plus three upper division nursing elective credits with the NUR prefix, comprise the professional major requirements.

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 College 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 31 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 are eligible for membership in the Arizona Association of Student Nurses, the National Student Nurses Association, and Associated Students. Students are represented in the Student Senate of Associated Students.

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, the Daniel E. Noble Science 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 professional courses and the professional nursing major. The pre-professional nursing courses consists of 63 semester credit hours of prescribed prerequisite study. The professional nursing major consists of a 53 credit four semester nursing sequence The remaining 10 semester credit hours are free electives, non nursing and/or nursing.

Admission to the professional nursing major is not automatic. Students admitted to Arizona State University declaring nursing as their interest are classified as having pre-professional nursing status. There is a separate College of Nursing procedure for admission to the professional nursing major.

Students are admitted to the professional nursing major each fall and spring semester. Admissions are competitive and selective due to 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 professional nursing major may be reduced from 4 semesters to 3 semesters for Registered Nurse students who choose to enroll full time.

Pre-Professional Nursing

Admission Requirements. Students admitted to the University automatically qualify for admission to pre-professional nursing status.

Academic Advisement. Students admitted to pre-professional nursing status are advised by the College of Nursing academic advisors. All students are encouraged to seek advisement in order to plan an appropriate program of study. Students in the professional nursing major are advised by College of Nursing baccalaureate faculty.

Pre-Professional Nursing Curriculum. There are approximately 63 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 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 for courses of a vocational-technical, or community interest nature Course work, particularly in the natural sciences, completed more than 10 years before the date of application to the professional nursing major will be evaluated for acceptability by the Baccalaureate Standards Committee. Prerequisite courses taken for pass/fail credit do not qualify toward the minimum 126 semester credit hour requirement.

Prerequisite Courses

	Semester Hours
ENG 101 and 102 or 105	3 6
Humanities (See Humanities under General Studies) to include a human communications course	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
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 41 Human Nutrition	3
Statistics	3
MAT 106 Intermediate Algebra (or demonstration of math proficiency on placement test	3
NUR 219	2
	60 63

Any prerequisite course substitution must be approved in advance through the Nursing Academic Advisors.

Professional Nursing Major

Admission to the professional nursing major is a process separate from admission to Arizona State University and to pre professional nursing status. 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 professional nursing major include:

1. Admission to Arizona State University and classification of good standing;
2. Attainment of a minimum grade point average of 2.75 in the prerequisite courses and 2.50 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 63 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 for admission by the designated deadlines.

2. Deadlines

a. Applications for admission to the professional nursing major for Fall Semester must be submitted by January 31 of the same calendar year.

b. Applications for admission to the professional 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 professional nursing major:

a. Certificate of Admission to Arizona State University.

b. Completed application to the professional 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. Selected other health requirement as defined by the College of Nursing.

f. 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 professional nursing major and have given evidence of the most reasonable prospect for success in the nursing program *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 63 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 professional 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 professional nursing major at Arizona State University must submit an application for re-admission to the major. Re-admission is not automatic.

Student Health. Students enrolled in the professional nursing major are responsible for fulfilling the requirements of the current health policies of the College of Nursing, available from the Baccalaureate Program Office. All students enrolled in the professional nursing major should carry health and accident insurance.

Liability Insurance. Students are encouraged to carry their own professional liability insurance.

Grading Policy for Nursing Courses. With in 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 professional nursing major. No student may enroll in a required nursing course more than twice. To repeat any required nursing course, students must petition to the Baccalaureate Standards Committee for readmission to the nursing course and/or the professional nursing major. The form, "Petition to Standards Committee for Adjustment of Cur riculum 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 without an approved petition from the Baccalaureate Standards Committee.

An *incomplete* in a required nursing course must be satisfactorily removed before progression in the nursing major is permitted. A grade of "I" is not allowed in clinical practice courses.

Audits are not permitted in required professional nursing courses.

Pass/Fail grades are not acceptable for courses in the minimum 126 credit hour requirement for graduation.

Retention. Retention in the professional 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.

Appropriate professional behavior and appearance is required during all nursing course activities.

Academic dishonesty is not tolerated and will be subject to specific College of Nursing policies and procedures.

Nursing

PROFESSORS:
(NUR 457), BRANSTETTER, JOHNSON, MUHLENKAMP, MURPHY, SANTORA, STEFFL, WOOD

ASSOCIATE PROFESSORS:
BRUNER, KNUDSEN, NORTH, ROBERTS, STUMPF, THEOBALD, ZORNOW

ASSISTANT PROFESSORS:
BAGWELL CONNELL, ELL SON, FELLER, FINCH, GARRITY, GRANT, GRONSETH, HENSON, KURTH, LaMONTAGNE, LUDLOW, McCLELLAN MELVIN, MILLER, M LTON, OSBORN RICHARDS, SEHESTED, SHERIDAN, SQU RES, TETTING, THOMPSON, TOBIASON, WH TE, UUSTAL WURZELL, ZSOHAR

INSTRUCTORS:
BELL, CA N FOX, GALE, KASTENBAUM, K LLEEN, NELSON, OLSON, PETERS, STARKEY, TATHWELL, WONG

NURSING

Enrollment is restricted to students admitted to the upper division nursing major.

Prerequ s te course numbers marked with a dagger †) have further prerequis tes Each student s requ red to take the nd cated prerequ s te courses

NUR 219 Health Promotion and Self-Care Competencies. 2) F S, SS
Bas c nurs ng ski s and health promot on content as re lated to se f-care, home care and act vit es of da ly v ng. Prerequis tes Sophomore stand ng and approva of nstructor. One hour ecture, 3 hours ab

303 Nursing Process, Roles and Functions. 2) F, S
Soc a zation nto professional ro e Nurs ng process for dec s n mak ng and act on. Nurs ng funct ons and re spons b t es n health and il ness Prerequ sites. NUR 219 and admission to the professiona nursing major

304 Pharmacology for Nursing. (3) F S
Drug c ass ficat ons and prototypes Psychophysiolog c pr nc p es of drug act on. Know edge bas c to safe ad m n strat on n nurs ng pract ce Prerequ s tes NUR 219 and adm ss on to the profess ona nurs ng major

305 Development of Professional Nursing. 2 F S
H stor cal deve opment of nurs ng educat on and prac t ce r es Profess ona va ues and norms ega and s c o po tica processes Prerequ s te NUR 303

313 Basic Competencies in Nursing Practice. 2) F S
Sc ent f c pr nc p es and se ected psychomotor sk l s for beg nn ng c in ca nurs ng practice Prerequ sites NUR 219 and adm ss on nto the profess ona i urs ng major One hour ecture, 3 hours aboratory

314 Health Assessment. (3) F S
Introductory know edge and sk s for systemat c phys ca psychosocia and deve opmenta nurs ng as ses r ent over the fe span Prerequ s te or c ncurrent NUR 303 313 Two hours ecture, 3 hours ab

323 Care of the Hospitalized Adult I. 5 F S
Nurs ng concepts and pract ce n car ng for the hosp ta zed adu t with med ca surg ca prob ems. Theoretical bases, pathophys ology and related nursing man agement Prerequis te NUR 219 and concurrent 303, 304 313, 314. Two hours ecture, 9 hours lab.

327 Care of the Well and Hospitalized Child. (3) F, S
Nurs ng concepts and pract ce n caring for well and hospita zed children exper encing norma or excep t ona hea th stressors. Prerequ site· NUR 323, 305 pre-requis te or concurrent One hour ecture, 6 hours ab.

328 Parent-Infant Nursing. (3) F S
Nurs ng concepts and pract ce in the perinatal period. ncludes the mpact on fam ly members and the r rela t onships Prerequ sites: NUR 323; 305 prerequ s te or concurrent 1½ hour ecture, 4½ hour lab

329 Mental Health Nursing. (5) F S
Concepts and practices in psychiatric/menta hea th nursing Therapeut c communication, re ationsh ps, and treatment approaches used n the nursing process. Pre-requis tes· NUR 323, 305 prerequ s te or concurrent. 2 hours ecture, 9 hours lab.

403 Nursing Research. (2) F, S
Components of the research process Significance of research to the mprovement of nurs ng pract ce and deve opment of the profession Prerequ sites· NUR 327, 328, 329 or approva of nstructor

406 Leadership and Management in Nursing. (2) F, S
Se ected theoretica frameworks for organ zat on, man-agement and leadersh p n nursing Prerequis tes. NUR 403, 426 427

407 Contemporary Issues in Nursing and Health. (2) F, S
Se ected contemporary issues nf uencing nurs ng and the hea th care system. Prerequisites. NUR 403, 426 427

426 Care of the Hospitalized Adult II. (4) F, S
Nurs ng concepts and pract ce n caring for the hospi tal zed adu t with comp ex med ca -surg cal problems. Theoretica bases pathophysiology and related nursing management Prerequ sites. NUR 327, 328, 329; 403 prerequ site or concurrent. 1½ hours ecture, 7½ hours ab

427 Community Health Nursing. (4 F, S
Nurs ng process and the fam ly as the framework for care n the community Emphasis on health promotion and ness prevent on. Prerequ sites. NUR 327 328, 329 NUR 403 prerequ site or concurrent. 1½ hours lec ture, 7½ hours lab.

428 Management of Clients in Acute Care Settings. (4) F S
App icat on of pr nc p es of nursing management and eadersh p n acute care settings. Prerequ site or con-current NUR 406 407 One hour ecture 9 hours lab.

429 Community Nursing of Populations at Risk. (4) F, S
App cat on of concepts of epidemiology, hea th educa t on and hea th screen ng to h gh r sk populations n the commun ty Prerequ sites or concurrent NUR 406, 407 One hour ecture, 9 hours lab.

431 Introduction to Cardiovascular Nursing. (3) F, S, SS
Se ected aspects of card ovascular nurs ng. D agnostic eva uat on, history and phys ca assessment med ca and surg ca intervent ons, prevent ve and rehabil tat ve management. Prerequ s tes NUR 313, 323 or approva of nstructor

432 Cardiovascular Nursing Laboratory. (1) F, S, SS
Exper ences to accompany NUR 431 Observat on, d rect care dec s on mak ng and plann ng for clients in various stages of card ac disease Prerequ sites NUR 313, 323 or approval of nstructor NUR 431 concurrent. Three hours aboratory

433 Abnormal Stress in the Maternity Cycle. (2-3) F, S
Clinical nursing in high risk obstetrics. Abnormal stresses for pregnant women, effects in newborns and appropriate nursing interventions. Prerequisite: NUR 328† or approval of instructor. Two hours lecture; 3 hours lab optional.

434 Cultural Variations of Health and Illness. (2-3) F, S
Health-illness beliefs, behaviors and interventions in selected ethnic cultures. Integrating scientific and folk medicine in nursing practice. Prerequisite: approval of instructor. Two hours lecture; 3 hours lab optional.

435 Nursing of Children with Developmental Disabilities (2-3) F, S
Congenital and acquired physical and mental developmental disorders. Evaluation of child and family. Clinical nursing in pediatric community settings. Prerequisite: NUR 327 or approval of instructor. Two hours lecture; 3 hours lab optional.

436 Prospective Health Care. (3) F, S
Analysis of factors influencing health and health care systems. Includes review of health risks, utilization of local and national resources and the performance of selected health screening techniques. Prerequisite: approval of instructor. Two hours lecture, 3 hours lab.

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: 403†, 426†, 427†; 3.40 GPA; application must be filed eight weeks before beginning course.

500 Research Methods. (3) F, S
Research methods including research conceptualization and design. Prerequisite: Course that includes inferential statistics.

580 Practicum. (1-4) N
Supervised clinical application of theoretical concepts. Prerequisite: Approval of instructor.

581 Advanced Theory I. (2) F
Analysis of health care delivery systems with emphasis on current roles, issues, trends, and legislation.

582 Advanced Theory II. (2) S
Theories related to health and illness behavior.

591 Seminar. (2-4) N
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
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
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
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
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 33-34.)

HUMAN DEVELOPMENT

HDE 586 Origins of Human Behavior. (3) F
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
Critical examination of theories and research of adulthood and aging.

CONTINUING EDUCATION

Full descriptions of courses, topics and prerequisites are publicized each semester in the *Schedule of Classes* and are also available in the Continuing Education Program office.

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 Registered Nurses, health-related professionals by instructor approval.

494 Special Topics. (1-4) F, S, SS
Content presumes a fundamental level of theory and practice skill; designed to lead toward analysis. For Registered Nurses, 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.

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 Department of Journalism and Telecommunication, the Department of Leisure Studies, the Center for Public Affairs, and the Center for the Study of Justice. 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 Vice President for Academic Affairs.

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.)

Justice Studies:
Bachelor of Science (B.S.)

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 five 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.)

Justice Studies:
Master of Science (M.S.)

Journalism and Telecommunication:
Master of Mass Communication (M.M.C)

Leisure Studies:
Master of Science (Recreation) (M.S.)

Public Affairs:
Master of Public Administration (M.P.A.)

College of Public Programs:
Doctor of Public Administration (D.P.A.)

The D.P.A. degree program is interdisciplinary in nature and is offered by faculty from various colleges. The program is administered by an executive committee ap-

pointed by and responsible to the Dean of the Graduate College. The purpose of the program is to prepare skilled professional public administrators for high-level positions in the public sector.

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 18-21 will be admitted to any chosen undergraduate academic unit of the College as a *pre-major* in that respective academic unit.

Major Status Admission. Entry to any undergraduate academic unit of the College with status as a major requires the completion of at least 56 semester hours with a minimum cu mulative grade point average of 2.50, plus whatever additional requirements the respective center/department may impose. When a student has completed course work at Arizona State University, the grade point average is computed on Arizona State University courses only, and must be based on a *minimum* of nine (9) semester hours of courses with grade options of A, B, C, D, or E.

Students should refer to the information section of the catalog with reference to their preferred area of study for retention requirements and/or continued enrollment in their major courses.

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 accred ited 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 edu cation (community or junior college) will transfer as lower division credit up to a maxi mum 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 accep tance 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 fac ulty 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 Pro grams.

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 Cen ter/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.

General Studies Requirements. All undergraduate students in the College of Public Programs are required to complete a minimum of 37 hours, plus the English Proficiency re quirement, of General Studies courses in order to be eligible for graduation in any of the undergraduate curricula offered by the College. The following list includes the courses recognized by the College in each area. Students should refer to departmental/center check sheets for additional or stricter requirements. Any deviations or substitutions from the fol lowing will require the approval of the College Standards Committee.

Students presenting transfer course work, especially of a generalized or unusual description, should make sure that such courses are suitable for inclusion in one of these areas. The College follows the Course Equivalency Guide for transfer work from Arizona commu nity colleges. Courses designated "E" (elective) in the Guide may not be used for General Studies credit.

English Proficiency. Students must demonstrate reasonable proficiency in written En glish by achieving a grade of "C" or better in both ENG 101 and ENG 102, or in ENG 105 or its equivalent. Should a student receive a grade lower than "C" in any of the courses, it must be repeated until specified proficiency is demonstrated. Transfer students from colleges

outside Arizona should consult the College Student Services Office in Wilson Hall to assure completion of this requirement.

Communication Requirement. One of the following courses is required for all undergraduate majors: COM 100, 225, 230, 241, or 250. It may be included within the General Studies distributional requirement or department/center degree program where appropriate.

Computer Science Requirement. One of the following courses is required for all undergraduate majors: CSC 180, 181, or 183. It may be included within the General Studies distributional requirement or department/center degree program where appropriate.

Foreign Language Requirement. The Department of Journalism and Telecommunication 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 Telecommunication for detailed information.

Limitation on Physical Education Activity Hours. No more than eight hours of physical education activity courses may be counted within the minimum 126 hours required for graduation.

All students in the College of Public Programs must meet minimums as listed below.

The following list uses the prefixes as listed in the 1983 85 *General Catalog*. Students presenting coursework from earlier catalogs should make sure it is accurately applied to requirements. It is the student's responsibility to make sure that graduation requirements are met.

General Studies Course List

Humanities and Fine Arts: Nine (9) semester hours minimum. Must include courses in at least two subject areas. Students may take up to three of the nine hours in performance or studio courses: ART, DAN, MUP, THP.

Architecture:
Architectural Philosophy and History, APH
Architectural Communication, AVC

Art:
Art History, ARH
Studio Art, ART

Communication:
COM 210, 222, 225, 241, 243, 271, 274, 341, 344, 420, 422, 441, 442, 443, 474

Dance:
Dance History, DAH
Dance Performance, DAN

English:
ENG (other than Freshman Composition). "Reading courses from community colleges *NOT* included.

Foreign Languages:
FLA, CHI, FRE, GER, GRK, ITA, JPN, LAT, RUS, SPA

Interdisciplinary Humanities:
Humanities, HUP

Music:
General Studies Electives, MUS
Music History and Literature, MHL
Music Theory and Composition, MTC
Music Performance, MUP

Philosophy: PHI

Religious Studies: REL

Theatre:
History, Literature, and Theory, THE
Theatre Performance and Production, THP

Social and Behavioral Sciences: Eighteen (18) semester hours minimum. Must include courses in at least three subject areas.

Anthropology (Cultural):
ASB

Business Administration:
Advertising, ADV
Computer Information Systems, CIS
Economics, ECN
Finance, FIN
Management, MGT
Marketing, MKT
Quantitative Business Analysis, QBA
Transportation, TRA
Administrative Services, ADS

Communication:
All Communication courses *other* than listed above under Humanities requirements.

Design Sciences:
Design History and Theory, DSC
Industrial Design, IND
Interior Architecture, INT

Engineering:
Analysis and Systems, ASE
Industrial and Management Systems Engineering, IEE
Society, Values, and Technology, STE

Geography (Cultural): GCU

History: HIS

Journalism and Telecommunication:
JRN, MCO, TCM

Justice Studies: CRJ

Leisure Studies: REC

Planning: PLA. PUD, PUP

Political Science: POS

Psychology:
PGS (includes general introductory courses)
Sociology: SOC

Science and Mathematics: Ten (10) semester hours minimum. Must include at least two subject areas. A laboratory science course is required.

Anthropology (Physical): ASM
Botany: BIO, BOT, MIC
Chemistry: CHM
Computer Science: CSC
Engineering:
Civil Engineering, CEE
Chemical and Bio Engineering, CHE
Engineering Core, ECE
Electrical and Computer Engineering, EEE
Mechanical and Aerospace Engineering, MEE
Geography (Physical): GPH
Geology: GLG
Mathematics: MAT
Physics: AST, PHS, PHY
Psychology: PSY
Zoology: ENT, ZOL

Students may not use courses from their major department/center to satisfy General Studies requirements.

Special Credit Options

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 en roll 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 taught by outstanding faculty and limited in class size, special advisement, preferential preregistration, and the preparation of a senior Honors thesis.

Admission to the Honors Program. Entering freshmen in the top 5% of their high school graduating class and those who have a 27 or higher ACT composite score or a 1250 or higher SAT combined score are eligible to apply for admission to the program. Continu ing and transfer students who have completed between 15 and 60 hours with at least a 3.25 GPA also may apply for admission to the program. However, only ASU course work is used to determine the GPA for Honors retention and graduation.

Graduation Requirements. Besides completing the regular University, College, and de partmental graduation requirements for the major, Honors students must complete at least 60 hours of resident course work at ASU with a 3.40 cumulative GPA; complete at least 18 hours of specially designated Honors course work, including 6 upper division hours out of the major; and write a senior Honors thesis under the supervision of a thesis committee, subject to oral defense and designated approvals.

For further information about the program, students should call or write the College Student Services Office, Wilson Hall 203.

Center for Urban Studies

Dr. John S. Hall, Director

The Center for Urban Studies (CUS) is an interdisciplinary research and service unit of the College of Public Programs which seeks to promote the analysis and understanding of urban systems. Center studies are directed at improving the effectiveness, efficiency, responsiveness and equity of urban decision making. To meet its goals, the center undertakes research, conducts workships and provides technical assistance both for local governments and citizens. The center is a community resource.

The Center is organized to conduct high quality interdisciplinary research that is useful for public problem solving. The divisions and major foci of the Center are the Advanced Public Executive Program (APEP), Adult Development and Aging Program; Division of Field Research; Division of Policy Analysis and Evaluation; and the Division of Public Opinion Research.

The demand for CUS services from state, local and community groups has been substantial. Past studies have included those on the evaluation of social service delivery; housing investment patterns; crime and police services; problems and programs of the elderly; community sentiment about governance; assessment of governmentally provided health systems; and evaluation of the impact of shifts in national domestic policy on local governments, non-profit organizations, and citizens.

Advanced Public Executive Program (APEP). APEP is designed to provide the public sector executive with analytical approaches and skills that will help mobilize ideas, people, and resources in support of public programs. To meet these objectives, APEP uses interdisciplinary faculty teams to provide a series of short-courses, seminars, and other training devices to help public managers become more effective and efficient.

Adult Development and Aging Program. This program is an interdisciplinary research unit which emphasizes the analysis and understanding of the distinctive problems of elderly populations. This unit places special emphasis on the aged in the Southwest. Besides its research activities, the program offers a Certificate in Gerontology and carries out many community service projects.

The College of Public Programs offers a Certificate in Gerontology through the Adult Development and Aging Program. Students who wish to work in gerontology related professions or who are interested in issues which pertain to the elderly may earn the Certificate while pursuing degrees in various university departments. For further information, contact Director, Adult Development and Aging Program.

Division of Field Research. The Phoenix urban area is a virtual laboratory of public programs and issues. This division will apply techniques of field research to local public policy and organization issues. In addition to its own studies, the division assists other Center units in using field research techniques such as elite and specialized interviewing, observational research and archival analysis.

Division of Policy Analysis and Evaluation. This unit focuses on the analysis of significant public policy problems and issues, with an emphasis of providing public sector decision makers with high quality decision-relevant information.

Part of the division's mission is to provide ongoing support to those agencies with which the division contracts to undertake research. The division is committed to the idea of making maximum use of data collected for public agencies beyond the demands of the initial grant or contract.

Division of Public Opinion Research. The Public Opinion Research Program provides a mechanism for assessing and reporting community sentiment and reactions to news events, public policy issues and problems of broad public interest. As such, it has established an ongoing relationship with a wide array of public and private agencies.

Morrison Institute for Public Policy. This research unit, located in the Center for Public Affairs, was created by a grant from the Marvin Morrison family, and seeks to provide both citizens and public officials with objective information to make well informed policy decisions.

The Institute's mission revolves around public service and research activities. These activities include the publication of occasional papers, policy reports, and the *Policy Studies Review.* The Institute also sponsors conferences on policy issues and engages in contract and grant research on public policy in support of state and local government agencies.

Communication

PROFESSORS:
GOYER (STAUF 412), ARNOLD, DAVIS, JAIN, KASTENBAUM, PERRILL, RICHARDS, STITES, K. VALENTINE

ASSOCIATE PROFESSORS:
BOSTER, BULEY, DAVEY, HIRSCH, McHUGHES, REINARD, WIGAND

ASSISTANT PROFESSORS:
CRAWFORD, JOHNSON, MAYER, MERRILL, C. VALENTINE

LECTURER:
WILLIAMS

General Information

The purpose of the Department of Communication is to demonstrate, encourage, and facili tate systematic study of the theories, processes, and skills of human communication. Courses of study are designed to provide relevant, integrated programs adapted to the academic and professional goals of students.

Communication Pre-Major Requirements. All students admitted to the University are eligible for acceptance to the Department of Communication in a pre-major status.

Communication Major Requirements. Undergraduate students may be admitted to Communication major status after meeting all of the following requirements:
(1) Completion of at least 56 semester hours with a minimum cumulative grade point aver age of 2.50. For students completing course work at Arizona State University, the grade point average is computed on ASU courses only, and must be based on a *minimum* of nine semester hours of courses with grade options of A, B, C, D, or E.
(2) Completion of University core course requirements (English proficiency), with a minimum grade of C in each.
(3) Completion of all Department of Communication core course requirements in force at the time of admission to major status in the department, with a minimum grade of C in each.

In addition to University core course requirements, all departmental majors must fulfill the College of Public Programs core course requirements, plus those required courses specified in their particular area of concentration. Current undergraduate and graduate areas of concentration include Intercultural Communication, Interpersonal Communication, Interpretation, Organizational Communication, and Rhetoric/Public Communication. Consult departmental academic advisors for current information concerning University, College of Public Programs, and Department of Communication core and area of concentration course requirements.

Degree Requirements

Bachelor of Arts and Bachelor of Science. The departmental requirements for the B.A. and B.S. degrees consist of a minimum of 45 semester hours, of which at least 30 hours must be in departmental courses, with 24 hours of the 30 from courses offering grade options of A, B, C, D, or E. At least 15 hours of the 45 must be in courses offering grade options of A, B, C, D, or E in a related area approved by the student's advisor. At least 24 hours of the total departmental and related courses must be 300 level or higher. A minimum grade of C is required in each course taken in the major.

General Studies requirements for the Bachelor of Arts and Bachelor of Science degrees consist of:

	Bachelor of Arts	Bachelor of Science
Humanities/Fine Arts:	15	9
Social/Behavioral Sciences·	18	21
Science/Mathematics:	9	12
General Studies Electives:	12	12
Total:	54	54

Communication majors seeking the B.A. or B.S. degree may not use courses included in the major to fulfill General Studies requirements. Consult departmental academic advisors for current information concerning College of Public Programs and Department of Communication lists of courses applicable to General Studies requirements.

Bachelor of Arts in Education: Secondary Education curriculum *major* in Communication. The major consists of 60 semester hours and is designed to provide preparation for teaching. Two options are available: (1) The student may complete a minimum of 24 hours in Communication and a minimum of 18 hours in each of two additional approved academic minors. (2) The student may complete a minimum of 36 hours in Communication and a minimum of 24 hours in a single additional approved academic minor. The Communication Arts major must complete all University, College of Public Programs and Department of Communication core courses, 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; an additional 6 hours of Communication activity courses (COM 381, 382) must be completed, 6 hours of which may be counted toward the major. Specific courses to complete the major are selected by the student in consultation with the student's advisor.

Requirements for the Bachelor of Arts in Education degree consist of a minimum of 39 hours in General Studies: 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.

Bachelor of Arts in Education: Secondary Education curriculum *minor* in Communication. The minor consists of 24 semester hours in Communication, including the departmental core courses, plus COM 480. At least 9 of the additional hours must be in upper division course work.

Communication Internships. Internships consist of supervised field experiences and are available to qualified upper-level undergraduate (COM 484) and graduate (COM 584) students. Internships must receive prior approval from the Coordinator of Internship Programs *before* student registration for the course. Internships may be taken once or repeated for credit up to a total of 12 hours, but not more than 3 hours may be applied toward the major.

Departmental Graduate Programs

The Department of Communication offers programs leading to the degree of Master of Arts. Consult the *Graduate College 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. (3) F, S, SS
Demonstration and practice of communicative techniques in establishing and maintaining interpersonal relationships.

172 Introduction to Manual Communication. (3) F, S
American Sign Language (ASL): linguistic principles, expressive/receptive skills; terminology, cultural aspects, socio-educational trends, and sign systems.

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.

207 Introduction to Communication Inquiry. (3) F, S, SS
Bases of inquiry into human communication, including introduction to notions of theory, philosophy, problems, and approaches to the study of communication. Prerequisite: COM 100.

210 Issues in Personal Communication. (3) F, S
Exploration of theoretical, ethical, and philosophical approaches to communication in human relationships. Prerequisite: COM 110.

215 Listening. (3) F, S
Study of theory and practice of effective listening behaviors, including intensive skill exercises.

222 Argumentation. (3) A
Philosophical and theoretical foundations of argumentation, including a comparison of models of advocacy and evidence applied in the forensics environment.

225 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.

230 Small 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. Prerequisite: COM 100 or approval of instructor.

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.

250 Communication in Business and the Professions. (3) F, S, SS
Interpersonal, group, and public communication methods and practices in business and professional organizations. Not open to freshmen.

263 Elements of Intercultural Communication. (3) A
Basic concepts, principles and skills for improving communication between persons from different minority, racial, ethnic, and cultural backgrounds.

271 Voice Improvement. (3) F, S
Intensive personal and group experience to improve normal vocal usage, including articulation and pronunciation.

272 Intermediate Manual Communication. (3) F, S
Emphasis on increasing vocabulary and speed; development of greater fluency in ASL, including fingerspelling and non-verbal communication. Survey of deafness. Prerequisite: COM 172.

274 General Semantics. (3) A
Analysis of relationship to language to reality: nature of meaning, levels of abstraction, application of general semantics to everyday contexts.

275 Nonverbal Communication. (3) F, S, SS
The effects of space, time, body movement, environment, objects, and voice quality on human communication and interaction.

294 Special Topics. (3) F, S, SS
Prerequisite: approval of instructor.

308 Empirical Research Methods in Communication. (3) F, S
Review of empirical research methods in commun ca- t on, including app ications to exper mental, survey, de- scriptive, and other quant tat ve approaches. Prerequ - site. COM 207

309 Rhetorical Research Methods in Communication. (3) F, S
H'stor ca development of rhetorica theory and re- search methods in commun cation, and the modes of qual tat ve research in the f eld Prerequ site: COM 207.

320 Communication and Consumerism. (3) F S
Crit cal evaluat on of messages des'gned for publ c con- sumption Perceiv ng, eva uat ng, and respond ng to pol t ca , socia and commercial communication

325 Advanced Public Speaking. (3) F S
Social and pragmat c aspects of pub ic speaking as a commun cat ve system: strateg es of rhetorica theory and the presentation of forms of pub ic communicat on Prerequ site. COM 225 or approva of nstructor.

329 Persuasion. (3) A
Variab es wh ch influence and modify attitudes and behaviors of message receivers nc uding ana ys s of theories, research and current prob ems. Prerequ site: COM 207 or approval of nstructor.

331 Large Group Decision-Making. (3) A
Theory, methods, and ndiv dua commun cat ve behaviors relevant to large group 'nteraction systems Public d scussion and par amentary procedure in various types of pub ic and de iberative assemb ies. Prerequisite COM 100 or approval of instructor.

341 Interpretation in Social Contexts. (3) F
Adaptation and performance of literature n situat ons of cr sis and confl ct, notably in prisons, mental hospi- tals, and centers for the aged Prerequis te: COM 241 or approva of instructor.

344 Oral Traditions in Literature. (3) S
Literary forms evolv ng from oral myths egends, fo k tales, and fables. Prerequisite. COM 241 or approval of instructor.

351 Interviewing. (3) F, S
Pr nc p es and techn ques of nterv ew ng, nc uding practice through real and s mulated interviews in in formational, persuas ve, and employee-related situa- tions Not open to freshmen.

355 Organizational Communication. (3) F, S
Ana ysis of theories and processes of communication in complex, forma organizational settings (government, ndustry education, etc.) Prerequis te· COM 308 or ap- prova of nstructor

363 Intercultural Communication Processes. (3) F, S
Processes and problems of commun cat on between peop e from different racia ethn c, and cultura back- grounds n both domest c and nternat onal settings. Prerequis te COM 263 or approval of instructor.

371 Language, Culture, and Communication. (3) A
Cu tural nfluences of language on commun cat on, in- c uding social functions of anguage bil ngual sm, bi- cu tural sm, and bidia ect sm

372 Advanced Manual Communication. (3) F, S
ASL and English concepts and idiomatic expressions; emphas s on ASL princ ples Pract'ce in bu ld ng fluency in Ames an; preparat on for interpreting Prerequisite. COM 272.

381 Communication Activities. (1-3) F, S, SS
Non-graded partic pation in forensics or nterpretat on cocurricu ar act vities, or for students enro led n SED 433 (maximum 3 cred ts each semester) Prerequisite: approval of instructor.

382 Classroom Apprenticeship. (1-3) F, S, SS
For students extend ng the r experience w th a content area by ass st ng with c assroom supervis on and ex- ercises in other COM courses (maximum 3 cred ts each semester) Prerequ site· approval of nstructor.

408 Quantitative Methods in Communication Research. (3) N, Boster, Johnson
Advanced theory and pract ce n the formu at on and conduct of empirica research us ng quant tat ve methodologies. Prerequisite COM 308 or approva of nstructor

414 Crisis Communication. (3) N; Arnold
Role of commun cation in crisis deve opment and n- tervention. Prerequisite: approval of instructor.

417 Communication and Aging. (3) N, Arno d, Kastenbaum
Dynamics of aging as it relates to communicat on Pre- requis te. approva of nstructor

420 Public Address. (3) A, Dav s, McHughes
Critical study of signif'cant speakers and speeches of the past and present Prerequisite approva of n- structor.

422 Advanced Argumentation. (3) A; Mayer Re nard
Advanced study of argumentation theories and re- search as appl ed to pub ic forum, adversary, scho arly, and egal settings. Prerequ s te: COM 222 or approval of instructor

425 Legal Communication. (3) N, Hirsch Reinard
The legal setting as a communicative event, featuring d scussion of jury se ect on, legal interviewing negotia tions, and jury behavior Prerequisite· approva of n structor

430 Leadership in Group Communications. (3) A, R chards, W il ams
Theory and process of leadersh p n group commun ca- t on, emphasiz ng philosoph cal foundations, contem- porary research, and app icat ons to group situations Prerequis te· COM 230 or 331 or approval of instructor

441 Interpretation as Literary Criticism. (3) A, McHughes, K. Valentine
Communication of iterature through the medium of per- formance Problems of content, structure, and style in poetry, drama, and prose. Prerequisite COM 241 or ap- prova of nstructor

442 Interpretation and the Mass Media. (3) A, McHughes, K Valentine
The re at onship of modern med a (radio, TV, and film) to ora interpretation and l terature

443 Interpreters Theatre: Theory and Practice. (3) A; McHughes, K Va ent ne
Studies n visual perception, audience psycho ogy, theory and cr tic sm; practice in d recting, analyz ng, script ng, and stag ng of terature Prerequis te· COM 243 or approval of nstructor

451 Quality Circles. (3) A; Perril
Analysis of ' quality circles ' theory, procedures and faci tation techn ques in human resources development and organizat onal problem so ving Prerequ s tes COM 230 and 355, or approval of instructor

456 Political Communication. (3) A; Hirsch, Merri
Theory and research related to pol tica campa gn com- municat on The persuas ve process of pol tical cam- pa gn ng, the ro e of the media, the candidate and image creat on. Prerequ site. approva of nstructor.

457 Communication and Information Diffusion. (3) A, Goyer, Wil ams
Ro e of communicat on n diffus on of nnovat ons Prin- ciples for effective use of communication for p anned change in var ous socia systems. Prerequ site. approval of instructor

472 Development of Language as Communicative Behavior. (3) N; Davey
Development of language and interpersonal communicative behaviors of children through adolescence, including expressive and receptive competencies and interactions with others. Prerequisite: approval of instructor.

480 Methods of Teaching Communication. (3) A; Stites
Analysis, organizat on, and presentation of textual and other classroom materials.

484 Communication Internship. (1-12) F, S

494 Special Topics. (1 4) F, S, SS
Prerequis te: approval of instructor.

500 Research Methods in Communication. (3) F
Def nition and structure of the field of communication; identification and analysis of current research emphases, strategies, techn ques and des gns. Prerequ - site: approval of instructor.

504 Theories and Models of Communication. (3) A
Critical survey and analysis of theories and models of commun cation v ewed as process and event, including their respective research impl cations. Prerequ site: ap proval of instructor.

508 Quantitative Research Methods in Communication. (3) S
Empirical research designs, measurements, and statistical strategies and techniques employed in the analysis and evaluation of exper mentive, descriptive, and related research problems n communication Prerequisite· COM 500.

509 Qualitative Research Methods in Communication. (3) S
Qual tative research methods including histor cal/critical/rhetorical and other non-quantitative techn ques for analyzing communication. Prerequisite: COM 500.

520 Rhetorical Criticism of Oral Discourse. (3) A
History and significance of rhetorical theory and criticism in the analysis of oral discourse. Prerequisite: approval of instructor.

529 Theories of Persuasion. (3) A
Analysis of representative theories and models of persuasive processes and their implications for commun - cative behavior. Prerequisite: approval of nstructor

531 Theories of Small Group Communication. (3) A
Theory and research in small group interaction and decision-making, focusing on communicational variables which affect sma l group output. Prerequisite: approval of nstructor.

541 Research Perspectives in Interpretation. (3) A
Supervised research in the historical and contemporary relationships between the interpreter, the text, and the aud ence. Prerequis te· approval of instructor.

544 Communicative Processes in Organizations. (3) A
Systematic analys s of communicat ve interactions between organizational structure, information flow, and human behaviors in the organizational setting. Prerequisite: approval of instructor.

563 Intercultural Communication. (3) A
Analys s of contemporary theory and research con cern ng the effects of a variety of cultural variables on communicat on between people. Prerequisite: approval of instructor.

575 Language and Message Systems. (3) A
Sign/symbol systems; personal, functional, and contextual aspects of message systems; measurement of "meaning." Prerequisite: approval of instructor.

584 Communication Internship. (1-12) F, S

Special Courses: COM 498, 499, 500, 580, 590, 591, 592, 598, 599. (See pages 33-34.)

Center for the Study of Justice

Michael C. Musheno, Ph.D., Director

Purpose and Philosophy

The Center provides a multidisciplinary setting for studying justice from a social science perspective. The curriculum focuses on criminal, juvenile, civil and administrative regulations, as well as the individual and group behavior that these regulations are designed to influence. The study of justice includes diverse conceptions such as social justice, economic justice and the growing concern with victimology as well as the exploration of liberty and responsibility.

Degrees

Bachelor of Science. The curriculum for the Bachelor of Science degree in Justice Studies provides multidisciplinary, social science courses relevant to law and justice for students working in the justice field, those anticipating justice-related careers (including the legal profession), and interested non-majors.

Master of Science. The curriculum for the Master of Science degree with a major in Justice Studies is designed to prepare students for justice-related agencies, for teaching in community and four-year colleges, or for further study and research in the field of justice. Information on the Master of Science with a major in Justice Studies is detailed in the *Graduate College Catalog.*

Doctor of Public Administration. The D.P.A. degree program is interdisciplinary in nature and is offered by faculty from various colleges. The purpose of the Justice Studies area of concentration is to prepare skilled professionals for high-level positions in justice agencies and to prepare other individuals for justice related teaching positions in colleges/universities. The D.P.A. degree program is administered by an executive committee appointed by and responsible to the Dean of the Graduate College. For more details, see the description of the D.P.A. in the *Graduate College Catalog.*

Admission to Undergraduate Program

Undergraduate students at Arizona State University may become classified as justice studies majors in one of two ways: (1) Students who meet the minimum requirements (56 hours 2.50 grade point average—GPA) at the time of admission to the University will automatically be designated as justice studies majors by the Admissions Office. If students do not meet the minimum requirements, Admissions will designate them as pre-justice studies students. (2) At the point pre-justice studies students attain the minimum requirements, they will be designated as justice studies majors. In this case, the GPA will be calculated on hours earned at Arizona State University only. Students having achieved major status in the Center are expected to maintain a minimum GPA of 2.50 until graduation; students failing to maintain at least a 2.25 GPA will be reviewed by the Center and may be subject to reclassification as a pre-justice studies major.

Academic Advisement. Students admitted as pre-justice studies majors are advised by the Center's academic advisor. All students are encouraged to seek advisement in order to plan an appropriate program of studies. Justice studies majors may also be advised by the Center's faculty.

Degree Requirements

The Center for the Study of Justice awards a Bachelor of Science degree upon the successful completion of a curriculum of 126 semester hours consisting of:

	Semester Hours
General Studies Requirements	46
Justice Studies Major	48
Electives	32
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 justice courses, at Arizona State University.
3. Have obtained a grade "C" or better for all justice courses taken at Arizona State 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 105.

General Studies Program. To meet the University's General Studies requirements, and to assure breadth and depth of the student's education, all justice students must complete a total of 46 semester hours of General Studies courses, excluding all 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, at least one mathematics course at the level approved by the Center, and one computer science course approved by the Center. Courses may be chosen from the listing on the Center's curriculum check sheet.

Other General Courses . ...6-9 sem. hrs.
All justice students must complete a course in Communication approved by the Center, and ENG 105 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

Justice Studies Program. A major consists of 48 semester hours credit, of which 9 must be taken in related fields approved by the Center for the Study of Justice. CRJ 100, 200, 301, 302, and 402 are required for all degree candidates. Additionally, all degree candidates must complete ENG 101 and 102 (*or* 105) according to University guidelines for the English proficiency requirement as prerequisites for all upper-division justice courses. Finally, a group of justice courses may be recommended to ensure a comprehensive exposure to all aspects of justice studies.

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 deter-

mined by the Director of Admissions, and the applicability of credits toward degree requirements will be determined by the Center for the Study of Justice.

Justice Studies

PROFESSORS:

_____ (WILSON 323), HAYNES, KENNEDY, LAUDERDALE, MUSHENO

ASSOCIATE PROFESSORS:

ALTHEIDE, BRUNS, DATESMAN, HERNANDEZ, JOHNSON, SCHADE, SHUMAN

ASSISTANT PROFESSORS:

BORTNER, CAVENDER, JURIK, MELICHAR, ZATZ

VISITING INSTRUCTOR:

FERRARO

CRJ 100 The Justice System. (3) F, S, SS
Overview of the justice system Ro es of aw enforcement personne , the courts and correct onal agenc es Phi osoph cal and theoretical views in histor ca perspect ve.

200 Concepts and Issues of Justice. (3) F S SS
Issues re ating to justice policies, perspectives tech niques, roles, inst tut ona arrangements management uses of research, nnovat ve patterns. Prerequis te. CRJ 100 or approva of nstructor

301 Research in Justice Studies. (3) F S, SS
Or ented toward an understand ng of research elements i e , errors n reasoning, hypotheses scales of measurement, var ables, sampl ng and reliab l ty. Pre requ sites· CRJ 100 200, ENG 101 and 102 (*or* 105) or approval of instructor

302 Basic Statistical Analysis in Justice Studies. (3) F, S, SS
ntroduct on to the fundamentals of stat st cs; a descr ption of the purpose and process of eva uat ve research in justice stud es Prerequ s tes CRJ 100 200, 301, ENG 101 and 102 (*or* 105) MAT 106.

306 The Police Function. (3) F S SS
Alternat ve object ves strateg es programs, inst tu tional arrangements, ro es perspectives, and nteragency relationsh ps of the po ce Prerequisites. CRJ 100, 200, ENG 101 and 102 (*or* 105) or approva of n structor

308 The Adjudication Function. (3) S
Object ves, processes, sett ngs, ro es, and perspectives of the courts prosecution and defense. Prerequisites· CRJ 100 200, ENG 101 and 102 (*or* 105), or approval of instructor.

310 The Correctional Function. (3) F, S, SS
Alternative correct onal object ves, strateg es, programs, nst tutional arrangements, roles, perspectives and nteragency relationships Prerequis tes CRJ 100, 200, ENG 101 and 102 (*or* 105) or approva of in structor.

311 Prevention of Delinquent and Criminal Behavior. (3) F, S
Theories of prevention ndiv dual, group and communi ty approaches intervention at appropriate stages, contemporary law enforcement and corrections practices. Prerequ sites. CRJ 100, 200, ENG 101 and 102 (*or* 105), or approval of instructor

320 Community Relations in the Justice System. (3) F, S
Re at onsh p between the justice system and the com mun ty served. Focus on soc al stratif cation, interest groups, and racia /ethnic minor ties Prerequis tes· CRJ 100, 200, ENG 101 and 102 (*or* 105), or approval of n structor.

340 Juvenile Justice. (3) F, S
A crit cal exam nation of the history and development of the juvenile court and the juven le justice system. Prerequisites· CRJ 100, 200, ENG 101 and 102 (*or* 105), or approva of nstructor.

360 Law and Social Control. (3) F, S, SS
Resolution of social ssues through the application of law as an agent of social control Nature, sanctions, and l mits of aw Categor es of law and schools of jurisprudence. Prerequ sites. CRJ 100, 200, ENG 101 and 102 (*or* 105) or approval of instructor.

402 Justice Theory.(3) F, S; Jurik, Kennedy
A conceptual examinat on of the justice system. Integration of contemporary thought nto an operat onal frame of reference. Prerequisites. CRJ 100, 200, ENG 101 and 102 (*or* 105), or approval of instructor

404 Imperatives of Proof in the Justice System. (3) F, S; Haynes
Problems and means of establ shing dent ty and fact n re at on to arrest, detent on, adjud cation, sentenc ng, and correctional case management. Prerequ s tes: CRJ 100, 200 and 402, ENG 101 and 102 (*or* 105), or ap prova of nstructor.

440 Organization and Administration of the Justice System. (3) F, S, SS Bruns Shuman
System wide analysis of organ zational structures. Management and administrative policies of justice agencies law enforcement, courts and corrections. Prerequis tes. CRJ 100, 200 and 402, ENG 101 and 102 *or* 105), or approval of instructor.

461 Substantive Criminal Law. (3) F, S, SS
Cr minal iab lity Crimes against persons, property, and soc ety. Governmental sanctions of ind vidual conduct as formulated by leg slatures and the courts. Prerequ sites: CRJ 100 200 and 402 ENG 101 and 102 (*or* 105), or approval of instructor.

462 Procedural Criminal Law. (3) F, S; Shuman
The crim nal process. Const tut ona and lega problems assoc ated with crimina procedures. Due process of law Prerequisites. CRJ 100, 200 and 402, ENG 101 and 102 (*or* 105), or approval of instructor

463 Discretionary Justice. (3) F, S, SS; Haynes, Musheno Johnson, Zatz
Use of discret onary authority throughout all phases of the justice system. Cross purpose effect of discretionary just ce. Constitutional im tations on and judicia review of d scretionary authority. Prerequ s tes· CRJ 100 200 and 402, ENG 101 and 102 (*or* 105), or approval of instructor

484 Internship in Justice Studies. (3 or 6) F, S, SS
Ass gnments in a justice agency designed to further the student s integration of theory and practice. Placements are arranged through consultat on with students and agencies. May be taken for a total of up to 12 hours credit, of which a maximum of six shall be applied to the major Prerequisites Major status and completion of required courses (CRJ 100, 200, 402 ENG 101 and 102 (*or* 105), or approval of instructor

494 Special Topics in Justice Studies. (1-3) F, S, SS
Topics chosen from various fields of justice studies. Prerequisites. CRJ 100, 200, 402, ENG 101 and 102 (*or* 105) or approval of instructor

498 Pro-Seminar. (1-3) F, S
Small group study and research for advanced students May be repeated for credit up to a maximum of nine hours, no more than three applied to the major. Prereq uisites: Jun or status, m nimum cumulative GPA of 3 0, approval of instructor and completion of required courses. CRJ 100, 200, 402, ENG 101 and 102 (*or* 105)

499 Independent Study. (1-3) F, S, SS
Original study or invest gat on n the advanced stu dent's field of nterest under the superv sion of a facu ty member May be repeated for credit up to a maximum of six hours, all applied to the major. Prerequisites. Senior status, m nimum cumulative GPA of 3.0, ap prova of nstructor and comp etion of required courses. CRJ 100, 200, 402, ENG 101 and 102 (*or* 105).

500 Justice Research Methods. (3) F, S, SS
Theories and methods of research with emphas s on development of des gns most relevant to justice data and problems. Prerequisite· approval of instructor.

501 Justice System, Theory and Issues. (3) F S
Ana ysis of the justice structure and process within various theoret cal frameworks. Issues such as discretion, divers on and p ea negotiations Prerequisite. approval of instructor

502 Primary Management in Justice Agencies. (3) S; Bruns, Haynes
Concepts of modern management and the r application to justice-related agency supervision and management. Prerequ s te approval of instructor.

503 Crime and Social Causation. (3) S, Bortner, Cavender
Theories of deviance and crime as they re ate to social policies and specific response of the just ce comp ex Prerequisite: approva of instructor.

509 Statistical Problems in Justice Research. (3) F, S
Methodological problems of research des gn and sta t st cal methods specific to justice studies. Prerequ site. CRJ 500 or approval of instructor

510 Understanding the Offender. (3) F, Kennedy
Survey of learning, personality and biologica theories of causation and their relevance to understanding criminal and del nquent behavior Prerequ site. approval of instructor.

514 Justice Policy. (3) F
Assessment of the po it cs of justice pol cy as wel as an understanding of the basic tools avai able to social sc entists for analyz ng the formulation, mp ementation and evaluation of justice pol cy Prerequ site· approval of instructor.

530 Justice Education. (3) F
Development and philosophy of just ce education and tra ning. Problems of curricu um development and eva uation Exam nat on and eva uation of teaching methodologies and nstructional aids. Prerequ site: ap prova of instructor

540 Justice Administration. (3) S
Admin strative po icies and practices used n just ce agencies, and their applicat on to the var ous facets of the justice adm nistrat ve process. Prerequisite. ap proval of nstructor.

541 Justice Planning: Innovation and Change. (3) S
Normat ve factors in planning for standards and goals n the just ce system Application of innovation and change techniques in an interdependent system. Prerequisite: approval of instructor.

550 Survey Research in the Public Sector. (3) S
Design and mplementation of survey research methods with an emphasis on public sector app icat ons Prerequisites. CRJ 500 509 or PAF 500, 501 or equivalent, or approval of nstructor

560 Women and Crime. (3) F
Nature and extent of female crime causat on theories and the treatment of females in the aw and justice system. Prerequisite. approval of nstructor.

570 Juvenile Delinquency. (3) F
Study of del nquency, includ ng causation theor es alternat ve definitions of de inquency, official statist cs and the crit que and analysis of the nteract on between socia institutions and youth Prerequis te· approval of instructor.

571 Juvenile Justice System. (3) S
Graduate-leve introduction to juveni e justice system, nc uding h stor cal deve opment, philosoph cal or entation organ zat ona structure, and contemporary controversies. Prerequisite· approval of nstructor.

610 Law and the Social Sciences. (3)
Normative conceptualizations of law, law and the adm n strative state; impacts of law on society, d scret on, street- evel bureaucrats and the liv ng law. Prerequ site. Approva of instructor.

Special Courses. CRJ 584 590, 591, 592, 593, 594, 598 599. (See pages 33-34.)

Journalism and Telecommunication

PROFESSORS:
BENNETT (STAUF A231B), MILNER

ASSOCIATE PROFESSORS:
ANDERSON, CRAFT, CROWDER, ELLIS, FLYNN, HOY, LANCE, SMITH

ASSISTANT PROFESSORS:
LEIGH, McCAFFERTY, PLATTE, SILVER, SYLVESTER

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 105.	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. All students intending to take department courses beyond the 100-level must complete an English proficiency exam with a passing score. The exam will be administered by the department. To be recognized as a major in either Journalism or Broadcasting, a student must complete at least 56 semester hours with a minimum cumulative grade point average of 2.50. Journalism and Broadcasting students must maintain a 2.25 cumulative grade point average in order to continue to enroll in courses beyond the 100-level 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. Courses elsewhere in the university which duplicate or are closely related to department subject matter may be restricted by the department.

The journalism news-editorial and broadcasting sequences are accredited by the American Council on Education for Journalism and Mass Communication.

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, Management or Broadcast News. 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 Degree Requirements, page 40.)

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 JRN 421†. In addition the student must choose 9 credit hours in a major professional emphasis area. These include; News-Editorial, Public Relations or Photojournalism.

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 Degree Requirements, page 40.)

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, Management or Broadcast News.

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 and may not be used to satisfy General Studies requirements. (See Degree Requirements, page 40).

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, 421 or JRN 412†. In addition the student must choose 9 credit hours in a major professional emphasis area. These include: News-Editorial, Public Relations or Photojournalism.

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 and may not be used to satisfy General Studies requirements. (See Degree Requirements, page 40).

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.

General Studies. 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 18 credit hours in background courses, within the General Studies requirements. Students will be required to take one course in each of the following: political science (either 110 or 300), history, economics, communication, computer science, and English (beyond the freshman English level). Students are also required to take one course in advertising (301).

Departmental Graduate Program

Master of Mass Communication Degree. The curriculum for the M.M.C. degree is designed to help students achieve intellectual and professional growth, to prepare students for positions in the mass media, and to provide a background to enable those currently in the media to advance their careers. Information on the Master of Mass Communication program is detailed in the *Graduate College Catalog.*

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; Sylvester, Milner
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.

503 Press Freedom Theory. (3) S
Examination of philosophical and legal aspects of press freedom. Emphasis on First Amendment theory evolution from 1791 to present

510 Research Methodology in Mass Communication. (3) F
Identification of research problems in mass communication. Overview of questionnaire constructions. Attention to survey historical and research methods.

522 Mass Media and Society. (3) F
Mass media as social institutions, particularly interaction with government and public. Emphasis on critical, normative statements.

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 proficiency 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 pub ic ty, public re ations and related techniques and procedures. Prerequisite· JRN 201† or approva of instructor

412 Editorial Interpretation. (3) N; Mi ner, Sylvester
The press as an nfluence on publ c op nion. The role of the editoria in ana yz ng and interpret ng current events Prerequ site· JRN 301†

413 Advanced Editing. (3) F,S; Anderson, F ynn, Mi ner
Theory and pract ce of newspaper ed ting, layout and des gn picture and story selection Prerequis te· JRN 313†

414 Business and Industrial Publications. (3) S, Smith
Theory and practice of ayout, typography and design for magaz nes, brochures and ndustr al publications

420 Reporting Public Affairs. (3) F,S Schatt
nstruction and ass gnments in report ng the courts, schoo s, government c ty ha l, socia prob ems and other areas nvo ving public ssues Prerequ s te JRN 301†

422 Business Reporting. (3) N; Mi ner
Analyzing and report ng econom c and consumer af fa rs Prerequ sites· three hours of econom cs, JRN 301†

451 Photojournalism II. (3) F S; Hoy
Theory and pract ce of photojourna ism with emphas s on shooting, ghting and ayout for the media. Prerequ - site JRN 351†.

452 Photojournalism III. (3) F S; Hoy
Advanced theory and pract ce of photojournal sm w th emphasis on the photo essay and lustrat ons in black and white and color. Prerequis te. JRN 451†.

480 Methods of Teaching Journalism. (3) F, Staff
Methods of nstruction, organization and presentation of appropriate content in ourna sm Prerequ s te. s x hours of journalism at 300 leve and above or approva of instructor

TELECOMMUNICATION

TCM 200 Fundamentals of Radio-Television. (3) F,S SS
Structure of te ecommun cations n the U S · h story, regu ation, organ zat on, with emphas s on broadcast ng Re at onship to advertising, research and gov ernment agenc es Prerequ s te· MCO 110 or 120.

201 Broadcast News Writing. (3) F,S,SS
Wr ting for electron c med a news and cont nuity Pre requ s tes MCO 110 or 120 successful comp et on of English proficiency requ rement and demonstrated typing ab ity of 30 words per m nute.

235 Studio Techniques. (3) F S,SS
ntroduct on to the theory, techn ques and operat on of te ecommun cat on product on equ pment audio and v deo Prerequ site. TCM 200†. One ecture, 4 hours stud o

300 Videography. (3 N
Bas cs of v deo cont nu ty as used in telecommun cat on news and nformation Prerequis tes. TCM 201† and 235†.

315 Broadcast News Reporting. (3) F S
News and informat on practices of networks stations and ndustry and educat on te ecommun cat on centers Advanced pract ce in writ ng report ng and ed ting Prerequ sites TCM 201† 235†.

332 Broadcast Programming. 3) F,S,SS
Programm ng theory and eva uat on regulation eth cs and respons b it es and bas cs of audience psychographics and effects Prerequ s tes TCM 200†, 201† and jun or stand ng

336 Television Production. (3) F,S
Planning, staging and presenting television programs and segments. Prerequisites. TCM 201†, 235†. One lecture, 4 hours stud o.

343 Broadcast Announcing. (3) F,S
Techniques of radio and te evision announcing. Prereq- u sites: TCM 201†, 235†.

431 Advanced Writing for Telecommunication. (3) F,S; Bennett, Platte
Technique and practice in writ ng for telecommun ca t on, inc uding broadcast, industrial and educational areas Prerequ site· TCM 201† and jun or standing

433 Broadcast Station Operations. (3) F; Bennett
Programming planning traff c, music, news, cont nu ty, sa es and promot on. Operat ona procedures in the departments of a rad o or te ev sion stat on. Prerequis tes. TCM 201† and 332† or approva of instructor May be repeated for cred t

435 Cable TV and Emerging Telecommunication Systems. (3) F, S, Craft
Structures and util zat on of cable, ndustrial and n struct ona te ev sion and sate lite and videocassettes. Prerequ site: TCM 332†

437 Television Directing. (3) S; Craft, P atte, McCafferty
Directing televis on programs for broadcast, cab e, n dustry, and educat on. Prerequisite. TCM 336†. One ecture 4 hours studio.

472 Broadcast Station Management. (3) S; Bennett El is
Management pr nc ples and practices, includ ng organ zat on, procedures, policies, personne problems and f nancia aspects of station management Prerequi s te· TCM 332.†

Special Courses: MCO 492, 493 494, JRN 499, TCM 499, MCO 500, 580 584, JRN 584, TCM 584, MCO 590, 591 592, 593, 598 (See pages 33-34.)

Leisure Studies

PROFESSORS:
CHEATHAM (GHALL 204), GREEY

ASSOCIATE PROFESSOR:
HALEY

ASSISTANT PROFESSORS:
HOEFT, ROBERTSON, SOLAN

LECTURER:
ZWICK

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 56 semester hours with a minimum of 2.50 cumulative grade point average before being officially admitted to the Bachelor of Science program in Recreation with major status. As part of this mini mum requirement, the students must successfully complete REC 160 and ENG 101 102 *or* ENG 105 (or the English Proficiency Examination) with a grade of "C" or better.

Transfer students who have completed 56 semester hours or more at another institution must remove any of the above course or scholastic deficiencies prior to being admitted with major status to the Bachelor of Science program in Recreation.

The student must maintain a minimum 2.50 cumulative GPA to continue to enroll in professional core 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 69 75 semester hours of course work including related studies. The following courses are core major courses required of all undergraduate majors:

			Semester Hours
REC	120	Dynamics of Play	3
REC	160	Leisure and Society	3
REC	210	Urban Leisure Systems	3
REC	330	Theory and Principles of Recreation Programming	3
REC	364	Recreation for Special Populations	3
REC	462	Administration of Leisure Services	3
REC	463	Senior Internship	12
		Total	24

REC 160, 210, 330, 462, and 463 are to be taken in sequence and may not be taken concurrently.

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, 200 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 Camping and Outdoor Skills. (3) F S
Theories and practical skills for outdoor living. Wilderness philosophy, outdoor experience culminating in ACA certification (fee required) 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. Leisure Studies majors only.

300 Fund Raising. (3) S
Methods, techniques and directed experience in fund raising for voluntary youth and human services agencies Budget control and accountability.

310 Volunteerism. (3) S
Administration of volunteer service programs Study and analysis of the volunteer personnel process.

320 Youth and Human Service Workshop. (1) F, S
Forum for exchange between students and professional agency personnel. Variable topics, guest speakers. Prerequisite. approval of instructor

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†. Leisure Studies majors only.

340 Outdoor Survival. (4) F S
Skills for survival Use of plant animal life in short long term emergency survival in the Southwest. Off campus weekend required

350 Recreation Planning and Design. (4) F
Design and development of leisure and recreational resources with a focus upon man and his environment.

360 Resource Management. 3) S
Management and decision making in recreation resource agencies. Policy, analysis and use conflicts. Prerequisite Leisure Studies majors only

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 Environmental and Outdoor Recreation Issues. 3 F
Survey of outdoor recreation resource delivery in the public sector

380 Outdoor Education. (3) F, S
Utilization of the outdoors to facilitate learning and enjoyment of the natural environment. Techniques of organizing outdoor education programs Off campus weekend required

400 Therapeutic Recreation. (3) S
Princ p es practices of program deve opment, evalua t ons, profess ona roles and support services related to therapeut c recreation serv ce. Off campus labs. Le sure Stud es majors only. Prerequis te. REC 364†.

410 Tourism and Commercial Recreation. (3) S
Survey and ana ys s of the role and mpact of tourism and commerc al recreat on enterpr se on the commun - ty, state and c tizen. Prerequ site Leisure Stud es ma- jors only

420 American Humanics Institute. (1) S
Mini ntensive national management institute for vo un tary youth and human serv ce agency personne . Out- of state conference required. Prerequ site. approva of instructor.

430 Youth Agency Administration. (3) F
Ana ys s of admin strat ve structure, dec s on-making and program del very w thin vo untary youth and human serv ce agencies.

440 Areas and Facilities. (3) S
Publ c, pr vate and commerc al recreat on areas and faci it es. Survey of design function, aesthet cs and re- at onsh ps

450 Recreation and Aging. (3) F
Organized recreat on services and fac ities for the aged Soc oeconomic considerations affecting del very of comprehens ve leisure serv ces to the elder y Off- campus laboratory Prerequis te. approval of instructor

460 Issues in Therapeutic Recreation. (3) S
Contemporary problems/ ssues confront ng the therapeut c recreation fie d profess ona deve opment, programs and serv ces, egis at on, ph osoph ca and research ssues Off-campus aboratories Prerequ sites REC 364 Leisure Stud es majors only.

462 Administration of Leisure Services. (3) F,S
Basic pr nc ples of adm n stration and their app cat on to successful admin strat on practices Analysis of ad- ministrat ve funct on structure and polic es. Prerequ s te. REC 330†. Leisure Stud es majors on y.

463 Senior Internship. (6 or 12) F, S, SS
Superv sed guided exper ence n se ected agencies Prerequisites· REC 330†, 462† sen or stand ng Recre- at on majors on y

470 Camp Organization and Administration. (3 F
Organization and administration of camps Preparat on for camp management, cons deration of budget camp site and personne

540 Recreation Services for the Aged. (3) S
Recreat onal activities specia fac l ties, use of vo un teers, publ c re at ons techniques, fund ra sing, and the dynam cs of interpersonal relationsh ps relat ve to the senior cit zen

552 Philosophical Foundations of Leisure. (3) F
Analys s of fundamental philosoph cal concepts as they re ate to princip es and pract ces of organized programs for eisure

558 Current Issues in Recreation. (3) F
Contemporary ssues and problems confront ng the le sure serv ces profession Prerequisite REC 552

569 Commercial Recreation. (3) F'82
Procedures n determ ning public needs nit at ng en terprise, promoting act vity and evaluating the total project n terms of both proprietor and publ c.

570 Outdoor Recreation Planning. (3) S 82
Plann ng for administrat ve dut es n varied recreation sett ngs. Prerequ sites. REC 370 or equ va ent.

Special Courses: REC 294, 298, 484, 492, 493, 494, 497, 498 499 500, 580, 584, 590, 591, 592, 593, 598, 599 691 (See pages 33-34.)

Center for Public Affairs

PROFESSORS:
KARNIG (WILSON 206), BECKER, CAYER, HENRY, KELLY, MUSHENO, PALUMBO, SACKTON, WESCHLER

ASSOCIATE PROFESSORS:
BROWN, DANEKE, ERIBES, HALL, MANKIN, McCLA N, MERR LL, MUSHKATEL, WIGAND, WILSON

ASSISTANT PROFESSORS:
PIJAWKA

LECTURER:
DeBOLSKE

The faculty in the Center for Public Affairs offer a graduate program leading to the professional degree, Master of Public Administration (MPA). The MPA program has been recognized to be in conformity with standards developed by the National Association of Schools of Public Affairs and Administration. The faculty also participate in the interdisciplinary degree program leading to the Doctor of Public Administration. Consult the *Graduate College Catalog* for information about these programs. The basic aims of the Center are: (1) to offer professional education programs leading to graduate degrees in pub lic administration and to encourage mid-career education for public administrators by offering evening course work at the state gov ernment 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.

PUBLIC AFFAIRS

PAF 500 Research Methods I. (3) F, S
Presentation of mult variate stat st cs, computer appli cat ons and ntroduct on to major research design is sues

500 Research Methods II. (3) F S
Advanced treatment of design and measurement issues w th emphasis on app ied research projects by stu- dents

501 Statistics in Administration. (3) N
Appl cation of statistica methods to problems n fi nance, personnel, survey and p anning.

502 Computers in Administration. (3) N
Exper ence n use of computer technology for public ad- m nistration problem solving

503 Organization Theory. (3) A
Organization theories and current research emphasis with application to public administrative organizations.

504 Comparative Administration. (3) N
Literature on comparative public administrat on theory Bureaucracies and their impact on the polit cal develop ment process. Selected nat ons will be stud ed

505 Intergovernmental Relations. (3) N
Evolution, growth, present status and character st cs of the U.S. federal system of government. Federal state relat ons, state-local re at ons, reg onalism, counc s of government, interstate cooperation grants- n-a d, and revenue sharing.

506 Regional Cooperation, Programs and Associations. (3) N
nter and intrastate reg onal po it cal and administrat ve cooperative devices and bod es.

507 Bureaucracy and Public Affairs I. (3) F, S
Analyses of the conceptual and contextual elements of public administration and policy

508 Bureaucracy and Public Affairs II. (3) F S
Analyses of public admin stration concepts app ied to management situat ons including personnel, finance, budgeting, decision making and implementation

510 Governmental Budgeting. (3) F, S
Legal, social, econom c, and pol tica nature of govern mental budgets and the budgetary process. Theor es and social consequences of budget dec sion-mak ng and practices of budget control.

511 Governmental Finance Management. (3) A
Sources of funding, management of funds and debts and general pattern of expenditures, n states, counties, cities, and districts

512 Public Affairs Economics. (3) A
Role of economics in public affairs w th examp es from transportation, urban form, Rio Salado project, housing land use, flood control, growth, aspects of energy eco nomics.

520 Public Management. (3) A
The management process in government and pub ic agencies, with emphas s on the execut ve eadersh p within the public sector

521 Public Personnel Management. (3) A
History of the c vi service, recru tment, select on, posi tion and wage class fication, motivational analysis, pro ductivity, public un onism, and ethics in the publ c ser vice.

522 Public Labor Relations. (3) A
Rise of pub ic unionism, managerial pol cy toward un ionism, conflict reso ut on, impact of unionism on budgets, personnel policies and public policy

523 Public Information Systems. (3) N
Systems analysis concepts and theory as appl ed to administration. Alternative modes of nformation organ za tion and their impact on pub ic decision mak ng

524 Community Conflict Resolution. (3) N
Interdiscipl nary approach to understand ng the dy namics of commun ty conflict. Strategic cons derations in policy design and advocacy; potent al react on to conflict. Relevant models and research find ngs gener ated by both case stud es and comparat ve methods

525 Public Program Management. (3) A
Governmental service programming. formulat ng, f - nancing, operating, eva uating and reporting. Ana ys s of interagency relationships and the role and conduct of research in the programm ng process

530 Management of Urban Government. (3) A
Administrative pract ces and behavior with n the urban political admin strative environment Funct onal areas such as cit zen part c pation urban p anning, urban transportation and the confl cts between urban po it cs and adm n strative eff c ency

531 Comparative Urban Administration. (3) N
Deve opment of urban governments with n different cultura , soc al and po it cal mil eu C ties w th n develop ng countries as well as n the deve oped countries of Europe and North Amer ca

532 Urban Planning Administration. (3) A
Histor ca and present day uses of urban p anning and procedures for ts implementat on Bas c pr nc p es and pract ces.

533 Politics of Urban Planning. (3) A
Urban plann ng policy issues frequent y faced by loca , state and federal government Cons deration of the re- at onships between the politica leader, the profess onal planner and the c tizen

535 The City and County Manager. (3) A
The manager s role and resources n the d ffering forms of adm n strative leg s at ve and commun ty sectors.

540 Public Policy Analysis. (3) A
Theor es which attempt to expla n pub ic policy formula t on. App ication of soc a science to pol cy ssues

541 Topics in Public Policy Analysis. (3) A
May be repeated for credit Topics may be offered from the following· (a) Aging, (b) Art (c) Educat on Po icy, (d) Env ronmental Pub ic Pol cy (e) Health, (f) Nat ona Pub- c Pol cy, (g) Publ c Safety, (h) Recreat on (Transportat on, (j) Welfare

542 Science, Technology and Public Affairs. (3) N
The nfluence of science and techno ogy on governmen ta pol cy-making, sc ent sts as admin strators and ad visors, governmental policy mak ng for science and technology, government as a sponsor of research and development.

543 Public Management of Land. (3) N
Extent, basis, procedures, and consequences of and management by agenc es of federa state and local go vernments.

544 Preparation of Reports in Public Administration. (3) N
Intensive practice in wr tten and oral presentation of reports to conferences covered with problems in publ c administrat on. V sua a d techniques

545 Research Data Management. (3) N
Techniques and prob ems associated with data man agement in a research env ronment Data base management systems, secur ty and integr ty, accessib ity and cost

546 Data Base Management Systems in Public Administration. (3) N
Concept and use of modern data base management systems n an adm n strative organ zat on Advantages and disadvantages of th s approach.

547 Program Evaluation. 3) N
Various methodo og es avai able for the eva uat on of pub ic po icies and programs.

550 Survey Research in the Public Sector. (3 N
Design and implementat on of survey research methods with an emphas s on public sector app cat ons Same course as CRJ 550 Prerequis tes PAF 500 and 501 or CRJ 500 and 509, or equ va ent, or approva of in- structor

551 Urban Planning Evaluation. (3) N
Concepts, pr nc p es and methods emp oyed by pub ic planners in the ana ysis of urban problems nvolv ng mu t ple criter a decis ons Prerequ site. Forma gradu ate evel course work n stat stics and p anning.

552 Urban Housing Policy. (3) N
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
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
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
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
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
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
Practical team research and field experience. Emphasis on the synthesis of public sector planning methodologies, concepts and techniques learned in prior course work.

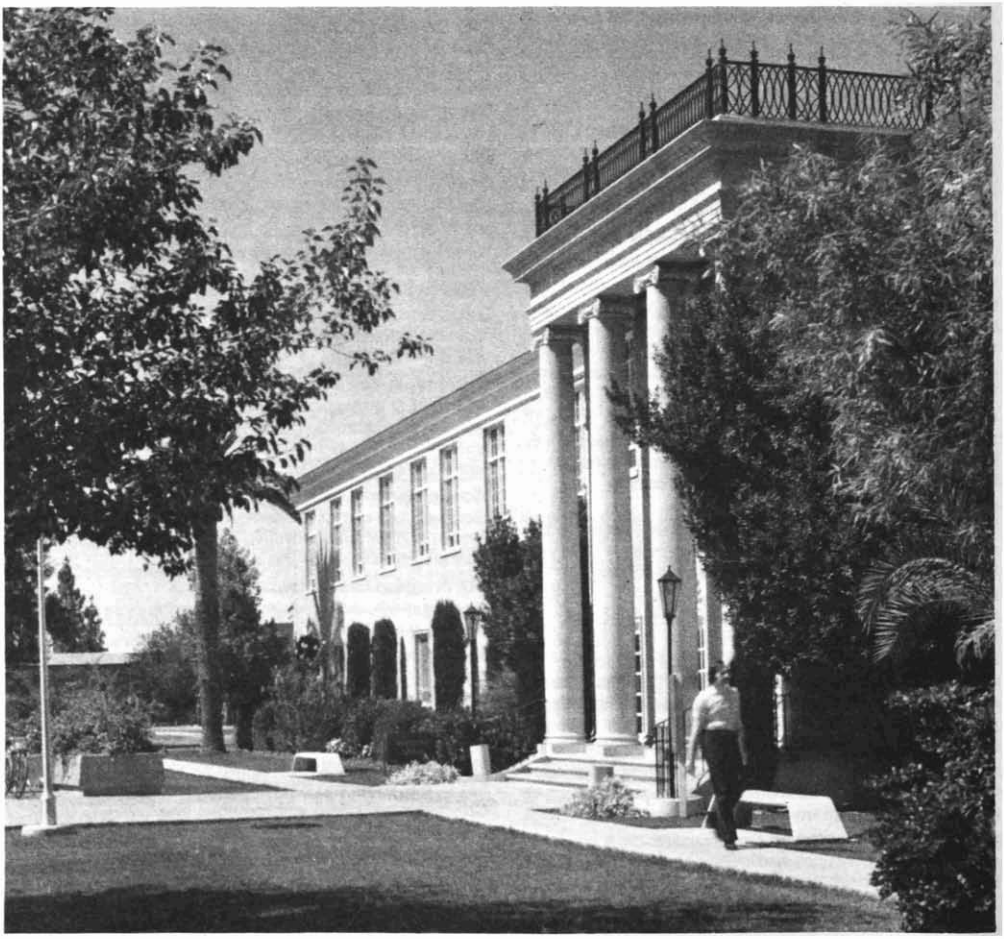
600 Research Design and Methods. (3) F, S
Advanced methods of research design and analysis. Prerequisites: Formal graduate level course work in statistics and in research methods.

601 Seminar: Policy Analysis and Program Evaluation. (3) A
Normative and conceptual issues of policy formulation, implementation, and evaluation; empirical approaches and methods of program evaluation and policy analysis.

602 Seminar: Foundation of Public Administration. (3) A
Ethical, social, legal and philosophical foundations of public administration.

603 Seminar: Organization and Behavior in the Public Sector. (3) A
Structure, organization, conduct, and performance of public sector institutions in the administration of public policy. Prerequisite: PAF 602.

Special Graduate Courses: PAF 580, 584, 590, 592, 594, 598, 599, 780, 783, 784, 790, 791, 792, 799. (See pages 33-34.)



School of Social Work

The School of Social Work offers three degree programs: Doctor of Social Work (D.S.W.), 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 M.S.W. and B.S.W. programs are accredited by the Council on Social Work Education for the preparation 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 105*—3 credit hours (see page 28, "University English Proficiency Requirement").

*Those students taking ENG 105 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: Architec-

ture (APH and certain DES courses only); Art History (ARH courses only); Dance History (DAH courses only); English (except ENG 101, 102, 105); 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.)
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.); 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 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 may take the 12 credit hours of electives at the School of Social Work or other departments 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 stan dards, 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 last semester of his/her sophomore year. It is expected that applicants will have completed 55 semester hours by the end of the semester in which they are applying. Students are admitted to the major at the beginning of the term following the semester during which they applied.

Students who have been pre-majors will automatically be sent social work major application packets at the end of the semester in

which they successfully completed 45 hours. Upon notification of formal acceptance at 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 also may 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.

Applicants are reviewed for admission for the fall and spring semester. Students applying must have a certificate of admission to the University in their files by: November 1 for spring admission and February 1 for fall admission. Students should allow at least four additional weeks to process their ASU application to recveive 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 November 15 for spring admission or February 15 for fall admission. Failure to meet these deadlines may result in the applicant having to wait for the next admissions process. Applicants will be notified by mail of the committee's decision within five weeks following the application 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. Admissions are based on 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 educational 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:
_____(WEST HALL), ALDRIDGE, DALEY, LEWIS, MONTIEL, MORONEY, WONG

ASSOCIATE PROFESSORS:
BORRELL, BRAND, COUDROGLOU, ENGELHARDT, FAUSEL, HALL, HILL, KETTNER, LEYBA, MAGEL, MONTERO, NICHOLS, RED HORSE, WOODMAN

ASSISTANT PROFESSORS:
DeGRAW, JORQUEZ

EMERITI PROFESSORS:
CRANMER, HARWARD, LUNDBERG, 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: 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 ap-

ture (APH and certain DES courses only); Art History (ARH courses only); Dance History (DAH courses only); English (except ENG 101, 102, 105); 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).

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Additional Courses.....9 sem. hrs.
Required: FAS 331 Family Relationships (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

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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.

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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 ap-

proved placement and 1½ hours a week field seminar. 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 and 1½ hours a week field seminar. 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 33-34.)

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	4
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	541, 542	Field Practicum I, II	8
			30

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	Direct Practice III	6
		and select one of the following:	
		SWG 611 Social Work Treatment With Individual	
		SWG 612 Social Work Treatment With Families	
		SWG 619 Social Work With Groups	
		or	
SWG	680	Program Planning in Social Services	6
		and select one of the following:	
		SWG 681 Social Work Administration	
		SWG 682 Community Practice	
SWG	620, 621	Field Research I, II	4
SWG	631	Social Policy and Services III	2
SWG	641, 642	Advanced Practicum/Direct Practice I, II	8
		or	
SWG	643, 644	Advanced Practicum/SW Administration & Community Development	8
		Electives selected from offerings at the School of Social Work or courses offered through other departments with the approval of student's advisor	8
			30

Comprehensive Examinations. Arizona State University requires a comprehensive examination for graduation in all professional master's programs that do not have a thesis requirement. All social work students must pass a comprehensive examination, administered by the School, prior to graduation.

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 se-

quential; 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.

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 College 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 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, AZ 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, AZ 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 9 graduate semester hours earned as an unclassified student in the ASU School of Social Work may be transferred. Up to six semesters 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 9 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 April and 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, Indians and rural residents.

These stipends are awarded on the basis of academic scholarship, financial need and career goals. Application for the Trainee Sti pends should be submitted to the School of Social Work by March 1.

SOCIAL WORK (SWG)

SWG 501 Human Behavior in the Social Environment I. (2) F
Examination of individua , family and small group behavior nc uding the ro e of ethn c ty and women's status.

502 Human Behavior in the Social Environment II. (2) S
Continuation of SWG 501 Prerequ site: 501.

510 Direct Practice I. (3) F
Basic social work methods with an emphasis on the problem-so ving process as t perta ns to nd viduals, families and small groups. Prerequ site: Soc al Work major, concurrent enrol ment n SWG 541.

511 Direct Practice II. (3) S
Continuat on of interventive techniques with ndividuals, fam lies and small groups Prerequ site. Soc al Work major, SWG 510, concurrent enro ment in SWG 542.

520 Practice-Oriented Research. (2) S
Accelerated course n applicat on of sc ent fic princip es to f eld practice, problem formu ation, intervention pro cedures and impact assessment Prerequ sites. Social Work major and an approved course n statistics.

531 Social Policy and Services I. (2) F
Advanced conceptua , analytical and histor'ca perspectives n soc al we fare nstitutional policies, serv'ces and the soc al work profession Emphasis on women and m nor ty issues n the Southwest

532 Social Policy and Services II. (2) S
Pol tica , socio-econom c, ideo og ca forces/ ssues affecting pol cy formu at on. Emphas s on pol cy ana ys s and agenda-bu ld ng. Attention to pub ic polic es and the issues of poverty and nequa ty in the Southwest. Prerequ site: SWG 531.

541 Field Practicum I. (4) F
Sixteen hours a week integrated pract cum/seminar Superv sed pract ce in an approved p acement. Prereq- uis tes: Socia Work major, and concurrent enrol ment in SWG 510.

542 Field Practicum II. (4) S
Sixteen hours a week integrated practicum/sem nar. Superv sed pract ce in an approved p acement. Prereq- uis tes· Socia Work major SWG 541, concurrent enrol - ment in SWG 511

580 Social Work Organizational Problem Solving. (3) F
ntroduces logic, rationa e and spec fic steps of the problem so lv ng process as app ed at the group and organ zat ona leve s

581 Social Work Community Problem Solving. (3) S
Stresses the techn cal and interact onal aspects of prob em solv ng at the community leve including the professional use of self n a var ety of roles. Prerequi- s te SWG 580.

591 Seminar. (1-3) F S
Courses offered in specialized areas.

601 Human Behavior in the Social Environment III. (2) F
Descr pt ve and ana yt c study of human behavior in organizations and communit es. Multiple specia ized sec- t ons may be taken concurrently or repeated for credit. Prerequisites. SWG 501, 502.

605 Substance Abuse. (2) N
Psychological and socio-cultural determinants of substance abuse. Overview of social policies and treatment approaches.

606 Psychopathology. (2) N
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 approva of instructor.

608 Cross Cultural Aspects of Aging. (2) N
Ag ng 'n context of cu ture and ethn city; comparative ana ys s selected modern and traditional populations. mplications for practice with minority aged.

609 Health Aspects of Aging. (2) N
The aging process and health of the aged; chronic illness and adaptation, prevention, control of chronic disease disab lity assessment, intervention.

610 Direct Practice III. (3) F
Refine and integrate knowledge, sk ils and attitudes provided in basic soc al work methods. Prerequisites: SWG 510, 511

611 Social Work Treatment With Individuals. (3) S
Advanced theory and practice of use of social work n- tervention with nd viduals Prerequisites: SWG 510, 511, 610

612 Social Work Family Treatment. (3) S
Theory and practice of social work treatment with fam- lies. Prerequ sites· SWG 510, 511, 610.

614 Social Work With Reconstituted Families. (2) N
Ana yzes the psycho social dynamics of famil es disrupted by divorce, separation, or death of a parent. Offers different al socia work interventions.

615 Group Process in Social Work. (2) N
Appl ca ton of small group theory/group dynamics know edge to social work practice. Understanding and appl cation of small group theory in worker/group member ro es.

619 Social Work With Groups. (3) S
Advanced course us ng social work groups as a direct pract ce intervention in social work. Prerequisites: SWG 510, 511, 610

620, 621 Field Research I and II. (2,2) F, S
nd vidual or group projects on one of four options: A) Po icy Oriented Research B) Knowledge Assessment for Practice C) Knowledge Building-Empir cal Research on a Human Services Problem D) Program Evaluation. Prerequ s tes Socia Work major and SWG 520

624 Program Evaluation in the Human Services. (2) N
Deve opment of understanding and sk il n the conduct of program and project eva uat on Prerequis te. SWG 620 or approval of instructor.

631 Social Policy and Services III. (2) F
Advanced analysis of the h story, institutions, current leg s at on and policy issues re ated to se ected areas of focus (social work fields of practice). Mult ple specialized sections may be taken concurrently or repeated for credit Prerequisites. SWG 531, 532.

633 Philosophical Issues in Social Work. (2) N
Major profess ona pract ce concerns, issues, societal, ethnic, cultura and professiona values. Social work/so- c al welfare inst tut ons philosophical assumptions, ob- ject ves and practice. Prerequis te: Socia Work major.

634 Child Welfare Law. (2) N
Provides social workers with knowledge of basic legal princip es and procedures with emphasis on family related issues and children s rights.

635 Community Mental Health. (2) N
The seminar examines theory development in communi-

ty mental health practice with ind viduals, groups and communities as we l as the inkages among these elements.

641, 642 Advanced Practicum/Direct Practice I, II (4, 4) F S
Two consecut ve semesters in social work practice in an approved placement related to student's spec alization Prerequisites: Soc al Work major, SWG 510, 511, 541, 542, concurrent enrollment n SWG 610 and one of the fol ow ng. 611, 612, 619

643, 644 Advanced Practicum/SW Administration and Community Development I, II. (4 4) F, S
Two consecutive semesters in soc al work practice in an approved placement re ated to student's spec al zation Prerequisites. Soc al Work major: SWG 510, 511, 541, 542 580, 581 concurrent enrollment n SWG 680 and one of the fo lowing: 681, 682

673 Humanistic Concepts for Social Work Practice. (2) N
Appl cat on of perceptual/human st c/ex stentia concepts to social work pract ce. Th rd force psychologica constructs their mpact upon human services, the he p ng process.

680 Program Planning in Social Services. (3) F
The socia serv ces planning process includes needs as sessment, goals and objectives, program des gn, budgeting, management information systems and pro gram evaluation Prerequ s tes. SWG 580 581

681 Social Work Administration. (3) S
Adm n strative ski l building and theory application w th n human service non-prof t socia work sett ngs Prerequ sites SWG 580, 581, 680

682 Community Practice. (3) S
Commun ty practice entails specif c ski areas includ ng program evaluat on, task or ented group techno ogy, cit zen/consumer participat on and bargaining/negotiating. Prerequ sites. SWG 580 581, 680

683 Proposal Development/Grantsmanship. (2) N
Student groups work w th agency or community per sons to deve op real proposals. Both techn cal and n terpersonal/politica aspects of the proposa development process are stressed

684 Contract Administration in Social Work. (2) N
Fundamentals of contract ng from initia conceptual z ation of the service need through deve opment negot at on, adm nistration and mon toring of contracts

685 Social Work and the Political Process. 2) N
Ways n wh ch socia workers can impact oca state and nationa po it'cal systems n order to improve soc a serv ces

Doctor of Social Work

The Doctor of Social Work program is designed to prepare a limited number of experienced social workers for leadership roles in social welfare as administrators and as social policy analysts, with an applied research orientation.

Policies developed by legislative bodies, administrative regulations and judicial decisions, establish the basic programs and services with which social workers are concerned. D.S.W. graduates should be prepared to contribute to the assessment and formulation of such policies, based on sophisticated analysis and understanding of the social problems for which the policies are designed. They should also be prepared to engage in leadership roles in the development of viable social work programs of intervention on behalf of populations at risk, and to contribute to the efficient and effective operation and administration of such programs.

Program of Study

Completion of the program will require at least 39 credit hours of course work beyond the master's degree and a minimum of 15 credit hours for the dissertation. Each student will complete all core requirements: Research (9 hours), Social Work Administration (9 hours); Social Policy (9 hours); Comprehensive Examinations (written and oral), Dissertation (15 hours), and 12 hours of electives In addition, based on an educational assessment by the Supervisory Committee, a number of "leveling" courses may be required to bring the student to an acceptable level of specific knowledge.

The following are the core requirements.

			Semester Hours
SWG	720	Research Methods n Socia Policy and Adm n stration...	3
SWG	721	Survey Research and Selected Research Issues in Social Policy and Adm n stration	3
SWG	722	Organizat ona and Evaluative Research in Social Policy and Administrat on	3
SWG	730	Social Policy Issues n Socia Welfare	3
SWG	731	Soc'a Welfare Po icy Ana ys s and Development	3
SWG	732	Soc al Welfare P icy: Economic and Politica Ana yses ..	3
SWG	740	Theory and Practice of Social Work Adm nistration .. .	3
SWG	741	Social Work Administration in a Systems Context	3
SWG	742	System Redesign for Social Change..	3

The remaining 12 semester hours will be negotiated by the student and his her advisory committee and will reflect the student's short and long term career interests. It is expected that in most instances these courses will be taken in other schools or departments w thin the University.

Admission to the D.S.W. Program

In general, an applicant to the program should hold a Master of Soc al Work degree from an accredited school of social work and

have demonstrated professional growth in the practice of social work, particularly in the administration of social services. Exceptions to this general requirement may be made for applicants with an advanced degree in a related field and exceptional practice or research experience in social work.

Admission to the D.S.W. program requires completion of all admission requirements and procedures set forth by the Graduate College and test scores from the Graduate Record Examination (verbal and quantitative). Applications are accepted up to March 1 preceding the fall semester to which the applicant is seeking admission. Students are admitted only in the fall semester.

Application Procedure. The following should be submitted to the Admissions Office, Graduate College, Arizona State University, Tempe, AZ 85287: The application for admissions to the Graduate College, two transcripts from each institution where the applicant has attended previously, test scores from the Graduate Record Examination.

The following should be submitted to the Admissions Committee, Graduate Program, School of Social Work, Arizona State University, Tempe, AZ 85287: 1) application to the Doctor of 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, 3) examples of written work or published materials, and 4) four letters of reference. The reference letter forms provided by the School of Social Work must be used.

SOCIAL WORK

SWG 720 Research Methods in Social Policy and Administration. (3) F
Research methodology, statistical methods and social data applied to social welfare problems and administrative decisions, emphasizing southwestern populations.

721 Survey Research and Selected Research Issues in Social Policy and Administration. (3) S
Sampling data collection; forecasting methodology; research and development programs in southwestern settings; computer methods. Prerequisite: SWG 720.

722 Organizational and Evaluative Research in Social Policy and Administration. (3) F
Evaluating social welfare organizations, policies, practices; measuring program results; impact on target populations; research methods to fit social welfare problems. Prerequisite: SWG 721.

730 Social Policy Issues in Social Welfare. (3) F
Historical backgrounds of current policy issues; law as expression of social policy; legislative, executive and judicial roles in formulating policy.

731 Social Welfare Policy Analysis and Development. (3) F
Methods of policy analysis; critique of social welfare policies against proposed models; case studies of policy development emphasizing southwestern populations. Prerequisite: SWG 730.

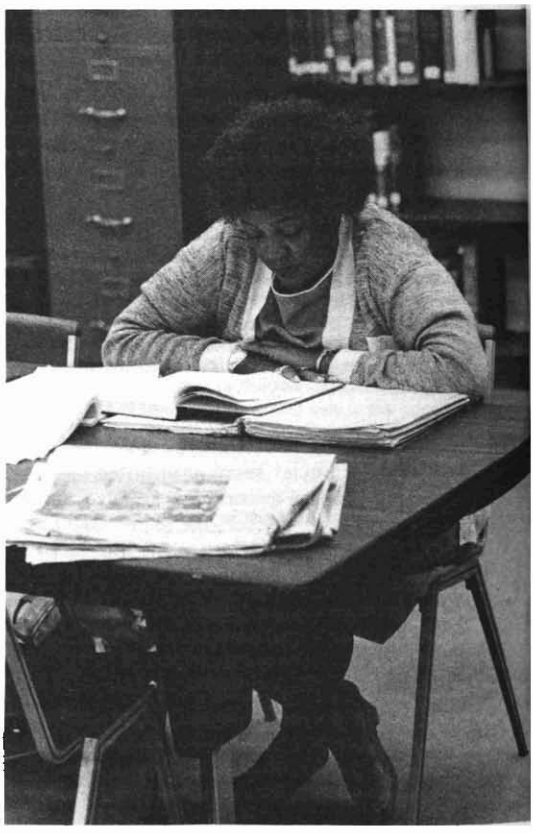
732 Social Welfare Policy: Economic and Political Analyses. (3) S
Economic and political factors influencing national social welfare policies; taxes, financial resources and civil rights as affecting social welfare programs. Prerequisite: SWG 731.

740 Theory and Practice of Social Work Administration. (3) F
Organizational theory and administrative principles applied to social work administration; distinctive features of social work administration; serving populations at risk.

741 Social Work Administration in a Systems Context. (3) S
Case studies of social work administration from initial conceptualization of policy through implementation at national, state and local levels. Prerequisite: SWG 740.

742 System Redesign for Social Change. (3) F
Redesigning/improving administrative structures; relation of administrative organization to service delivery; organization change procedures; case studies emphasizing minorities and women. Prerequisite: SWG 741.

Special Courses: SWG 584, 590, 591, 594, 598, 690.
(See pages 33-34.)



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, theory, 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 Architecture
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 Mass Communication
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
Doctor of Social Work

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 advised 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 Man-

agement 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 addi tional evidence of their qualifications for ad mission 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 non degree status in the Graduate College. Before enrolling, he/she must submit an application for registration to the Graduate Admissions Office.

International Student Admission. An international applicant is one who is a citizen of a country other than the United States. International applicants who are not currently attending a university in the United States are urged to apply one year prior to the date they plan to enroll. The application for admission, official transcripts, results of the Test of English as a Foreign Language (TOEFL), and a financial guarantee should be received in the Graduate College International Admissions Office by March 30 for admission for fall semester and by September 30 for admission for spring semester. Applicants should contact the individual academic units regarding additional admission requirements, application deadlines and test scores.

Transcripts cannot be submitted directly by the student. To be official, transcripts must be received by the Graduate College International Admissions Office directly from the institution that issues them. Alternate methods have been established for students whose previous academic institutions are unable to issue the documents directly to the Graduate College International Admissions Office. Those methods are outlined on the application for admission.

To be eligible to apply to the Graduate College, an applicant must have received a degree equivalent to a U.S. bachelor's degree.

International applicants are selected upon the basis of a high standard of performance in their previous academic work. An applicant should have maintained a grade standard in the last two years of undergraduate study that is approximately equivalent to a 3.0 minimum grade point average on a 4.0 scale.

The Graduate College is required by the Immigration and Naturalization Service to verify that a person with a student visa has been admitted to a degree program and has financial support for the entire proposed period of study. An applicant must have assured fi nancial resources in an amount not less than the one specified on the application for admission for each year of study. In addition, all international students must carry health insurance. An international student on a student visa may not enroll as a non degree student.

Change in Graduate Degree Program. A change from one graduate degree program to another requires reapplication. 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.

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 to observe all procedures and requirements of the Graduate College as defined in the *Graduate Catalog*. Students should also be informed about the require ments concerning the degree program they are enrolled in and any special requirements within the department or academic unit. Students are expected, as part of their obligations, to be familiar with the *Code of Coduct*. Violations of this *Code of Conduct* or instances of academic dishonesty, specifically cheating in examinations, laboratory work, written work (plagiarism), forging, or altering University records that is attempting to gain credit for

work which the student has not actually performed will be subject to University discipline whether committed by individuals or groups.

Graduate Supervisory Committees. Upon the recommendation of the head of the academic unit the Dean of the Graduate College appoints a graduate student's supervisory committee, consisting of a chairperson and other resident faculty members. The number of members serving on this committee is a function of the degree program. See the specific degree program for additional information

In some cases, individuals who are not members of the resident faculty may be appointed to a supervisory committee as a main or extra member Such appointments must be consistent with quality graduate training, and be strongly recommended by the head of the academic unit. A vita for this individual should be submitted to the Graduate College with the recommendation.

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.

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 Graduate assistants/associates working 50% time may not enroll for less than 6 hours or more than 12 hours during a regular semester. 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)	W Withdrawal
B Good (3.0)	I Incomplete
C Passing (2.0)	X Audit
D No Graduate Credit (1.0)*	Z—Course in Progress**
Y—Satisfactory	E Failure (0.0)*

*Cannot be applied toward a graduate degree but is included in calculation of grade point average.

**This grade is given pending completion of courses such as thesis, dissertation and practicum.

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 withdraws from a

course or officially withdraws from the University during the first six weeks of the semester; (2) officially withdraws from 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 9 semester hours of graduate credit taken before admission may appear on a program of study for a master's degree. The number of hours transferred from other institutions and not previously used toward a graduate degree may not exceed 20% of the total minimum semester hours required for a master's degree. However, in certain 60-hour professional master's degree programs, up to 32 hours from a previous master's degree may be transferred 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 resident graduate 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 of approximately 200 pages in length in the desired foreign language. 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.

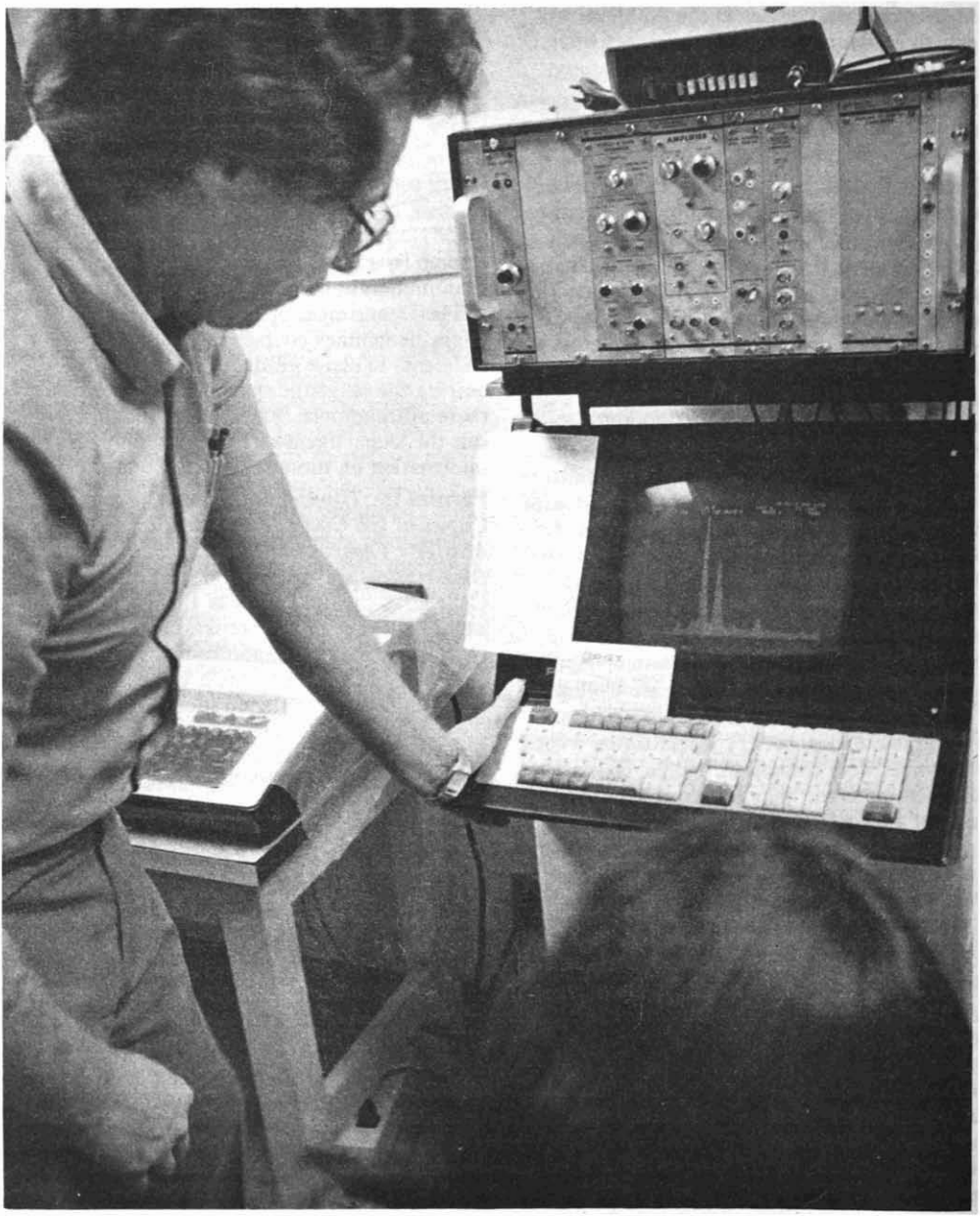
Format for Theses and Dissertations. Copies of the *Guide to Preparation of the Master's Thesis, Applied Project, or Doctoral Dissertation* are available in the Graduate College. A careful review of this document well in advance of the preparation of the manuscript is strongly recommended. Format evaluation 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 all degree requirements 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, AZ 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, AZ 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 $42.00 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 enrol 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 concluding with a final examination. Eight to ten hours are normally required preparing each assignment.

A student will not be permitted to take the final examination for a course in less than 7 days from date of registration for a one-unit course, 14 days for a two-unit course, and 21 days for a three-unit course.

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. Tuition waivers do not apply 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 20.)

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 achieve-

ment 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, en rollment and fee schedules should be directed to the Dean of University Continuing Education, Academic Services Building 110, Arizona State University, Tempe, Az 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 cam pus group desirous of conducting an educa tional 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 guide lines, checklists, and general operating proce dures 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. De gree candidates, both graduate and undergrad uate, 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. Hours of enrollment in any other institution, or correspondence course is included in the maximum allowable course load during any given session. 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 18-21).

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 21).

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 357 and the *Graduate College Catalog*).

Fees and Expenses. The Summer Sessions fee is $42.00 per credit hour, which includes the student activity fee. Textbooks and supplies may be purchased at the ASU Bookstore. 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 in formation should be addressed to the Office of Summer Sessions at Arizona State University, Tempe, AZ 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 1984
Thomas Chandler, B.A., LL.B.
William G. Payne, B.A., M.A., M.D.

To January 1986
Esther N. Capin, B.A., M.Ed.
Donald Pitt, B.S., LL.B.

To January 1988
William P. Reilly
Tio A. Tachias

To January 1990
A. J. Pfister, B.S., LL.B.
Donald G. Shropshire

Student Regent, To May 1983
Vada Manager

Stephen K. Smith, A.A., B.A., M.M.E., J.D. ..... *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 ..... *Executive Vice President; Professor of History*
B.S., B.A., M.A., University of Arkansas; Ph.D., University of Texas, Austin

Jack B. Kinsinger ..... *Vice President for Academic Affairs; Professor of Chemistry*
B.S., Hiram College; M.S., Cornell University; Ph.D., University of Pennsylvania

Betty Turner Asher ..... *Vice President for Student Affairs; Associate Professor of Counselor Education*
B.A., Eastern Kentucky University; M.A., Western Kentucky University; Ed.D., University of Cincinnati

_____ ..... *Vice President for Business Affairs*

Troy F. Crowder ..... *Special Assistant to the President; Associate Professor of Journalism and Telecommunication*
B.A., University of South Dakota
M.A., University of Iowa

Luis Aranda ..... *Assistant to the President for Equal Employment Opportunity in Affirmative Action; Associate Professor of Administrative Services*
B.M., M.Ed., University of Arizona;
J.D., Arizona State University

Guido G. Weigend ..... *Dean, College of Liberal Arts; Professor of Geography*
B.S., M.S., Ph.D., University of Chicago

Gerald R. McSheffrey ..... *Dean, College of Architecture; Professor of Architecture*
Dipl. Arch., University College, London; Dip. C.D., Edinburgh University

L. William Seidman ..... *Dean, College of Business Administration; Professor of Accounting*
A.B., Dartmouth College; LL.B., Harvard University Law School; M.B.A., University of Michigan

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; Director, School of Engineering; Director, Engineering Research Center; Professor of Engineering*
B.S., Arlington State College; M.S., California Institute of Technology; Ph.D., University of Texas

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

_____ ..... *Dean, College of Nursing*

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

_____ ..... *Dean, School of Social Work*

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; Director, Summer Sessions; Professor of Industrial Technology*
B.S., Mankato State Teachers College; M.S., The Stout Institute; Ed.D., University of Missouri

Resident Faculty

Aannestad, Per (1975) ..... *Associate 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) ..... *Associate 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

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) ..... *Professor of Theatre; Chair, Department of Theatre*
B.A., Duke University; M.A., Ph.D., University of Denver

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

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) ... *Associate 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 in Center for the Study of Justice*
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*
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) ... *Associate 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) ... *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) ... *Associate 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, Assistant to the President for Equal Employment Opportunity in Affirmative Action*
B.M., M.Ed., University of Arizona, J.D., Arizona State University

Aranda, Eileen K. (1979) ... *Assistant Professor of Management*
B.A., Evergreen State College, M.B.A., Ph.D., University of Washington

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

Arterian Furnish, Hannah (1979) ... *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

Asher, Betty Turner (1982) ... *Associate Professor of Counselor Education; Vice President for Student Affairs*
B.A., Eastern Kentucky University; M.A., Western Kentucky University, Ed.D., University of Cincinnati

Ashley, Richard (1977) ... *Associate Professor of Political Science*
B.A., University of California, Santa Barbara, M.A., Ph.D., Massachusetts Institute of Technology

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) ..... *Associate Professor of Agriculture*
B.S., Rutgers, The State University; M.S., Ph.D., University of California

Backus, Charles E. (1968) ..... *Professor of Engineering; Assistant Dean, College of Engineering and Applied Sciences*
B.S.M.E., Ohio University; M.S., Ph.D., University of Arizona

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

Baldwin, Bruce A. (1980) ..... *Assistant Professor of Accounting*
B.A., M.B.A., Michigan State University; D.B.A., Arizona State University

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) ..... *Associate 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) ..... *Associate 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

Bartels, Robert D. (1981) ..... *Professor of Law*
B.A., University of Michigan; J.D., Stanford University

Barroll, Rayna (1980) ..... *Assistant Professor of Music*
B.M., University of Texas; D.M.A. University of Maryland

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., Univers ty of Wyoming; D B A , Indiana University

Batalden, Stephen K. (1976) ..... *Associate Professor of History*
B A., Augsburg College M A , Ph D., Univers ty of M nnesota

Batchelor, Harold W. (1943) ..... *Professor Emeritus of Library Science*
B A , University of Oregon, B S in L S , M S , Univers ty of Illinois

Baty, Wayne M. (1962) ..... *Professor of Administrative Services*
B S in Ed , Southwest Missouri State Col ege, M A , Northwestern University,
Ph D , Un versity of Southern Ca ifornia

Baumann, Victor H. (1964) ..... *Professor Emeritus of Education*
B A , Grinnel Col ege, M A Northwestern University, Ed.D Univers ty of Southern Ca ifornia

Beakley, George C. Jr. (1956) ..... *Professor of Engineering, Associate Dean, College of Engineering and Applied Sciences*
B.S M E , Texas Tech Univers ty,
M S M.E., University of Texas Ph D Ok ahoma State Univers ty P E

Beatty, John (1982) ..... *Associate Professor of Philosophy*
B S , Tulane Un vers ty M A , Ph D , Ind ana Un versity

Becker, R. James (1965) ..... *Professor of Public Affairs*
B S., M.A., Bradley University, Ph D , Un vers ty of Il no s

Becker, Walter G. (1955) ..... *Associate Professor Emeritus of Finance*
A B , M A , Loyola Un versity, Ph D , State Univers ty of owa, CFA

Beckman, James R. (1980) ..... *Associate Professor of Engineering*
B.S., M.S., Un versity of W sconsin, Ph D University of Ar zona

Bedient, Jack D (1963) ..... *Associate Professor of Mathematics*
A B., Albion Co lege; M B S , Ed D , Univers ty of Colorado

Bedworth, David D. (1963) ..... *Professor of Engineering*
B S I E , Lamar Col ege of Techno ogy M S E., Ph D , Purdue University

Bell, James W (1966) ..... *Professor of Education*
A.B Washburn University, M Ed , Ed D , Un versity of Kansas

Bell, John E. (1965) ..... *Professor of Education, Chair, Department of Secondary Education*
B S , University of Nebraska; M A Ed D , Un versity of Wyoming

Bell, LoAnn (1980) ..... *Instructor of Nursing*
B S , Un versity of Wisconsin, M.S , Un vers ty f Minnesota

Bell, Mary E (1970) ..... *Associate Professor Emeritus of Education*
B S , Indiana State Teachers College M S., But er University, Ed D , nd ana University

Bellamy, Lynn (1976) ..... *Associate Professor of Engineering*
B S., Texas A & M, M.S , Ph D Tu ane Un versity

Belok, Michael V (1959) ..... *Professor of Education*
B S , Indiana Un vers ty, M.A., Arizona State University; Ph.D , Univers ty of Southern Ca fornia

Beltramini, Richard H. (1980) ..... *Assistant Professor of Marketing and Advertising*
B S., M.B A , University of Ill nois, Ph D , Univers ty of Texas, Austin

Bender, Bert A (1971) ..... *Associate Professor of English*
B A., Un versity of Wash ngton, Ph D , University of Ca ifornia, Irv ne

Bender, Eldon M (1981) ..... *Assistant Professor of Technology*
B A S E , Un versity of Cinc nnati

Bender, Gordon L. (1953) ..... *Professor Emeritus of Zoology*
B S., Iowa State College, M S , University of Wisconsin, Ph D , University of I l no s

Benedict, Joel A. (1946) ..... *Professor Emeritus of Education*
B A , M A , Ar zona 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, Chair, Department of Journalism and Telecommunication*
B A , Brigham Young University,
M A Ph D , Mich gan State Un versity

Benzinger, Robert P. (1970) ..... *Associate Professor of Design Sciences*
B S M.E , Univers ty of Wisconsin, M A E., Chrys er Institute of Engineering

Berch, Michael A. (1969) ..... *Professor of Law*
B A J.D , Columbia Univers ty

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

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*
B.S., M.S., Ph.D., Northwestern University

Beyard-Tyler, Karen C. (1975) ..... *Assistant Professor of Education*
A.B., Wellesley College; M.A., 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) ..... *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 Emeritus 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

Boetto, Laurel B. (1956) ..... *Assistant Professor Emeritus of Education*
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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;*
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B.S., M.A., Ph.D., Ohio State University

Bohlander, George W. (1977) ..... *Associate Professor of Management*
B.A., San Francisco State College; M.B.A., University of Southern California;
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Bohlman, Herbert M. (1964) ..... *Associate Professor of Administrative Services*
B.S., 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

Bongarts, Monty D. (1983) ..... *Assistant Professor of Aerospace Studies*
B.S., University of Tampa; M.P.A., Golden Gate University; M.S., Air Force Institute of Technology

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 Justice Studies*
B A , Edinboro State College, M.A., Ohio University; Ph.D., Washington University, St Louis

Borrell, Maria L (1981) ..... *Associate Professor of Social Work*
B A , Univers'ty of Miami, M S , Barry College, North Miami; D Soc Sc , University of Stockholm, Ph D , New York Un versity

Bose, Anjan (1981) ..... *Associate Professor of Engineering*
B. Tech., Ind'ana Institute of Technology, M S E.E., University of California, Ph.D.E.E , Iowa State Un versity

Boster, Franklin (1977) ..... *Associate Professor of Communication*
B A., M.A., Southern Illinois University; Ph D , Michigan State University

Boswell, Jacquelyn (1982) ..... *Professor of Music*
B.M.E., Murray State Un versity, M.M.E., Lou siana State University, Ed.D , Un versity of Ill nois

Bowers, Charles O. (1948) ..... *Professor Emeritus of Music*
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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 Col ege

Boyd, James H. (1976) ..... *Associate Professor of Accounting*
B.B.A., Texas Christian Univers ty, M S , Northeastern University; Ph D , University of Texas, Austin; C P A , Texas

Boyer, Jay M. (1976) ..... *Associate Professor of English*
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Boyes, William J. (1974) ..... *Professor of Economics; Chair, Department of Economics*
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Boyle, Bernard M. (1969) ..... *Professor of Planning*
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Brack, O M, Jr. (1973) ..... *Professor of English*
B A , M.A , Baylor Univers ty, Ph.D., University of Texas, Austin

Bracker, Jeffrey S. (1982) ..... *Assistant Professor of Management*
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Brada, Josef C. (1978) ..... *Professor of Economics*
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Brady, Ward W. (1973) ..... *Associate Professor of Agriculture*
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Brand, Mark (1968) ..... *Associate Professor of Social Work*
B.A , M.A., University of Arizona, M S W., University of California, Berke ey

Brandt, Elizabeth A. (1974) ..... *Associate Professor of Anthropology*
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Branstetter, Ellamae (1967) ..... *Professor of Nursing*
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Braun, Joseph J. (1973) ..... *Professor of Psychology*
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Braver, Sanford L. (1970) ..... *Associate Professor of Psychology*
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Brenenstuhl, Daniel C. (1978) ..... *Associate Professor of Management*
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Bresina, Bertha M. (1960) ..... *Professor Emeritus of Home Economics*
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Brink, Daniel T. (1976) ..... *Associate Professor of English*
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Brink, Jeanie R. (1974) ..... *Associate Professor of English; Director, Center for Medieval and Renaissance Studies*
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Britton, Daniel D (1976) ..... *Assistant Professor of Art*
B F A , M F A Un versity of Colorado

Britton, Mervin W. (1956) ..... *Professor of Music*
B S., M S , Univers ty of Ill nois

Broadley, Hugh T. (1969) ..... *Professor of Art*
A B , Park Col ege, M A , Yale Un versity, Ph.D , New York Un versity

Brock, John H (1977) ..... *Associate Professor of Agriculture*
B.S., M S Fort Hays State Un versity, Ph D , Texas A&M Un versity

Brockmann, Robert J. (1980) ..... *Assistant Professor of Technology*
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Brook, Weston L. (1966) ..... *Asso iate Professor of Education, Director Professional Field Experiences*
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Brooks, Daniel G. (1977) ..... *Associate Professor of Quantitative Systems*
B S , M.S., Colorado School of Mines, M B.A., D B A , Indiana Univers ty

Brose, Marianna F. (1963) ..... *Assistant Professor of English*
B A , C l ege of Wi liam and Mary, M A , Ar zona State Un vers ty

Brown, Alan R (1968) ..... *Associate Professor of Education*
B A , M A , Los Angeles State Co ege, Ph D., U nivers ty of Texas, Austin

Brown, Brent W (1972) ..... *Associate Professor of Public Affairs, Assistant Vice President for Community Relations*
B A , Br gham Young Un versity,
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Brown, Donald E. (1963) ..... *Professor Emeritus of Journalism and Telecommunication*
B A , M A , University of Iowa

Brown, Duane (1950) ..... *Professor of Chemistry*
B S , Brigham Young Un versity Ph D., Cornel Un versity

Brown, Stephen W. (1974) ..... *Professor of Marketing*
B.S , M B A., D B A , Ar zona State Un versity

Brown, Theodore M. (1963) ..... *Professor of Chemistry*
B S , M S , Un versity of Toledo, Ph D , Iowa State Univers ty

Brown, Walter C. (1966) ..... *Professor of Technology*
B S , Northwest M ssour State University; M Ed , Ed D , University of Missour Columb a

Bruner, May I. (1961) ..... *Associate Professor of Nursing*
B S , Un versity of Hawai , M S., Univers ty of Colorado

Bruns, Gilbert H (1974) ..... *Associate Professor of Justice Studies*
B S M.Ed , South Dakota State U nivers ty, Ed.D , Arizona State U nivers ty

Bryant, Fred O (1950) ..... *Associate Professor of Phy sical Education*
B S , Springhe d Col ege, M S , Univers ty of I l nois, Ed D , Ar zona State University

Buckingham, Wi lis J. (1969) ..... *Associate Professor of English*
A B , Harvard Un ve s ty, M S , Un versity of W scons n, Mad son Ph D , Ind ana University

Buley, Jerry L (1973) ..... *Associate Profe ssor of Communication*
B A , Univers ty of Colorado, M A , M ch gan State Un vers ty Ph D , F o ida State Univers ty

Bunt, Lucas N H. (1968) ..... *Professor Emeritus of Mathematics*
B S., Drs Un versity f Amst rdam, Ph D , U niversity of Gr ningen Nether and s)

Burdette, Wa ter E. (1956) ..... *Profess or Emeritus of Technology*
B S , M S , Kansas State C ege of P ttsburg Ed.D U n vers ty of Miss uri, Co umbia

Burdick, Richard K. 1976 ..... *Associate Professor of Quantitative Sy stems*
B S , Un vers ty f Wy om ng M S , Texas A&M Un vers ty

Burg, B Richard (1967) ..... *Professor of History*
B A , U nive sity of C o ado, M.A., Western State Co ege of Co orado, Ph D , U nivers ty f Co orado

Burgess, Hugh (1974) ..... *Professor of Planning*
B S Un versity of dah , M S A ch Colun b a Un versity, A ch D Rice U nivers ty

Burgess, Paul L (1969) ..... *Associate Professor of Economics*
B.A Ph D , Un versity of Co rado

Burgoyne, Edward E. (1951) ..... *Professor of Chemistry*
B S , Ut h State versity, M.S , Ph D , Un v rsity of W scons n, Mad son

Burk, Karl W (1949) ..... *Associate Professor Emeritus of Technology*
B A n Ed , M.A. in Ed , Ar zona St te Univers ty Ed D , Brad ey Un vers ty

Burke, Joy Patricia (1981) ..... *Assistant Professor of Education*
B.A., San Jose State University, M.Ed., Ed.D., Rutgers University

Burke, William F. Jr. (1977) ..... *Assistant Professor of Microbiology*
B A., University of Da las, Irving, M A., North Texas State University, Ph D , Arizona State University

Burke, William J. (1962) ..... *Professor of Chemistry*
A.B., Ohio University; Ph D , Oh'o State University

Burkett, Lee N. (1974) ..... *Associate Professor of Physical Education*
B.A., M A , San Diego State University, Ph D , Washington State University

Burstein, David (1982) ..... *Assistant Professor of Physics*
B A., Wesleyan University, Ph D , University of California, Santa Cruz

Burt, Donald M. (1974) ..... *Associate Professor of Geology*
A.B., Princeton University; A.M , Ph D , Harvard University

Burt, Glen D., Captain (1981) ..... *Assistant Professor of Military Science*
B.S Ed., M.S Ed., Henderson State University

Burton, Arleigh R. (1941) ..... *Professor Emeritus of Accounting*
A B , M S , Emporia State Teachers College, Ph.D., Univers ty of Nebraska, Lincoln, C P A , Arizona

Burton, Dora (1976) ..... *Assistant Professor of Russian*
M.D., First Leningrad and Kazan' Med cal Institute (Russia); M.A , Ph D., University of Wash ngton

Burton, Foster M. (1969) ..... *Associate Professor of Construction*
B S C.E., B S. (Industrial Management), Carnegie Institute of Technology,
M.B A., New York University; Ph D , University of Pittsburgh

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 Design Sciences*
B S., Arizona State University, M A., University of Notre Dame; Ph D , University of New Mexico

Bustoz, Joaquin (1975) ..... *Professor of Mathematics; Chair Department of Mathematics*
B.A., M.A , Ph D , Arizona State University

Butler, Jay Q. (1972) ..... *Associate Professor of Real Estate*
B.B A., M B A., University of New Mexico, Ph D., University of Washington

Cabianca, William A. (1967) ..... *Professor of Counselor Education, Chair, Department of Counselor Education*
B.Ed., Gonzaga University,
M.Ed , Ph.D., Wash ngton State University

Cadzow, James A (1981) ..... *Professor of Research; Electrical and Computer Engineering*
B S E E , University of Buffalo; M S.E E , State University of New York at Buffalo, Ph D , Cornell Un versity

Cahen, Leonard S. (1979) ..... *Professor of Education*
A B., San Francisco State University; M.Ed , West Texas State College, Ph.D., Stanford University

Cain, Charlotte S (1982) ..... *Instructor of Nursing*
B.S , M.S., Ohio State University

Cale, Timothy S (1981) ..... *Assistant Professor of Engineering*
B S., Arizona State University; Ph D., University of Houston

Callarman, Thomas E. (1980) ..... *Assistant Professor of Management*
B B A , West Texas State University, M.B.A., Arizona State University; Ph D , Purdue Un versity

Calleros, Charles R (1980) ..... *Associate Professor of Law*
B.A., University of California, Santa Cruz; J.D , Univers ty of California Davis

Canright, James E. (1964) ..... *Professor of Botany*
B.A , Miami University; A.M , Ph D , Harvard University

Carleton, Andrew M. (1982) ..... *Assistant Professor of Geography*
B A , M.A , University of Adela de, Australia, Ph D , Univers ty of Colorado, Boulder

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, Holderlinschule, Heidelberg, Vorsemester and
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, Center for 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 Co lege, M A., Oh o Un versity

Carr, Benny M. (1982) ..... *.Associate Professor of Construction*
B.S E., United States M l tary Academy, M S E E , Purdue Un versity

Carrasco, Robert (1980) ..... *....Assistant Professor of Education*
B S , M.A T Cal forn'a State Un versity, Ed M., Harvard University

Carroll, Christina (1966) ..... *.....Professor of Music*

Carroll, James L (1976) ..... *....Associate Professor of Education*
B A , Bethe Co lege, Ph D., Univers ty of Minnesota

Carroll, Kevin K. (1975) ..... *....Assistant Professor of History*
B A , Canis us 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 Sem nary, Ba timore, Ph D , St. Louis University

Case, James L (1969) ..... *...Associate Professor of Speech and Hearing Science*
B S , Weber State Col ege, M.S., Ph D , Univers ty of Utah

Castle, Gordon B. (1962) ..... *.Professor Emeritus of Zoology*
B.A., Wabash Col ege, M A , Ph D., Univers ty of Cal forn a, Berke ey

Cavalliere, William A. (1946) ..... *. Assistant Professor Emeritus of Technology*
B A in Ed , M A n Ed , Arizona State University

Cavender, Gray (1977) ..... *..Assistant Professor of Justice Studies*
B S , J D , Univers ty of Tennessee, M S , Midd e Tennessee State Un versity, Ph.D , F orida State Un vers ty

Cayer, Joseph N. (1980) ..... *.... Professor of Public Affairs*
B A., M P A , Univers ty of Colorado; Ph D , Univers ty of Massachusetts

Cazier, Mont A. (1962) ..... *...Professor Emeritus of Zoology*
B.S , Ph D , University of Californ a, Berke ey

Cesta, John R (1975) ..... *.Associate Professor of Finance*
B S , Capita Univers ty, Columbus, Oh o, M.B A , Ph D , Florida State University

Chalquest, Richard R. (1971) ..... *.... Professor of Agriculture*
B S., D V M., Washington State University, M.S , Ph D , Corne l Un versity

Chandler, Douglas E. (1980) ..... *....Assistant Professor of Zoology*
B S , Univers ty of Rochester; M A , Johns Hopkins School of Medic ne,
Ph D , U n versity of Cal forn a, San Franc sco

Chartier, George M (1970) ..... *...Associate Professor of Psychology*
B.S , Universitv of Illino s, M A , Ph D , Un versity of Oregon

Chasey, Eugene F (1965) ..... *Associate Professor Emeritus of Education*
B S , Northwestern State Col ege, M.A., Colorado State College, Ed D , Un versity of Wyoming

Chassin, Laurie (1977) ..... *. Assistant Professor of Psychology*
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Cheatham, Glenn W. (1975) ..... *Professor of Leisure Studies· Chair, Department of Leisure Studies*
B A , M.S., San Franc sco State University Ph.D., Univers ty of Minnesota

Chen, Stanley S. (1967) ..... *.....Professor of Engineering*
Dipl ma, Ta pei Inst tute of Technology (Ch na); M S , Ohio University Ph D., Univers ty of Wiscons n, Madison

Childers, Bruce K. (1974) ..... *Associate Professor of Administrative Services*
B.B.A , North Texas State Un vers ty, M.B A , J D , Texas Tech Univers ty

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

Chr'stensen, George (1975) ..... *.. Assistant Professor of Architecture*
B Arch , I l nois Institute of Techno ogy

Christiansen, Kent M (1966) ..... *Associate Professor of Education· Director of Student Services*
B S , M S , Br gham Young Un vers ty, Ph D , M chigan State Univers ty

Christine, Ray O (1958) ..... *Associate Professor of Education*
A B , A M , Northern Co orado Un versity, Ed.D , Arizona State Univers ty

Chubrich, Robert E (1971) ..... *...Associate Professor of Speech and Hearing Science*
B A , Grinnell Col ege, M A , Indiana University, Ph D., State U niversity of New York, Bufla o

Church, Kathleen K (1969) ..... *.Professor of Zoology; Chair, Department of Zoology*
B S M A., University of Utah, Ph D , Un versity of Ca ifornia, Berkeley

Churchill, William D. (1966) ..... *Associate Professor of Education; Counselor, University Counseling Service*
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Cialdini, Robert B. (1971) ..... *Professor of Psychology*
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Clark, Geoffrey A. (1971) ..... *Professor of Anthropology*
B.A., M.A., University of Arizona; Ph.D., University of Chicago

Clark, William Dennis (1976) ..... *Assistant Professor of Botany*
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Cleary, Edward W. (1967) ..... *Professor Emeritus of Law*
A.B., Illinois College; J.D., University of Illinois; J.S.D., Yale University

Clothier, Ronald R. (1955) ..... *Associate Professor Emeritus of Zoology*
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Cluff, Gordon L. (1963) ..... *Professor of Speech and Hearing Science*
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Cmich, Dianne E. (1981) ..... *Assistant Professor of Health Science*
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Cobas, José A. (1975) ..... *Associate Professor of Sociology*
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Cochran, Douglas L. (1968) ..... *Associate Professor Emeritus of Management*
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Cochran, John A. (1962) ..... *Professor of Economics*
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Coghlan, William A. (1982) ..... *Associate Professor of Engineering*
B.S., Montana School of Mines; M.S., Ph.D., Stanford University

Cohen, David (1967) ..... *Professor of Music*
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Cohen, Herbert G. (1977) ..... *Assistant Professor of Education*
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Cohn, Sanford J. (1979) ..... *Assistant Professor of Education*
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Colby, Arthur L. (1965) ..... *Assistant Professor of English*
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Cole, Gerald A. (1958) ..... *Professor Emeritus of Zoology*
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Collins, James P. (1975) ..... *Associate 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*
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Comfort, Joseph R. (1981) ..... *Associate Professor of Physics*
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Conlin, David A. (1948) ..... *Professor Emeritus of English*
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Connell, Constance C. (1975) ..... *Assistant Professor of Nursing*
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Cook, Jeffrey (1961) ..... *Professor of Planning*
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Cook, Suzanne M. (1974) ..... *Associate Professor of Management*
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Cooperrider, Neil K. (1973) ..... *Professor of Engineering*
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Corbin, Charles B. (1982) ..... *Professor of Physical Education*
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Corder, Brice W. (1971) ..... *Professor of Health Science, Assistant Dean, Pre Health Professions, College of Liberal Arts*
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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 Wiscons n, Mad'son

Coudroglou, Aliki (1971) ..... *Associate Professor of Social Work*
B.A., Col ege of St. Bened ct, 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 Inst tute of Technology

Cox, Steven R. (1970) ..... *Associate Professor of Economics*
B S., Univers ty of Wiscons n, 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 Univers ty

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 Univers ty, 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 Sc), Ph.D , University of Pittsburgh

Creighton, Judith M. (1967) ..... *Assistant Professor of Home Economics*
B S , University of Ar zona; M.S., M C , Arizona State University

Croft, Lee B (1973) ..... *Associate Professor of Russian*
B S , Arizona State University, M.A., Univers ty of Arizona; Ph D , Cornell University

Cronin, John R. (1966) ..... *Professor of Chemistry*
B A., College of Wooster; Ph D , University of Colorado

Cross, James C (1983) ..... *Assistant Professor of Marketing*
B S., M B.A , University of Minnesota

Crouch, Beulah (1953) ..... *Assistant Professor Emeritus of Education*
B A in Ed , M A in Ed., Arizona State Un versity

Crowder, Troy F. (1970) ..... *Associate Professor of Journalism and Telecommunication; Special Assistant to the President*
B.A , University of South Dakota, M.A , University of Iowa

Crowe, Barbara J. (1981) ..... *Assistant Professor of Music*
B M , M M., Michigan State Univers ty

Cummings, Lawrence T. (1970) ..... *Associate Professor of Counselor Education; Director, University Counseling Service*
B A , M.A., Arizona State University;
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 , Columb a University; Ed.D , Indiana Univers ty

Dagger, Richard K. (1976) ..... *Assistant Professor of Political Science*
B.A., Un versity of Missouri, Ph.D., University of Minnesota

Dahl, Richard C. (1966) ..... *Professor of Law*
B.A., B L S , Un versity of California, LL B , Catholic University

Daley, Michael J. (1978) ..... *Professor of Social Work*
B S , Spring Hill College; M.S W , St Lou's University, M.S , University of P'ttsburgh; 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

Dandoy, Suzanne (1975) ..... *Professor of Health Services Administration*
B.A., M.D , M.P.H., University of California, Los Angeles

D'Andrea, Frank L. (1972) ..... *Associate Professor Emeritus of Music*
B.A., M.A , Ed.D., Columbia University

Daneke, Gregory A (1982)..... *Associate Professor of Public Affairs*
A A , San Bern rd no Valley Colleg, B.A., M.A., Brigham Young Univers ty, Ph D , Univers ty of Ca ifornia, Santa Barbara

D'Angelo, Frank J (1970)..... *Professor of English*
B.A , L yo a Un vers ty New Orleans, M A , Tu ane Un versity, Ph D , University of Nebraska, Linco n

Daniel, Norman E. 1970)..... *Associate Professor of Transportation*
B S., M S , Un versity of Tennessee, Knoxvi le, Ph D., Ind ana Univers ty

Dannenfeldt, Karl H. (1956)..... *Professor of History*
A B., Va para so University, M A , Indiana Un versity, Ph D , Univers ty of Chicago

Dantico, Marilyn (1978)..... *Assistant Professor of Political Science*
B A., Univers ty of Il nois M A , Ph D , F or da State Un vers ty

Darst, Paul W. (1976)..... *Assistant Professor of Physical Education*
B.S , M.S , Akron University, Ph D , Ohio State Univers ty

Datesman, Susan K. (1979)..... *Assistant Professor of Justice Studies*
B A., Kutztown State Co lege, M A , Ph D., University of De aware

Dauten, Joel J (1960)..... *Professor of Finance*
B.S., M S., Washington Un versity, Ph D , Univers ty of Iowa

Davey, William G (1976)..... *Associate Professor of Communication*
B A., Pennsylvania State University, M A , Co umbia Un versity, Ph D , Indiana University

Davidson, Joseph K. (1973)..... *Professor of Engineering*
B M E , M Sc , Ph D , Ohio State University

Davis, George R. (1980)..... *Associate Professor of Engineering*
B S E E , M S., University of Il nois, Ph D., Univers ty of Arizona

Davis, Joseph M (1975)..... *Associate Professor of Real Estate*
B S Univers ty o South Carolina, M B A., Texas A & I Un versity; Ph D , University of Georgia

Davis, Ke'th (1958)..... *Professor Emeritus of Management*
B B.A., M B A., Un versity of Texas, Ph.D., Ohio State Univers ty

Davis, Robert E. (1959)..... *Professor of Communication*
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Davis, Sanford S. (1953)..... *Professor Emeritus of Counselor Education*
A.B , B S , Central M ssou i State College, A M , Univers ty of M ssouri, Kansas City, Ed D , University of Colorado

Deach, Dorothy F (1967)..... *Professor Emeritus of Physical Education*
B S , M S Un versity of Il nois, Ph D., University of M ch gan

Dean, Arthur G. (1971)..... *Associate Professor of Engineering*
B A M S , Texas Tech Univers ty, Ph D Texas A & M Univers ty

Debenport, Sylvia (1978)..... *Associate Professor of Music*
B M.E , B M , M M Ind ana Univers ty

Decker, John P (1963)..... *Professor Emeritus of Engineering*
B.S., University of Idaho, M A , Ph D , Duke Un versity

DeGraw, Richard (1977)..... *Assistant Professor of Social Work*
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DeGroote, Steven (1981)..... *Assistant Professor of Music*
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Dellheim, Charles J (1980)..... *Assistant Professor of History*
B A , Harpur Co lege M A , Ph D , Ya e Univers ty

DeMars, James R. (1981)..... *Assistant Professor of Music*
B A Maca ester College, M A Ph D , Un vers ty of Minnesota

DeMarsche, Katharine Urry (1975)..... *Associate Professor of Art*
B A , M I s Co ege M F A University f C orado

DeMassa, Thomas A (1966)..... *Professor of Engineering*
B S E E , M S E E Ph D Univers ty of M ch gan

de Matties, Nicholas (1974)..... *Associate Professor of Art*
B A , Long Beach St te Un versity, M S I no s Institute of Tec no ogy

Demeke, Howard J. (1962)..... *Associate Professor Emeritus of Education*
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DeSerpa, Allan C (1975)..... *Associate Professor of Economics*
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Dezelsky, Thomas L (1968)..... *Associate Professor of Health Science*
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Dietz, Robert (1977) ..... *Professor of Geology*
B S , M S. Ph.D., Un versity of Il nois

Ditsworth, Richard L (1959).. ..... *Professor of Engineering*
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Dittert, Alfred E Jr (1967) ..... *Professor of Anthropology*
B A , M A Un versity of New Mex co, Ph D , University of Arizona

Doan, Jerry (1979) ..... *Associate Professor of Music*
B.M E., M M , North Texas State Univers ty, D M A , University of Michigan

Doane, Winifred W. (1977) ..... *Professor of Zoology*
B A Hunter Col ege of the City of New York, M S , Un versity of Wisconsin, Ph D , Ya e Univers ty

Dobkin, Will am E (1970) ..... *Professor of Theatre*
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Doeb er, Bettie Anne (1971) ..... *Professor of English*
B A , M A , Duke U n versity, Ph D , Univers ty of W sconsn, Madison

Doeb er, John W. (1970) ..... *Professor of English*
B A , Duke U n versity, M A , Ph D , Un vers ty of Wiscons n, Mad son

Donelson, Kenneth L. (1965) ..... *Professor of English*
B A M A Ph.D , U n versity of owa

Donne ly, Aaron V. (1962) ..... *Professor Emeritus of Engineering*
B S E E M S , Univers ty of Iowa, M A , C umb a University, Ph D , Univers ty of Iowa

Donovan, Jan (1980) ..... *Assistant Professor of Administrative Services*
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Dorman, Michael F (1976) ..... *Professor of Speech and Hearing Science*
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Dorson, Wi iam J. (1966) ..... *Professor of Engineering*
B Ch E , M Ch E , Rensse aer Polytechn c Inst tute, Ph D , Univers ty of Cincinnati

Douglas, Joan S. (1980) ..... *Assistant Professor of Nursing*
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Down ng, George D. Jr (1964) ..... *Professor Emeritus of Marketing*
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Drake, Jackson M (1974) ..... *Assistant Professor of Education*
B S M S Southern Il no s Un versity, *Director of Arizona Educational Information System,*
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Dresskell, Nadine (1946) ..... *Professor of Music*
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Driscoll, Michae F (1971) ..... *Associate Professor of Mathematics*
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Dubie, Norman (1978) ..... *Associate Professor of English*
B A , Goddard Col ege, M F A , Univers ty of Iowa

Dudek, Leona M. (1960) ..... *Assistant Professor Emeritus of Education*
B Ed , Nationa College of Educat on, M A in Ed , Arizona State Un versity

Duffy, Dennis M (1977) ..... *Associate Professor of Engineering*
B S , M S., Ph D , U n versity of Ariz na

Duncan, William A. (1980) ..... *Assistant Professor of Accounting*
B S , P rt and State University, Ph D , U niversity of Texas; C P A , Texas

Dundas, Mary Jane (1975) ..... *Associate Professor of Administrative Services*
B A , Ca fornia State Univers ty, Long Beach, J D , Loyola Univers ty, Los Ange es

Durrenberger, Robert W (1971) ..... *Professor Emeritus of Geography*
B S , Moorhead State Col ege, B S , California Inst tute of Technology, M S , Un versity of Wisconsin, Mad son;
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Dycus, Augustus M. (1959) ..... *Associate Professor Emeritus of Botany*
B S , Akron University; Ph D , Cor e l University

Eck, Roger D. (1970) ..... *Professor of Quantitative Systems*
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Eckert, Thomas W (1971) ..... *Associate Professor of Art*
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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*
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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*
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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, Berke ey

Ekmanis, Rolf (1963) ..... *Professor of Russian*
B.A., M A , University of Wisconsin, Mad son, Ph D., Indiana Univers ty

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; General Manager, KAET TV*
B A., Arizona State University M A , Case Western Reserve University

Ellison, Geraldine C. (1981) ..... *Assistant Professor of Nursing*
B.S.N , Berea College, M S N , Vanderbi t University

Ellman, Ira Mark (1978) ..... *Professor of Law*
B.A , Reed College, M A., University of Illino s, 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 Univers ty, M. Arch , Ya e University

Ellsworth, Lola M (1938) ..... *Professor Emeritus of Home Economics*
B.S , Brigham Young Univers ty, M A , Columb a University

Elmore, James W. (1949) ..... *Professor of Planning· Chair, Department of Planning*
A.B., University of Nebraska, M S n Arch , Co umbia Univers ty

Emery, Raymond C. (1962) ..... *Associate Professor Emeritus of English*
B.A , M A., University of Wyoming, Ed D , Stanford University

Engel, Glorianne (1982) ..... *Assistant Professor of Theatre*
B.F.A , University of Arizona; M A , Ph D , University of P ttsburgh

Engelhardt, Florence P. (1965) ..... *Associate Professor of Social Work*
B A., College of Mount Saint Vincent, M.S.S , Fordham Univers ty

Engelhardt, Jon M. (1972) ..... *Professor of Education; Chair Elementary Education*
B.A , M A , Arizona State University; Ph D , Un versity of Texas, Austin

English, William S. (1962) ..... *Professor of Music*
B.M , Washburn Un versity, M.A., Ph D , George Peabody Co lege

Eribes, Richard A. (1976) ..... *Associate Professor of Public Affairs; Director, Research and Publications*
B Arch , M.Arch , Ph D., University of Southern California

Erno, Richard B. (1957 62; 1963) ..... *Professor of English*
B A., Michigan State University, M A Univers ty of Denver; Ph.D., University of Minnesota

Esquer, Cecilia D (1981) ..... *Assistant Professor of Administrative Services*
B A., M A , J D , Arizona State University

Esquerra, Ronald L. (1982) ..... *Assistant Professor of Quantitative Systems*
B S , Brigham Young Un vers ty, M B A Arizona State Un vers ty, Ph D , University of Arizona

Evans, Donovan L (1966) ..... *Professor of Engineering*
B.S M E , University of Cinc nnat', Ph D , Northwestern University

Evans, John X. (1964) ..... *Professor of English*
B.A., Holy Cross College; M.A., Ph D , Yale University

Eveland, Charles L (1974)..... *Professor of Health Services Administration; Director, Center for Health Services Administration*
B S Un vers ty of Maryland;
M H.A , Baylor Univers ty Ph D , Un versity of M ch gan

Eyring, LeRoy (1961) ..... *Professor of Chemistry*
B S , University of Arizona, Ph D University of Cal forn a, Berke ey

Faas, Larry A (1967) ..... *Professor of Education*
B S , Iowa State Univers ty, M A , Colorado State Co lege, Ed D., Utah State Un versity

Faeth, Stanley H. (1980) ..... *Assistant Professor of Zoology*
B S , M S., Un versity of C ncinnat Ph D , F orida State Univers ty

Faith, Roger L (1981)... ..... *Associate Professor of Economics*
B A , St Mary s Co lege of Ca forn a, M A Ph D Un versity of Cal fornia, Los Ange es

Fa tz, Leonard M (1979) ..... *Assistant Professor of English*
B.S , C ty College of New York, M A Harvard Un vers ty, Ph.D , Un versity of California, Berke ey

Farber, Bernard (1971).. ..... *Professor of Sociology*
A B , Roosevelt University; A M Ph D , U n vers ty of Ch cago

Farmer, Frank D (1970).. ..... *Associate Professor of Mathematics*
B A , M A , University of Ca ifornia, R verside Ph D nivers ty of Wash ngton

Farness, Sherly F (1969)..... ..... *Assistant Professor of Art*
B A , M A , M chigan State Un versity

Farrar, Roger D (1974) ..... *Associate Professor of Education*
B.A , M S , Kearney State Co lege, Ed.D., U n versity of Nebraska

Farris, Martin T. (1957) ..... *Professor of Transportation*
B A M A , Un versity of Montana, Ph.D , Oh o State U nivers ty

Fausel, Donald F. (1969). ..... *Associate Professor of Social Work*
A B , S T B , S T L St Mary's Un versity, M S W , Fordham Univers ty D S.W , Co umbia Un vers ty

Fearon, Harold E. (1961) ..... *Professor of Management, Chair, Department of Management*
B S , M B A , Ind ana U niversity, Ph D , Michigan State Univers ty

Fehr, Fred S. (1971) ..... *Associate Professor of Psychology*
B S , University of W sconsn M A , Ph D , Wash ngton Univers ty

Feldhaus, Anne (1981) ..... *Assistant Professor of Religious Studies*
B A , Manhattanvil e College, Ph.D Un vers ty o Pennsy van a

Feldstein, Alan (1970) ..... *Professor of Mathematics*
B.A , Arizona State University; Ph D , U niversity of Ca ifornia Los Ange es

Feller, Carolyn M. (1972) ..... *Assistant Professor of Nursing*
B S N , M S , Ar zona State Univers ty

Fellows, Rush a G (1977) ..... *Assistant Professor of Planning;*
B S , Ar zona State U nivers ty

Fenske, Robert H (1974) ..... *Professor of Education*
B S , M S , Ph D U nivers ty of Wisconsin

Ferraro, Kathleen (1982) ..... *Instructor of Justice Studies*
B.A , Case Western Reserve U n versity, M.A , Ph D , Arizona State Un vers ty

Ferrell, Wilfred A (1959) ..... *Professor of English*
B.A M A , Ph D., U nivers ty of Texas

Ferry, John M (1977) ..... *Associate Professor of Geology*
B S M S , Stanford Univers ty Ph D , Harvard Univers ty

Filsinger, Erik E (1978). ..... *Assistant Professor of Home Economics*
B S , University of Massachusetts, M T S , Drew Un versity, M A , Ph D , Pennsy vania State Un versity

Finch, A Joyce (1965) ..... *Assistant Professor of Nursing*
B S N , Augustana Col ege, M S , Un vers ty f Co or ado

Finer, Neal (1977)..... ..... *Associate Professor of Education*
B A , Un vers ty o Houston, M A , Mex co C ty Co ege (University f the Amer cas), Ph D , University of Texas, Austin

Fink, Raymond R. (1958) ..... *Professor of Art*
B A F , Schoo of the Art Inst tute of Chicago, M S A E , I l n s Inst tute of Technology

Firestone, Melvin M. (1968) ..... *Associate Professor of Anthropology*
B A , U nivers ty of New Mexico, M A , Ph D , Un vers ty of Washington

Fisher, Marvin M. (1958) ..... *Professor of English*
A B., A.M , Wayne University; Ph D , University of Minnesota

Fisher, Stuart G (1976) ..... *Associate Professor of Zoology*
B.S., M.A , Wake Forest College, Ph.D , Dartmouth College

Fitch, Gregory W. (1974) ..... *Associate Professor of Philosophy*
B A., Western Washington State College, M A., Ph.D., University of Massachusetts, Amherst

Flaherty, Richard E. (1978) ..... *Professor of Accounting*
B.A., M S , Ph D., University of Kansas; C.P.A., Kansas

Fleig, Bernard M. (1982) ..... *Assistant Professor of Aerospace Studies*
B A., Bloomfield College, M.S , Boston University

Fleming, Robert C. (1974) ..... *Associate Professor of Music; Assistant Director of Bands*
B.S , Indiana University of Pennsylvania; M.F.A , Carnegie Mellon Un versity, Ph.D., Southern Illinois University

Fletcher, Grant (1956) ..... *Professor Emeritus of Music*
B.M , Il nois Wesleyan University; M.M., Univers ty of Michigan; Ph D , Eastman School, University of Rochester

Fletcher, Ian (1982) ..... *Professor of English*
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Flores, Barbara (1980) ..... *Assistant Professor of Education*
B A., California State University, Hayward, M.A., Californ a State University, Sacramento,
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Florschuetz, Leon W. (1964) ..... *Professor of Engineering*
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Flynn, George A. (1980) ..... *Associate Professor of Journalism and Telecommunication*
B.A., University of Miami; M.A , Florida Atlantic Univers ty A B D , North Texas State Un vers'ty, Ph.D., North
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Flys, Michael J. (1975) ..... *Professor of Spanish*
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Foard, James H. (1977) ..... *Assistant Professor of Religious Studies*
B A , College of Wooster, A M., Ph D , Stanford University

Foster, Brian L. (1980) ..... *Associate Professor of Anthropology, Chair, Department of Anthropology*
B A , Northern I linois Un versity, A M , Ph.D., University of Michigan

Foster, David W (1966) ..... *Professor of Spanish*
B A., M.A., Ph.D , University of Washington

Fouquette, Martin J Jr. (1965) ..... *Associate Professor of Zoology*
B A., M A., Ph.D., University of Texas

Fox, Lynn S. (1977) ..... *Instructor of Nursing*
B.A , Gustavus Adolphus College, M S , Boston University

Frasier, James E (1963) ..... *Professor of Education*
B.A., University of Northern Colorado, M.A., University of Michigan, Ed D , Un versity of Northern Colorado

Frazier, Robert C. (1973) ..... *Associate Professor Education*
B.M E , Kansas City Conservatory of Music, M M , University of Denver, Ph D , Arizona State University

Freund, John E. (1957) ..... *Professor Emeritus of Mathematics*
B.A , M A , University of California, Los Angeles, Ph D , University of Pittsburgh

Friedman, Edward (1977) ..... *Associate Professor of Spanish*
B.A., Univers ty of Virginia, M A , Ph D , Johns Hopkins University

Fritzemeyer, Joe R. (1973) ..... *Professor of Accounting*
B.B A., Baylor University, M B.A., D.B.A , Indiana University; C P A., Texas

Fronske, Jeanne Otis (1975) ..... *Assistant Professor of Art*
B A , DePauw University, B F.A., Denison University; M F.A , Ohio State Univers ty

Frost, Melvin Jesse (1965) ..... *Assistant Professor of Geography*
B S , Arizona State Un versity; M S , Brigham Young Univers ty, Ph D , Univers ty of Florida

Fry, Harold (1958) ..... *Associate Professor Emeritus of Engineering*
B.S , Colorado State University; M.E , University of Wyoming; M.S., University of Colorado

Fry, Maurine A (1967) ..... *Professor of Education*
B.S., M.A , Univers ty of South Dakota,
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Fuchs, Jacob (1951) ..... *Professor of Chemistry*
B.A , New York University; M S , Ph.D , University of Illinois *Director, Instruments Laboratory*

Fullerton, Bill J. (1958) ..... *Professor of Education*
B S , Northwestern State College, Ed.M , D Ed , University of Oklahoma

Full'nwider, S. Pendleton (1967). ..... *.Associate Professor of History*
B S. U S Naval Academy, M S , Ph D , University of W sconsin, Madison

Furnish, Da e B (1970)..... *..Professor of Law*
B A., Grinnel Co lege, J D , Un versity of Iowa, LL M., Un versity of Michigan

Gaffney, Philip D (1957) ..... *. Professor Emeritus of Education*
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Gaines, Sylvia W. (1972)... .... *.Associate Professor of Anthropology*
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Gale, Betty J. (1982) ..... *Instructor of Nursing*
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Gallinger, George W (1977)..... *.....Assistant Professor of Finance*
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Garcia, Eugene E. (1980) .. *...Professor of Education, Director, Center for Bilingual/Bicultural Education*
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Garrity, Marjorie L (1975) . *Assistant Professor of Nursing*
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Gasowski, Raymond E. (1971)..... *...Professor of Art*
B S.D., University of M ch gan; M F A , Univers tv of Wash ngton

Gereboff, Joel (1978)... *.....Assistant Professor of Religious Studies*
B A , New York University Ph D , Brown Univers ty

Gerking, Shelby D. (1974)..... *.Professor of Zoology*
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Gerlach, Vernon S. (1963) ... *..Professor of Education*
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Gibbs, Norman E (1981)..... *Professor of Computer Science*
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Gieschen, Donald W. (1959) .. *.Associate Professor of Philosophy*
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Giffin, Frederick C. (1967)..... *.Professor of History; Chair, Department of History*
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Gilbert, Michael W. (1981)..... *.....Senior Instructor, Sergeant First Class, Military Science*

Gill, George A (1966)... *Assistant Professor of Education*
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Gill, James D (1981) ..... *....Assistant Professor of Marketing*
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Gillingwater, Denis (1973) ..... *.Associate Professor of Art*
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Gilsdorf, Jeanette W. (1979).. ... *Assistant Professor of Administrative Services*
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Gisolo, Margaret (1954).. *.....Professor Emeritus of Dance*
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Glaunsinger, Wil iam S. (1972)..... *.Professor of Chemistry*
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Gold, Victor J (1980)..... *..Associate Professor of Law*
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Goldstein, Elliott S. (1974).. *.....Associate Professor of Zoology*
B S., Un versity of Hartford, M S., Ph D , University of Minnesota

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B S , M A , Ph D , Univers ty of Cal fornia, Los Ange es

Golubitsky, Martin (1979) ..... *... Professor of Mathematics*
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B.A , Southwest Texas State University, M Ed., Stephen F. Austin State Un'versity, Ph D , Pennsy vania State University

Goo, Benjamin (1955)... .. ..*Professor of Art*
B F.A., Un vers ty of Iowa, M F A , Cranbrook Academy of Art

Gooding, Elmer R. (1967).....*Professor of Economics; Assistant Vice President for Academic Affairs*
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Gordon, Leonard (1967) .... *Professor of Sociology; Chair, Department of Sociology*
B A , Wayne State Univers tv A M , Universitv of Michigan, Ph D , Wayne State Universitv

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Goyer, Robert S (1981) ....*Professor of Communication, Chair, Department of Communication*
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Grace, Edward E. (1963)..... ....*Professor of Mathematics*
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Graf, William L. (1978) .. ..*Associate Professor of Geography · Director, Center for Southwest Studies*
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Graham, Denny L. (1974) ....*Associate Professor of Technology*
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Grant, Richard E. (1980). .... *Assistant Professor of Nursing*
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Greeley, Ronald (1977)... .... *Professor of Geology*
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Green, Gary I (1980)..... .... *Assistant Professor of Quantitative Systems*
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Greene, Jeffrey, Captain (1980).. ... . *Assistant Professor of Military Science*
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A.B., Welles ey Col ege, M A T , Radcliffe Co lege, M A , University of Massachusetts, Ph.D , University of New Mex co

Greeneich, Edwin W (1982).. .... *Associate Professor of Engineering*
A A., Diablo Va ley Co lege B S.E.E , M S E E , Ph D , Universitv of Cal forn a, Berkeley

Greey, George W. (1969) .. .. *Professor of Leisure Studies*
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Gregory, David (1979)..... ... . *Assistant Professor of Dance*
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Grobe, Edwin P. (1957) . ... *Professor of French*
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Guntermann, Gail (1977) ..... *Associate Professor of Spanish*
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Haring, Marilyn J. (1980) ... . *Assistant Professor of Counselor Education*
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Harris, Jerry D (1972) . .. . *Associate Professor of Education*
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Harris, Joseph (1963) .. .. *Professor of Chemistry; Associate Chair, Department of Chemistry*
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Harris, Mark (1980) .... *Professor of English*
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Harris, Walter (1980). .. .. *Assistant Professor of Music*
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Hartwell, L. Kay (1975) ... ... *Associate Professor of Education*
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B D , Garrett Bibl cal Inst tute; B A , Northwestern Un versity,
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Hasbrouck, Frank F. (1962) ... ... *Associate Professor of Zoology*
B A., Ph D , University of Il nos

Hassan, Ahmed A. (1981) .... *Assistant Professor of Engineering*
B Sc , M Sc., University of Ca ro, Ph D., Un versity of Ar zona

Hassett, Matthew J. (1966) ... .*Associate Professor of Mathematics*
B A., Fordham University, M S , Ph D , Rutgers, The State Un versity

Hastings, Vernon L. (1973) ..... *Professor of Construction; Director, Division of Construction*
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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 Pschology*
B.S , Univers ty of Illinois, Urbana, M.S., Ph.D., University of Utah

Haynes, Peter (1975) ..... *Professor in Center for the Study of Justice*
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Hazel, Jeffrey R. (1975) ..... *Associate Professor of Zoology*
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Heier, William D. (1966) ..... *Professor of Management*
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Heimann, Robert A. (1952) ..... *Professor of Counselor Education*
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Heller, Jules (1976) ..... *Professor of Art; Dean, College of Fine Arts*
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Helms, Loyce Randel (1976) ..... *Associate Professor of English*
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Helmstadter, G. C. (1959) ..... *Professor of Education*
B S., M S , Iowa State Un versity, Ph.D., Univers ty 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) ..... *Professor of Finance*
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Hendrickson, Lester E. (1968) ..... *Associate Professor of Engineering*
B S , M S , Michigan Technological Un versity, Ph D , University of Illinois

Hendrickson, William L. (1976) ..... *Associate Professor of French*
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Henkel, Ray (1966) ..... *Assistant Professor of Geography*
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Hennington, Jo Ann (1975) ..... *Associate Professor of Administrative Services; Assistant Dean, College of Business Administration*
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Henry, Nicholas L. (1975) ..... *Professor of Public Affairs; Dean College of Public Programs*
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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*
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Herman, George R. (1956) ..... *Associate Professor of English*
B S M A , University of Kansas

Hernandez, Armand P. (1974) ..... *Associate Professor of Justice Studies*
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Herrero, Domingo (1981) ..... *Associate Professor of Mathematics*
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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*
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Hestenes, David O (1966) ..... *Professor of Physics*
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Higgins, Norman C. (1968) ..... *Professor of Education; Chair, Department of Educational Technology and Library Science*
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Higgins, Thomas Ernest (1977) ..... *Associate 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 Co lege, M S , Ph D , University of Arizona

Hill, Bernard (1966) ..... *Associate Professor of Social Work*
B S S , C ty College of New York, M S.W , Tulane University

Hines, Harold C. (1952) ..... *Professor Emeritus of Music*
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Hink, Heinz R. (1958) ..... *Professor of Political Science*
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B.Sc., University of Wales, M.S E., M.A., Ph.D., Princeton University

Hinshaw, Donald A. (1966) ..... *Associate Professor of Architecture*
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Hirata, Ernest T. (1974) ..... *Associate Professor of Technology*
B.A , San Diego State College, Ed.D., Arizona State Univers ty

Hirleman, Edwin D. Jr. (1977) ..... *Associate 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*
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Hoffer, Warren W. (1972) ..... *Associate Professor of Music*
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Hoffman, Dennis L. (1979) ..... *Assistant Professor of Economics*
B S., Grand Valley State Colleges, M.A., Ph D , Michigan State University

Hoffmeister, J. Ronald (1983) ..... *Assistant Professor of Finance*
B S., Milliken University; M S , Ph D., University of Illinois

Hogan, Timothy D. (1970) ..... *Associate Professor of Economics*
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Holloway, John R. (1969) ..... *Professor of Chemistry and Geology*
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Holmes, Jack E. (1972) ..... *Professor Emeritus of Political Science*
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Homa, Donald L. (1975) ..... *Associate Professor of Psychology*
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Hoover, Eric John (1977) ..... *Professor of Music*
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Hoover, Helene M. (1957) ..... *Professor of Home Economics, Chair Department of Home Economics*
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Hoover, Kenneth H. (1956) ..... *Professor of Education*
B S., M.A , Lou siana State University, Ed.D., Univers ty of Washington

Hopper, Michael, Captain (1980) ..... *Assistant Professor of Military Science*
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Hoult, Thomas Ford (1964) ..... *Professor of Sociology*
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Howell, Kenneth W. (1976) ..... *Associate Professor of Education, Chair, Department of Special Education*
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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

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Hoy, Frank P. (1978) ..... *Associate Professor of Journalism and Telecommunication*
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Hubbard, Paul G. (1950) ..... *Professor of History; Associate Dean, College of Liberal Arts*
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Humphrey, Ted (1966) . .. .*Associate Professor of Philosophy*
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Hunn'cutt, Harold B. (1962) ..... .*Professor of Education, Assistant Academic Vice President for Research, Director, Grants and Contracts*
B S , Ed M , Ed.D., Un vers ty of Ok ahoma
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Hurston, Clifford J. 197S) . ...*Assistant Professor of Administrative Services*
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Huston, Gera d D. (1962).. .... *Associate Professor of Quantitative Systems*
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Ihrig, Edw n (1979) . ...*Associate Professor of Mathematics*
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Imdieke, LeRoy F. (1968). ... ...*Professor of Accounting*
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Inman, Thomas H (1975) ... . *Professor of Administrative Services*
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Jacobson, Arthur (1956) . .. . *Professor of Art*
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B.A., Amherst College, M.A , University of Michigan; Ph D , University of Minnesota

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., Un versity of Texas, C.P.A., Texas

Johnson, J. David (1982) ..... *Assistant Professor of Communication*
B.S., M.A., Ph.D., Michigan State University

Johnson, John M. (1972) ..... *Associate Professor; Associate Director, Center for the Study of Justice*
B.A., Indiana University; M.A , San D ego State College, Ph D , University of California, San Diego

Johnson, Rosemary (1959) ..... *Professor of Nursing*
B.S., M.P.H., University of M nnesota

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, Ruth (1969) ..... *Professor of Political Science*
B.S., Indiana State University, M.A., Ph.D., Georgetown University

Jones, Marion K. (1970) ..... *Associate Professor of Dance*
B A., Wayne State University; M.A., Arizona State University

Jorquez, James S. (1980) ..... *Assistant Professor of Social Work*
B A , M.S.W., California State University; D.S W., University of California

Judd, B. Ira (1937) ..... *Professor Emeritus of Agriculture*
B.S., M S., Utah State University; Ph.D., University of Nebraska, Lincoln

Jurik, Nancy (1981) ..... *Assistant Professor of Justice Studies*
B.A., M.A , Southern Methodist University; Ph.D., University of Californ a, Los Angeles, N I M.H Postdoctoral Training Program in Mental Health Evaluation Research

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*
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Kadell, Kevin (1981) ..... *Assistant Professor of Mathematics*
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Kader, David (1979) ..... *Professor of Law; Associate Dean, College of Law*
B A , Calif rnia State Univers ty Fresno, J D , Univers ty of Wash ngton, LL M , Un versity of London

Kagy, Virginia L (1947) ..... *...Professor Emeritus of Home Economics*
B A , Drake Univers ty, M S , Iowa State Un versity, Ph D Johns Hopk ns Un versity

Kahn, B W nston (1966) ..... *.....Associate Professor of History*
B A , Nat onal Ta wan Univers ty (Ch na , M A , U niversity of M nnesota; Ph D , University of Pennsylvan a

Kahn, Herman (1981) ..... *..Goldwater Chair Public Affairs*
B A , U vers ty of Ca ifornia M A , Ca ifornia Inst tute of Technology

Ka da, Tamarra 1980) ..... *Assistant Professor of Art*
B A , G ddard C eee, M F A , State Un vers ty of New York at Buffalo

Ka kawa, William M (1937) ..... *.Associate Professor Emeritus of Physical Education*
B A , M A , Ar z na State University

Kam ns, Martin P (970) ..... *...Associate Professor of Education*
B Ed , Un vers ty f Miami, M.S , Flor da State University, Ed D. Wayne State Un vers ty

Kam nsky, 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 Un vers ty f Wiscons n M S E E , Univers ty of New Mex co, Ph D , Un versity of Wisconsin, Madison

Kaplan, Steve 1981) ..... *.Assistant Professor of Accounting*
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Karasz, Lawrence 1981). ..... *..Assistant Professor of Theatre*
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Kar ala, Dennis S. (1978) ..... *...Professor of Law*
B S E , Pr nceton Univers ty, Ph D , M S Univers ty of I l nois, J.D Un versity of Cal fornia, Berkeley

Karnes, Thomas L (1968) ..... *...Professor of History*
A B , C orado Un versity, A.M , Ph D , Stanford Univers ty

Karnig, A bert K. (1978) ..... *.Professor of Publi Affairs, Director, Center for Public Affairs*
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Karoly, Paul (1982) ..... *Professor of Psychology, Director, Clinical Training*
B A , City Col ege of New York, Ph D Un versity of Rochester

Kastenbaum, Beatr ce (1982). ..... *.Instructor of Nursing*
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A A , East Los Angeles Co lege, *Director, Adult Development and Aging Program*
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Kaufman, Lucile B (951). ..... *Assistant Professor Emeritus of Engineering*
B S M E , M S Un vers ty of Co orad

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A B , M A , Ph D , Un versity of Ca forn a Berke ey

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Kearney, James R. III (1968) ..... *Associate Professor of History*
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Keck, Char es H , Colonel (1980) ..... *Professor of Aerospace Studies·*
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Kehl, De mar G (1965) ..... *..Professor of English*
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Keim, Robert T (1979 ..... *...Assistant Professor of Quantitative Systems*
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Keith, Marlow F. (1946).. . . . .*Assistant Professor Emeritus of Technology*
B.A. in Ed., M A n Ed , Arizona State Un vers ty
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B.Ed , M Ed , Ed. Spec , University of To edo
Kelley, Donald G. (1980)..... .... *Assistant Professor of Technology*
B S., M S , Arizona State University
Kelly, John B. (1962)..... .... *Professor of Mathematics*
B A , Columb a University, Ph D , Massachusetts Institute of Techno gy
Kelly, Richard W (1965).. .... *Professor of Engineering,*
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Kiesow, Milton A. (1957). .. . . *Professor of Education*
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Kingsbury, Warren T. (1964). ... . *Professor Emeritus of Education*
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Kinicki, Angelo J. (1982) ... ... *Assistant Professor of Management*
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Kinsinger, Jack B. (1982)..... . .. .*Vice President for Academic Affairs, Professor of Chemistry*
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Klement, Charles A. (1981) ..... *Assistant Professor of Technology*
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Kliewer, Darleen (1975)..... *Associate Professor of Music*
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Klock, John W. (1960) ..... *Professor of Engineering*
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Klopovic, James, Captain, USAF (1981) ..... *Assistant Professor of Aerospace Studies*
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Knaupp, Jonathan E. (1970) ..... *Associate Professor of Education*
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Knauth, L. Paul (1979) ..... *Professor of Geology; Chair, Department of Geology*
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Kneer, Dan C. (1981)..... *Assistant Professor of Accounting*
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Kniep, Willard M (1975) ..... *Associate Professor of Education*
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Knight, Donald O. (1982)..... *Associate Professor of Engineering*
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Knight, Leland W. (1978)..... *Associate Professor of Design Sciences*
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Knowlton, John F. (1964) ..... *Associate Professor of Spanish*
B A., Lewis and C ark College, M A., Ph.D , Univers ty 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)..... *Associate Professor of Nursing*
B S , University of Arizona, M.S , Un versity of Colorado

Koonce, Frank W. (1978)..... *Assistant Professor of Music*
B.M , North Carolina School of the Arts; M M., Southern Methodist University

Kotrozo, Carol A. (1972)..... *Associate Professor of Art*
B A., Pomona College, M A., Ph.D , University of California, Los Angeles

Kozacik, Dorothy Piercey (1968). ..... *Professor Emeritus of Education Secondary Education*
B A , College of St. Francis, M.A , Arizona State University; Ph.D , University of Arizona

Krahenbuhl, Gary S. (1973).. ..... *Professor of Physical Education; Chair, Department of Health and Physical Education*
B S , M.S., Northern Illinois University, Ed.D University of Northern Colorado

Krause, Stephen J. (1981)..... *Assistant Professor of Engineering*
B S , Northwestern University, M.S., Ill nois Institute of Technology, Ph.D., University of Michigan

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 'n Ed , Un versity of Illinois; M A , Claremont Graduate School; Ph.D , University of Illinois

Krinsley, David (1976)..... *Professor of Geology*
Ph.B , S B , S.M Ph D., University of Chicago

Krivanek, Ondrej (1980)..... *Assistant Professor, Solid State Science; Associate Director, HREM Facility, Physics*
B Sc , Leeds University, Ph D , Cambridge University

Kroelinger, Michael D. (1980).... *Associate Professor of Design Sciences; Assistant Dean, College of Architecture*
B.S., University of Alabama, M S., Ph D , Univers ty of Tennessee

Kronengold, Eric A. (1970)..... *Associate Professor of Art*
B A., M A , San Franc sco 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)..... *Associate Professor of Finance*
B S.M E , Pennsylvan a State Un versity, 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., Univers ty of W sconsin, Mi waukee, M.S (Physics), M A (Math),
Ph D , Un vers ty of W scons n, Madison

Kulhavy, Raymond W. (1971). ... *Professor of Education*
A B., M A , Ca ifornia State College, San Diego, Ph D Un versity of I l nois

Kupka, Timothy J (1979) ... *Assistant Professor of Theatre*
B S , St. Cloud State University, M F A Un versity of Iowa

Kur, C. Edward (1978). ... *Assistant Professor of Management*
B S., M S , Un versity of Missouri

Kurth, Chestine L. (1974) ... *Assistant Professor of Nursing*
B S N , University of Kansas; M.S.N , Un versity of Cal forn a, San Franc sco

Kurtz, Lynn C. (1967) ... *Associate Professor of Mathematics*
B.S., South Dakota Schoo of M nes and Technol gy, M S Ph D , n versity of Utah

Kyrala, Ali (1960 62; 1964) ... *Professor of Phys ics*
B S , Massachusetts Institute of Techno ogy M S , Stanford Univers ty, S M , Harvard University,
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Ladman, Jerry R. (1967) ... *Professor of Economics, Director, Center for Latin American Studies*
B S , Ph D , Iowa State Univers ty

Laetz, Hans G. (1964) ... *Assistant Professor of German*
A B., Univers ty of Cal fornia, Berkeley, A.M , Ph D Stanfo d University

Lafford, Barbara ... *Assistant Professor of Spanish*
B.A., Middlebury Col ege, Vern ont, M A Cornel University

Lai, Richard T. (1973) ... *Asso iate Professor of Planning*
A B , M.F A in Arch , Princeton University, Ph D., University of Pennsy van a

Lake, Robert L. (1958) ... *Assistant Professor of Mathematics*
B S , South Dakota Schoo of M nes and Techno ogy, M A , A izona State Univers ty

Lamberts, Jacob J. (1960). ... *Professor Emeritus of English*
B.A., Calvin Col ege; M A , Ph.D., Univers ty of Michigan

Lamm, Robert C (1959) ... *Professor of Education*
B M., Univers ty of Lou svi le, M.M., Un vers ty of Ariz na, Ph D , Indiana Un vers ty

LaMontagne, Lynda L (1982) ... *Assistant Professor of Nursing*
A S , Los Angeles City Col ege, B S , Ca ifornia State Un versity, Los Ange es M S , D N.Sc , Un vers ty of Cal fo nia San Franc sco

Lance, Robert E. (1960) ... *Asso iate Professor of Journalism and Tele ommunication*
B S , Kent State Un versity, M S , Northwestern Univers ty

Landeira, Ricardo L (1962) ... *Profess or Emeritus of Spanish*
Bachiller Universitar o Univers dad de Sant ago Spa n), Maestro Nac ona , Escue a N rma de Sant ago Spa n ,
Ph D , Un versity of Colorado

Landers, Daniel M (1981) ... *Professor of Phys ical Education*
B A , San Jose State Co lege; M S. Ph D , Un versity of I no s

Landers, E. James (1960) ... *Professor Emeritus of Zoology*
B A , M.S., Un vers ty of Wyom ng Ph D., New York Un vers ty

Laner, Mary R. (1976). ... *Associate Professor of S ciology*
B A , University of Chicago M A , Un vers ty o New Mex co,
Ph D , Virginia Polytechnic Institute and State Univers ty

Lanyon, Richard I. (1975). ... *Professor of Psychology*
B E , University of Ade a de (Austra ia , M A Ph D , Un versity of Iowa

Lape, Jerry V. Lieutenant Colonel (1981) ... *Assistant Professor of Mi itary Science*
B S , U S Military Academy

Larimer, John W (1969) ... *Profe ssor of Geolo gy*
B A , M.S , Ph D , Leh gh University

Larson, George W. (1972) ... *Asso iate Professor of Planning*
B S L A , Utah State Univers ty, M.S L A Un vers ty of W scons n

Lauderdale, Pat (1981) ... *Profe ssor of Justi e Studies*
B A., University of Ok ahoma, M A (Socia Psychology), Un vers ty of Texas, M A (Soci gy Ph D Stanford
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Lawler, Eugene D. (1967) ... *Associate Professor of Engineering Communications*
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Lawson, Anton E. (1977) ..... *Associate Professor of Science Education/Physics*
B S , University of Arizona; M.A., University of Oregon, Ph.D., University of Oklahoma

Leathers, Chester R. (1957)..... ..... *Associate Professor of Microbiology*
B.S , Eastern Illinois University; M.S., Ph D , University of Michigan

Lee, Idelle B. (1962). .. .. *Assistant Professor Emeritus of Education*
B A , University of Wisconsin, M.A., Arizona State University

Lee, Stephen E. (1969)..... .... *Professor of Law*
B A , LL B., University of Minnesota

Lehrer, Leonard (1977)..... ... . *Professor of Art; Director, School of Art*
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Leigh, Frederic A (1979) ....*Assistant Professor of Journalism and Telecommunication*
B.A., University of South Dakota, M.A., University of Iowa

Leonard, Donald J. (1974)..... ... . *Associate Professor of Administrative Services*
B S , M.B.A., Nicholls State Univers ty

Leonard, Philip A. (1968). .... *Professor of Mathematics*
A B , Boston College, M A , Ph.D., Pennsylvania State University

Leshowitz, Barry H. (1970)... ....*Associate Professor of Psychology*
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Leshy, John D. (1980)..... ... . *Professor of Law*
A B , J D , Harvard University

Lessard, Elizabeth C. (1969) ... .*Professor of Dance; Chair, Department of Dance*
B S., Georgia Col ege, 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*
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Levy, Leo B. (1959)... ....*Professor of English*
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Lewis, Joseph Perley (1972)..... ....*Assistant Professor of Administrative Services*
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Lewis, Ronald G. (1981) .... *Professor of Social Work*
B A , Oklahoma Baptist Un'versity, M S W., Our Lady of the Lake Worden, San Antonio; Ph D., University of Denver

Lewis, William E. (1965)..... ... . *Professor of Computer Science; Chair,*
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Leyba, Raul L. (1970)..... ....*Associate Professor of Social Work*
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Lightfoot, Marjorie J. (1964) ....*Professor of English*
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Limbert, Douglas A. (1976) ....*Assistant Professor of Engineering*
S B , S M., Ph D , Massachusetts Inst tute of Technology

Lin, Sheng H. (1965) ....*Professor of Chemistry*
B S , M S , Nationa Ta wan Un versity (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*
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Lindholm, Ernest (1971) ....*Associate Professor of Psychology*
B.A., University of Cal fornia, Berkeley; M S., Ph D , University of Wisconsin, Madison

Lindner, Herbert E. (1983) .. ..*Assistant Professor of Technology*
B S M E , M.S M E. University of Massachusetts

Lindsay, Stuart M (1978) . . ..*Assistant Professor of Physics*
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Lindstrom, Frederick B. (1953)..... .....*Professor of Sociology; Associate 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*
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Liu, Chui H. (1965) ..... *Professor of Chemistry*
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Liu, Marjory Bong-Ray (1973) ..... *Associate Professor of Philosophy*
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Lockwood, Ralph G. (1972) ..... *Associate Professor of Music*
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Loewenberg, Robert J. (1972) ..... *Associate Professor of History*
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Logan, Earl Jr. (1963) ..... *Professor of Engineering*
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Lohr, Dennis E. (1979) ..... *Assistant Professor of Chemistry*
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LoPresti, Ronald (1964) ..... *Professor of Music*
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Lowenstein, Milton D. (1959) ..... *Professor Emeritus of Planning*
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Lu, Pao (1964) ..... *Professor of Physics*
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Luckingham, Bradford F. (1971) ..... *Associate Professor of History*
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Ludlow, Elizabeth A. (1972) ..... *Assistant Professor of Nursing*
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Lundgren, Harry R. (1962) ..... *Professor of Engineering*
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Lynch, David H (1976). ..... *Associate Professor of Administrative Services*
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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)... ..... *Professor of Music*
B A , Santa Barbara College M.M D M A , University of Southern California
Matenschein, Jane (1981)... ..... *Assistant Professor of Philosophy*
B A , Yale, M.A , Ph D Indiana University
Martin, Michael C. 1979)..... *Associate 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) ..... *Associate 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
Marcus, Melvin G (1974) . . .. *Professor of Geography*
B.A University of Miami, Florida M A University of Colorado Ph D , University of Chicago
Marion, Sheila (1981) . ..... *Assistant Professor of Dance*
B A , M A , University of California Los Angeles
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
Martin, Thomas 1982). ..... *Assistant Professor of Zoology*
B S , Washington State University, M S , South Dakota State University, P D , University of Illinois
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, Mary (1978) ..... *Assistant Professor of Anthropology*
B A University of California , M A , Columbia University, Ph D University of California
Marzke, Robert F (1969) ..... *Associate 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
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
Matt, Pamela (1980 ..... *Instructor of Dance*
A B , University of Washington M A University of Illinois
Matthias, Judson S (1967) .. . . *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

McCafferty, Richard B. (1982) ..... *Assistant Professor of Journalism and Telecommunication*
B A., St. Francis Xavier University (Nova Scotia), M.A., Boston College, M.A., Northwestern University, S.T.L , College of St. Albert (Belgium), Ph D., Northwestern University

McCarter, Joan H. (1961) ..... *Assistant Professor of Mathematics*
B.S., M.A , University of Arizona

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) ..... *Associate Professor of Education*
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McCready, Richard R. (1960) ..... *Professor Emeritus of Quantitative Systems*
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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*
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McGowan, Patrick J. (1979) ..... *Professor of Political Science, Chair, Department of Political Science*
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McGrath, G.D. (1950) ..... *Professor Emeritus of Education*
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McHenry, Albert L. (1978) ..... *Associate Professor of Technology*
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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

McKenzie, Patrick Bruce (1970) ..... *Professor of Accounting*
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McKinley, Sue H. (1982) ..... *Assistant Professor of Accounting*
B.S., Virginia Commonwealth University, M.Acc , Ph.D., Univers ty of Georgia

McKlveen, John W. (1974) ..... *Associate Professor of Engineering*
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McLeod, Lois L. (1976) ..... *Professor of Music*
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McMahon, Douglas (1978) ..... *Associate 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*
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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 Mart n s College, M Ed , Oregon State University; M Ed , Ph.D , University of Oregon

Meister Arnold G (1957)..... *Professor Emeritus of Physics*
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Melichar, Dudley W (1974)..... *Assistant Professor of Justice Studies; Assistant Dean for Student Services, College of Public Programs*
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Melvin, Michael (1980) ..... *Assistant Professor of Economics*
B B.A University of Houston; M A , San D ego State Un versity, Ph D , Univers ty of Cal fornia, Los Ange es

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Mendez, Jose A (1980 ..... *Assistant Professor of Economics*
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Mendleson, Jack (1967) ..... *Associate Professor of Management*
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Menke, Robert F. (1947)..... *Professor of Education, Director, Career Services*
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Merbs, Charles F. (1973) ..... *Professor of Anthropology*
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Metcalf, V Alonzo (1971)..... *Professor of Agriculture*
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Metha, Arlene (1973) ..... *Associate Professor of Education*
B A Arizona State Un versitv, M A , Oh o State Un versity, Ph D , University of Southern Ca ifornia

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 Univers ty, D M A The Jul liard Schoo

Metzger, Darrvl E. (1963)..... *Professor of Engineering, Chair, Mechanical and Aerospace Engineering*
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Meyer, Bonnie J. F (1976) ..... *Associate Professor of Education*
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M chels, LeMoyne F. (1963) ..... *Professor of Construction*
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Miller, Barbara K (1976)..... *Assistant Professor of Nursing*
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Miller, Donald S (1981)..... *Associate Professor of Computer Science*
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Miller, Fred L. (1971) ..... *Professor of Physical Education*
B S Univers ty of the Pac fic, M S , Univers ty of Southern Ca ifornia, P E D., Ind ana University

Miller, Paul T (1947) ..... *Professor Emeritus of Geology*
B A , S mpson Co lege, M.S , Ph D., Univers ty of Iowa

Miller, Peter J. (1972) ..... *Associate Professor of Quantitative Systems*
B S M E., Stanford University, M B A , San Diego State Universitv, D B A , University of Washington

Miller, Victor J (1958)..... *Professor of Agriculture*
B S , M S Ph D , Un versity of Il no s

Miller, Warren (1954 ..... *Professor of Political Science*
B S , M A Un versitv of Oregon, Ph D., Maxwe l School of Citizenship and Pub ic Affairs, Syracuse University

Miller, William Edgar (1966)..... *Associate Professor of Counselor Education; Counselor, University Counseling Service*
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Milner, Joe W. (1967)..... *Professor of Journalism and Telecommunication*
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Milton, Doris A. (1980) ..... *Assistant Professor of Nursing*
B.S N , Fairle gh 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 Emeritus of Technology*
B S.M.E , Purdue University; M S M.E., University of Ar zona

Misner, Robert L. (1975) ..... *Professor of Law*
B.A., University of San Francisco; J D., University of Ch cago

Mitchell, Frederic F. (1961) ..... *Professor of Education*
B.A M.A., University of Arizona, Ph D , Columb a University

Moeller, Therald (1969) ..... *Professor of Chemistry*
B.S , Oregon State College, Ph D , Un versity of Wiscons n, Mad son

Mokwa, Michael P. (1979) ..... *Assistant Professor of Marketing*
B B.A , M B A , Ph D , Univers ty of Houston

Montanari, John R. (1980) ..... *Associate Professor of Management*
B S., University of Dayton, M.B.A , University of New Mex co, D B.A , Un vers ty of Colorado

Monte, Woodrow (1979) ..... *Assistant Professor of Home Economics*
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Montero, Darrel (1979) ..... *Associate Professor of Social Work*
B A , California State Univers ty, M A , Ph D , Univers ty of California

Montiel, Miguel (1974) ..... *Professor of Social Work*
B S , University of Arizona; M S W , Arizona State Un versity, D S.W , University of Cal forn a, Berke ey

Monts, Elizabeth A. (1973) ..... *Professor of Home Economics*
B.S , Eastern Illinois University; M S., University of Wisconsin Ph D , Texas Woman's 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 Univers ty, 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, Center for Meteorite Studies*
B.S., Alfred University; Ph D., Californ a Institute of Techno ogy

Moore, Elsie Gloria Jean (1981) ..... *Assistant Professor of Counselor Education*
B A , Elmhurst College; M.A , Ph.D , Un versity of Ch cago

Moore, J. Douglas (1969) ..... *Associate Professor of Mathematics*
B S , M.S., Idaho State University; Ph D , Syracuse University

Moore, Michael (1982) ..... *Assistant Professor of Zoology*
B A., Indiana University, M S , Ph D , Univers ty of Washington

Moore, Thomas A. (1976) ..... *Associate Professor of Chemistry*
B.A , Ph.D., Texas Tech University

Moorhead, Gregory (1978) ..... *Associate Professor of Management*
B S.I E , M.B A , Ph D., University of Houston

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) ..... *Associate Professor of Insurance*
B.S , New Mexico State University; M S., Colorado State University, Ph D , Georg a 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 , Gr nnell College, M A., University of Nebraska, Omaha; Ph.D., University of Nebraska, Lincoln

Morgan, Miriam J (1965) ..... *Instructor of French*
Licence es Lettres, University of Paris, France; M.A. (French, Spanish), Arizona State University

Morgan, Richard J. (1980) ..... *Associate Professor of Law*
B.A , Un versity of California, Berkeley, J D , University of California, Los Angeles

Moroney, Robert M (1981) ..... *Professor of Social Work*
A B , M.S W , Boston College, M P.H., Harvard University; Ph.D., Brandeis University

Morris, Donald H. (1962) ..... *Professor o 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 Speech and Hearing Science*
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; Executive Vice President*
B S , B.A., M A , University of Arkansas;
Ph.D., University of Texas, Austin

Mumma, Stanley A. (1976) ..... *Professor of Planning*
B S M E., University of Cincinnati; M S., Ph.D., Un versity 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 Un versity

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, Jeffrie G. (1981) ..... *Professor of Philosophy; Chair, Department of Philosophy*
B.A., Johns Hopkins University, Ph D., University of Rochester

Murphy, Juanita F. (1971) ..... *Professor 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) ..... *Associate Professor of Administrative Services*
B.A , Trenton State College; M.A , Rider College; Ed.D., Utah State University

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) ..... *Professor of Justice Studies*
B.A., Lycoming College, M.A., Ph D , American University

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 , Co umbia 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

Nagrin, Daniel (1982) ..... *Professor of Dance*
B S., College of the City of New York

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) ..... *Professor of Botany*
B S , Duke University; M.S , Ph.D , Rutgers, The State Un versity

Navrotsky, Alexandra (1969) ..... *Professor of Chemistry and Geology*
B S , M.S , Ph.D., University of Chicago

Nebeker, Helen E. (1958) ..... *Professor of English; Assistant Chair, Department 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) ..... *Professor of Education, Associate Director, I D Pavne Laboratory*
B.S , Un'versity of Wisconsin, Madison; Ph D , Stanford University

Nelson, G. Lynn (1973) ..... *Assistant Professor of English*
B.A , Kearney State College, Ph D , Un versity of Nebraska, Lincoln

Nelson, Harold D. (1967) ..... *Professor of Engineering*
B.S., South Dakota School of M nes and Technology, M.S , Kansas State Univers ty, Ph D , Ar zona State University

Nelson, Kim L (1982) ..... *Assistant Professor of Engineering*
B.S Microb ology), B S , (Chem cal Engineer ng), Oregon State Univers ty; Ph D., University of De aware

Nelson, J. Russell (1981) ..... *President of the University; Professor of Finance*
B A , Pacific Union College; M B A , Ph.D , University of Cal fornia, Los Ange es

Nelson, John C. (1967) ..... *Associate Professor of Education*
B S , M.A , Arizona State Un versity; Ph D , George Peabody College

Nelson, Vanessa M. (1982) ..... *Instructor of Nursing*
B S N , M S., Arizona State University

Nering, Evar D. (1960) ..... *Professor of Mathematics*
A B , Ind ana University; A.M., Ph D , Princeton Un versity

Ney, James W. (1969) ..... *Professor of English*
B.A , M A., Wheaton Co lege; Ph.D., University of M ch gan

Nichols, Ann W. (1970) ..... *Associate Professor of Social Work*
A.B , Stanford Univers ty; M S W , Co umbia Univers ty

Nichols, Cather'ne G (1952) ..... *Professor Emeritus of Counselor Education*
A B , M.A , University of Kentucky, Ph D , Columbia University

Nichols, Paul S. (1981) ..... *Assistant Professor of Technology*
B S , Pennsv vania State University, B.S., Southern I l nois University Carbondale, M A , Plattsburgh State University, Ph D , Southern I lino s University, Carbondale

Nielsen, Michael J. (1969) ..... *Associate Professor of Design Sciences*
B.P D , North Carol na State Un vers ty; 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 of Mathematics*
B A., New Mexico Highlands University, M.S , Univers ty of Wvoming

Nigam, Bishan Perkash (1964) ..... *Professor of Physics*
B.S., M S , University of Delh (India); Ph D , Univers ty of Rochester

Nigg, M. Joanne (1979) ..... *Assistant Professor of Sociology*
B A , Cal fornia State Univers ty; M A , Ph D., Un versity of Ca fornia Los Ange es

Nilsen, Alleen P. (1975) ..... *Associate Professor of Education*
B A , Br gham Young University, M Ed , Amer can University, Ph D., Univers ty of Iowa

Nilsen, Don L. F (1973) ..... *Professor of English*
B A., Brigham Young Un versity M A , Amer can Univers ty, Ph.D nivers ty of Michigan

Noble, Frank C (1971) ..... *Professor of Counselor Education*
B S , Northern Il ino s Univers ty, M Ed , Ed D , niversity f I l n is

North, Larry W (1980) ..... *Associate Professor of Nursing*
B A , Hast ngs C lege; M S , U n versity of Colorado, Ph D Un versity of Arizo a

Northey, William T (1959) ..... *Professor of Microbiology*
B A , Un vers ty 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

Nutt, Merle C (1956) ..... *Professor Emeritus of Engineering*
B S., Illinois Inst tute of Techn logy M A , niversity of Iowa, LL D Il no s Wesleyan Un vers ty

O'Bannon, Charles E (1964) ..... *Professor of Engineering Chair, Department of Civil Engineering*
B S C E., University of New Mex co; M S , Harvard Univers ty Ph D , Ok ahoma State University

O'Beirne, Donald E. (1959) ..... *Professor Emeritus of Education*
B E., Wh tewater State Teachers Co lege, M A , Ed D , Northwestern University

Ober, B. Scot (1978) ..... *Associate 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 n Ed Ar zona State University

O'Connell, John J (1975) ..... *Associate Professor of Insurance*
B A., Western Wash ngton State Col ege, 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*
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O'Dell, Michael A. (1980) ..... *Assistant Professor of Accounting*
B.S , M B A., Un versity of Ca ifornia, Los Angeles, Ph D., Univers ty of Texas, C P.A., Colorado

Odenkirk, James E. (1967) ..... *Professor of Physical Education*
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Officer, Dennis T. (1979) ..... *Assistant Professor of Finance*
B A., Hendrix Co lege; M B A , Ph.D , Un versity of Arkansas

O'Grady, E. Pearse (1977) ..... *Associate Professor in Engineering*
B S E E , St Louis University, M S , Ph D., Un versity of Arizona

Ohmart, Robert D. (1970) ..... *Professor of Zoology*
B S , M S , New Mexico State Un versity, Ph.D , University of Arizona

Ojala, William T. (1971) ..... *Associate Professor of English*
B A , M A , Univers ty of Minnesota, Ph D., Florida State University

O'Keeffe, Michael (1963) ..... *Professor of Chemistry*
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Okun, Morris A (1976) ..... *Associate Professor of Education*
B A , Brook yn Col ege, M S., Ph D , Pennsylvania State Univers ty

Oldani, Robert W. (1982) ..... *Assistant Professor of Music*
B A , Univers ty of I l nois, Ubana Champaign, M A., Ph.D , Univers ty of Michigan, Ann Arbor

O'Leary, Timothy J. (1978) ..... *Associate Professor of Quantitative Systems*
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Olivas, Louis (1979) ..... *Assistant Professor of Administrative Services;*
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Oliver, Robert S. (1963) ..... *Professor of Architecture*
A B., M A , University of Ca ifornia, Berke ey, M F A., Inst tuto Allende (Mexico)

Olmsted, Cameron B (1956) ..... *Associate Professor Emeritus of Education*
B A in Ed , M.A in Ed , Arizona State Univers ty, Ed D , University of Northern Co orado

Olney, Claude W. (1967) ..... *Associate Professor of Administrative Services*
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Olsen, Dan R Jr. (1981) ..... *Assistant Professor of Computer Science*
B S , M S , Brigham Young University, Ph.D., Un versity of Pennsy van a

Olsen, Larry K. (1977) ..... *Associate Professor of Health Science*
B S , M A T , Lew s and C ark College, M P H , Univers ty of California, Berkeley,
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Olson, Grace P (1977) ..... *Instructor of Nursing*
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Osborn, Marianne (1972) ..... *Assistant Professor of Nursing*
B S N , Ar zona State Univers ty, M S N , University of Colorado

Osenburg, Frederic C (1946) ..... *Professor Emeritus of English*
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Osterhoudt, Robert G (1976) ..... *Professor of Physical Education*
B S , M S , Pennsylvania State University, Ph D , University of I l nois

Ostrom, Lonnie L. (1973) ..... *Professor of Marketing,*
B B A , Univers ty of Wiscons n, *Director of Development*
M S , Southern I l no s Un versity, Ph D., University of Alabama

Overman, Glenn D. (1956) ..... *Professor of Marketing*
B.S., Central State Co lege, M S , Ok ahoma State University, D B A , Ind ana Univers ty

Owen, David C , Sgt. FC (1981) ..... *Senior Instructor, Military Science*

Owen, John E (1964) ..... *Professor of Sociology*
B A , Duke University; A M., Ph D , Un versity of Southern California

Ozkarahan, Esen A. (1982) ..... *Associate Professor of Computer Science*
B S , Middle East Technical Un versity, M S., New York Univers ty, Ph.D , University of Toronto

Packer, Merle A. (1959) ..... *Associate Professor of Physical Education*
B A , M.A , Arizona State University; Ed D , University of Northern Colorado

Paddock, Charles E. (1981) ..... *Assistant Professor Quantitative Systems*
B.S., University of New Orleans; M.B.A., Ph.D , University of Houston

Padilla, Raymond V. (1982) ..... *Associate Professor of Education*
B.A., University of Michigan; M.A., Ph.D., University of California, Berkeley

Page, John B. (1969) ..... *Professor of Physics*
B.S., Ph.D., University of Utah

Pai, Ammembal L. (1982) ..... *Associate Professor of Engineering*
B.E., University of Mysore; M.E, Indian Institute of Science; Ph.D , Ohio State University

Palais, Joseph C. (1964) ..... *Professor of Engineering*
B.S.E.E., University of Arizona, M.S.E., Ph.D , University of Michigan

Palumbo, Dennis J. (1983) ..... *Professor of Public Affairs; Director, Morrison Institute for Public Policy*
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Pangrazi, Robert P. (1973) ..... *Professor of Physical Education*
B.A., M.S., Ph D , Washington State University

Pany, Kurt J. (1978) ..... *Associate 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) ..... *Professor of Psychology; Chair, Department of Psychology*
A.B , University of California, Berkeley, M A., Ph.D., University of California, Davis

Parrish, Berta (1978) ..... *Assistant Professor of Education*
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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) ..... *Associate 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*
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Patten, Duncan T. (1965) ..... *Professor of Botany*
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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

Pattison, Diane D. (1980) ..... *Assistant Professor of Accounting*
B.S , University of Oregon; M.B.A., California State University, Hayward; Ph D., University of Washington

Paulsen, George E. (1959) ..... *Professor of History*
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Pavlovich, Raymond D. (1982) ..... *Associate Professor of Engineering*
B.S., M S., University of Wyoming, Ph.D., Purdue University

Pearce, Martha V. (1977) ..... *Assistant Professor of Technology*
B.S., Columbia Univers ty, M.S., Boston University, Ed.D , Arizona State University

Pearson, John N. (1981) ..... *Assistant Professor of Management*
B.S , M B.A., Florida Atlantic University; Ph.D., Georgia 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*
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Peek, George A. Jr. (1964) ..... *Professor Emeritus of Political Science*
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Perantoni, Daniel T. (1982) ..... *Professor of Music*
B M., Eastman School of Music, M M , Catholic University of America

Perrell, Richard C. (1976) ..... *Assistant Professor of Architecture*
B.A., Christian Brothers College

Perril, Lester S. (1957) ..... *Professor Emeritus of Education*
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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*
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Peters, D'ane (1980) ..... *Instructor in Nursing*
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Peters, Kathleen A. (1967) ..... *Assistant Professor of Home Economics*
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Peterson, Edward R. (1977) ..... *Assistant Professor of Technology*
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Peterson, John R. (1963) ..... *Professor of Architecture*
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Peterson, Ralph (1976) ..... *Associate Professor of Education*
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Pettit, George R. (1964) ..... *Professor of Chemistry*
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Péwe, Troy L. (1965) ..... *Professor of Geology*
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Pfuhl, Erdwin H. Jr. (1968) ..... *Professor of Sociology*
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Pheanis, David C. (1975) ..... *Associate Professor of Computer Science*
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Philippakis, Andreas S. (1967) ..... *Professor of Quantitative Systems*
B.S., Gannon College, M.B.A., Ph.D., University of Wisconsin, Madison

Phillips, William W. (1958) ..... *Associate Professor of History*
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Pian, Richard H. J. (1959) ..... *Professor of Engineering*
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Pijawka, David (1982) ..... *Assistant Professor of Public Affairs*
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Pike, Norma J. (1964) ..... *Assistant Professor of Physical Education*
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Pile, James (1971) ..... *Associate Professor of Art*
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Pimentel, David (1973) ..... *Associate Professor of Art*
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Pinkava, Donald J. (1964) ..... *Professor of Botany*
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Pittman, Anne M. (1952) ..... *Professor of Physical Education*
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Plantz, Don V. (1960) ..... *Professor of Economics*
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Platte, Mary Kay (1982) ..... *Assistant Professor of Journalism and Telecommunication*
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Podlich, William F. (1949) ..... *Professor Emeritus of Education*
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Poe, Jerry B. 1974) ..... *Professor of Finance*
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Polenz, G. Donald (1967 ..... *Associate Professor Emeritus of Social Work*
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Prather, Elizabeth (1978) ..... *Associate Professor of Speech and Hearing Science*
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Prehm, Herbert J. (1977) ..... *Professor of Education*
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Price, Thornton W. (1961) ..... *Professor Emeritus of Engineering*
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Prieto, Alfonso G. (1974) ..... *Professor of Education*
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Prust, Zenas A. (1959) ..... *Professor of Technology; Associate Director, Division of Technology; Chair, Department of Industrial Technology*
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Pulaski, Charles (1980) ..... *Professor of Law*
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Quesada, Eugene R. (1973) ..... *Assistant Professor of Design Sciences*
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Quigg, John C. (1981) ..... *Assistant Professor of Mathematics*
B S., M.S., Ph.D., Drexel University

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Rader, Martha (1975) ..... *Associate Professor of Administrative Services*
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Rader, Rosemary (1976) ..... *Assistant Professor of Religious Studies*
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Radke, Judith J. (1960) ..... *Associate Professor of French*
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Ragan, Donal M. (1967) ..... *Professor of Geology*
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Rajan, Mahesh (1981) ..... *Assistant Professor of Engineering*
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Ralston, Mack A. (1956) ..... *Professor of Education*
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Randall, Virginia R. (1962) ..... *Associate Professor of English*
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Rankin, Robert L. (1971) ..... *Associate Professor of Engineering*
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Rannells, Jessie M. (1939) ..... *Professor Emeritus of Home Economics*
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Rapp, James R. (1962) ..... *Professor of Architecture*
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Rasler, Karen (1981) ..... *Assistant Professor of Political Science*
B A., University of Florida; M.A., Ph.D., Florida State

Rasmussen, David I. (1963) ..... *Professor of Zoology*
B.S , M.S , University of Utah; Ph D , University of Michigan

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) ..... *Associate Professor of Management*
B A , Ph D , Michigan State Un vers ty

Reckers, M.J Philip (1980) ..... *Associate Professor of Accounting*
B S , Quincy Col ege; M B A , Wash ngton Un versity, Ph D , Univers ty of Il no s

Red Horse, John (1979) ..... *Associate Professor of Social Work*
A B , Un versity of the Pacific, M S W , University of Cal fornia; Ph D , Un versity of Minnesota

Reed, William H (1968) ..... *Associate Professor of Technology; Chair, Department of Aeronautical Technology*
B.S , University of Ok ahoma,
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Reeves, Henry C. (1969) ..... *Professor of Microbiology*
B S., Frank in and Marshall Co lege M A., Ph D , Vanderbi t Un versity

Reich, John W. (1965) ..... *Professor of Psychology*
B.A., M S , Un versity of Ok ahoma; Ph D , Univers ty of Co orado

Re f, William E. (1970) ..... *Professor of Management· Associate Dean, College of Business Administration*
B B A., M A , Ph D., Un versity of Iowa

Reiman, Etsuko Obata (1978) ..... *Assistant Professor of Japanese*
B A , Ke o Un versity, Japan, M A , Seton Ha l Un versity; M A , Ph.D., Univers ty of W sconsi n, Madison

Reinard, John C. (1975) ..... *Associate Professor of Communication*
B.A., M A , Cal forn a State Univers ty Fu lerton; Ph D , University of Southern Ca ifornia

Reingen, Peter H. (1982) ..... *Associate Professor of Marketing*
B B A., Cologne College Germany ; M.B A , Ph D , Univers ty of Cincinnati

Rein'l, Robert L. (1961) ..... *Professor Emeritus of Philosophy*
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Reiser, Castle O (1958) ..... *Professor Emeritus of Engineering*
B.S., Colorado State University; Pet E , Colorado School of Mines, Ph.D., Un versity of W sconsin, Madison

Re ss, Peter W. (1976) ..... *Assistant Professor of Administrative Services*
B S , J.D , Marquette Un versity, M A , Ar zona State Un versity

Reneau, J Hal (1975) ..... *Associate Professor of Accounting*
B B A., M S., Texas Tech Univers ty, Ph.D Un versity of M ssouri, Co umbia

Reuter, Vincent G. (1961) ..... *Professor of Management*
B.S.C , M.A., Ph D , U nivers ty of Iowa

Reynolds, Robert D. (1970) ..... *Associate Professor of Music*
B.M , Texas Christian University, M M Un versity of Texas; Ph D , Ohio State University

Reznikoff, Sivon C. (1973) ..... *Professor of Design Sciences*
B A , University of Southwestern Louisiana, Certificate, New York Schoo of Interior Design;
M A , Louisiana State U nivers ty

Rice, Margaret J. (1968) ..... *Assistant Professor Emeritus of Communication*
A B , A M., Univers ty of Kansas

Rice, Ross R (1950) ..... *Professor of Political Science*
M A , Ph D , Un vers ty of Chicago

Rice, Roy C (1946) ..... *Professor Emeritus of Education*
B S , Un versity of New Mexico, M S Un versity of Massachusetts; Ph D , University of Texas

Rice, Warren (1958 ..... *Professor of Engineering*
B S M.S., Ph D , Texas A & M U nivers ty

Richards, Gale L. 1965) ..... *Professor of Communication*
B A , University of Akron; M A , Ph D Un versity 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 Univers ty M A , Ed.D , Stanford U nivers ty

Richardson, Grant L. (1953) ..... *Professor of Agriculture*
B S , M S , Univers ty of Ar zona, Ph.D., Oregon State Univers ty

Richardson, H D. (1940) ..... *Professor Emeritus of Counselor Education*
Ph B , Ph M., University of Wisconsin, Ph.D , Northwestern Un versity; LL.D , Ar zona State Un versity

Richardson, Richard C. Jr. (1977) ..... *Professor of Education; Chair, Department of Higher and Adult Education*
B S., Castleton State College;
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Rickel, Harry P (1948) ..... *Professor Emeritus of Music*
B.M , M M , Univers ty of Arizona
Rider, Wendell J. (1953) ..... *Professor Emeritus of Music*
B.S , Iowa State Teachers Col ege, M M , Eastman School of Mus c; Ph D , University of Iowa
Righetti, Timothy L (1980) ..... *Assistant Professor of Agriculture*
B S , University of Maryland; Ph.D., Un vers ty of Cal forn a, Davis
Rios, Alberto A. (1982) ..... *Assistant Professor of English*
B A , M F A , Univers ty of Arizona
Risseeuw, John L. (1980) ..... *Assistant Professor of Art*
B S , M A , M F.A , Univers ty of Wisconsin, Madison
Ritchie, Kathleen E. (1972) ..... *Instructor in Psychology*
B A , Un versity of Arizona
Robbins, Earl R. (1961) ..... *Associate Professor of Engineering*
B S E E , Texas Techno og cal College; M S E , Ph D , Arizona State University
Roberts, Carolyn (1982) ..... *Associate Professor of Nursing*
B Sc.N., University of Western Ontario; M.Ed , Teachers Co lege, Columbia University, Ph.D., Wayne State Un vers ty
Roberts, Thomas G. (1970) ..... *Associate Professor of Education*
B A , Wake Forest Univers ty, M.A., Ph D , University of North Carol na
Robertson, Rachel D. (1981) ..... *Assistant Professor of Leisure Studies*
B A., University of Iowa, M S , Univers ty of Oregon; Ph D , Univers ty of Iowa
Robinson, Daniel O. (1950) ..... *Professor of Agriculture*
A B , Brigham Young University, M S , University of Arizona, Ph D , Ohio State niversity
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 Un versity
Rodd, Laurel R. (1975) ..... *Associate Professor of Japanese*
B A., DePauw University; M.A.T , East Tennessee State University, M.A., Ph D , University of Michigan
Roedel, Ronald J. (1981) ..... *Associate Professor of Engineering*
B S E , Princeton Un versity M S , Ph D , University of Californ a, Los Angeles
Rogers, Carol A. (1982) ..... *Assistant Professor of Economics*
B B A., Loyola University of Chicago
Rogers, Rhonda M. (1983) ..... *Assistant Professor of Aerospace Studies*
B.S.A , University of Texas, M P A Ba l State Un versity
Rollier, Dwayne A (1971) ..... *Associate Professor of Engineering*
B S , M S Oklahoma State Un versity, Ph D , Flor da State University
Roosa, Mark W , (1980) ..... *Assistant Professor of Home Economics*
B S , Oh o State University; M A , Ph.D , M chigan State Un vers ty
Rook, Fern H. (1969) ..... *Assistant Professor Emeritus of Technology*
B A , Un versity of Colorado, M A Arizona State University
Roper, Devon J. (1966) ..... *Associate Professor of Technology*
B S , Utah State Un versity; M S , Ar zona State Un versity
Rosales, F Arturo (1980) ..... *Assistant Professor of History*
B A., Ar zona State University M A , Stanf rd Univers ty Ph D Ind ana U n versity
Rose, Jonathan (1968) ..... *Professor of Law*
B.A , Univers ty of Pennsylvan a, LL B Un versity of M nnesota
Rose, Seth D. (1976) ..... *Associate Professor of Chemistry*
B S , University of Ca ifornia, Berke ey, Ph D , Univers ty of Ca ifornia, San Diego
Rosegrant, Teresa J (1980) ..... *Assistant Professor of Education*
B.S Southern I l nois U n versity, M A., I nois State Univers ty Ph D , Univers ty of Illino s
Rosensteel, George (1981) ..... *Assistant Professor of Mathematics*
B Sc., M.Sc , Ph D , U niversity of Tor nto
Rossi, Patrick J. (1967) ..... *Associate Professor of Psychology*
B S , St Mary's Co ege, M A , San Fernand Va ley State College, Ph D , Univers ty of California, R verside
Rossman, Mark H. (1974) ..... *Associate Professor of Education*
B A , New York Un vers ty, M S , Un vers ty of Bridgeport Ed D , University of Massachusetts
Rothschild, Mary A. (1975) ..... *Assistant Professor of History*
B A , M A , Ph.D Un vers ty of Washington

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*
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Roy, Radha R. (1963) ..... *Professor of Physics*
B.Sc., M.Sc., Presidency College, University of Calcutta; Ph.D., University of London

Roy, Ramendra P. (1981) ..... *Associate Professor in Engineering*
B.Sc , Un'versity of Calcutta, B S , University of Jadavpur; M.S , University of Washington; M.Sc , Ph.D., University of California, Berke ey

Ruccolo, James S. (1974) ..... *Professor of Music*
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Ruch, William A. (1968) ..... *Professor of Management*
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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*
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Ruppé, Reynold J. (1960) ..... *Professor of Anthropology*
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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*
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Rutherford, Robert B. Jr. (1976) ..... *Professor of Education*
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Rutowski, Ronald L. (1976) ..... *Associate Professor of Zoology*
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Sacks, Benjamin (1963) ..... *Professor Emeritus of History*
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Sackton, Frank J. (1976) ..... *Professor of Public Affairs*
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Sadalla, Edward K. (1974) ..... *Associate Professor of Psychology*
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Sadler, William E (1975) ..... *Assistant Professor of Design Sciences*
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Salmirs, Seymour (1981) ..... *Assistant Professor of Technology*
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Sanders, Bevie T. (1957) ..... *Associate Professor Emeritus of Accounting*
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Sanderson, R. Thomas (1963) ..... *Professor Emeritus of Chemistry*
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Sandler, Irwin (1975) ..... *Associate Professor of Psychology*
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Sands, Kathleen M. (1977) ..... *Associate Professor of English*
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Sankey, Otto F. (1982) ..... *Assistant Professor of Physics*
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Sanner, Robert D. (1979) ..... *Assistant Professor of Chemistry*
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Sansone, Fred J. (1965) ..... *Associate Professor of Mathematics*
B.S E , M S E , University of Michigan, M S , Ph.D , Rutgers, The State Univers ty

Santora, Dolores (1979) ..... *Professor of Nursing; Associate Dean, College of Nursing*
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Sargent, Charles S. Jr. (1971) ..... *Associate Professor of Geography*
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Sater, Vernon E. (1962) ..... *Professor of Engineering*
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Satterlie, Richard A. (1980) ..... *Assistant Professor of Zoology*
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Satterthwaite, Lester L. Jr. (1968) ..... *Professor of Education*
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Sattler, Howard E. (1967) ..... *Professor of Education*
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Savage, Nev'n W. (1959) ..... *Professor of Mathematics*
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Scalise, James W. (1975) ..... *Associate Professor of Planning*
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Schabacker, Joseph C. (1963) ..... *Professor of Management*
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Schade, Thomas V. (1974) ..... *Associate Professor of Justice Studies*
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Schall, Merri H (1960 66; 1967) ..... *Professor of Education*
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Scheatzle, David G (1979) ..... *Associate Professor of Architecture*
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Schildgen, Thomas E (1981) ..... *Assistant Professor of Technology*
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Schlagenhauf, Don E (1976) ..... *Associate Professor of Economics*
B S , Marquette Un versity; M A , Ph D , Univers ty of I linois

Schluntz, Roger L. (1980) ..... *Professor of Architecture; Chair, Department of Architecture*
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Schmidt, Alfred H (1960) ..... *Professor Emeritus of Marketing*
B S., U n versity of Oklahoma, M.B A , D B A Indiana Un versity

Schmidt, Jean M. (1966) ..... *Professor of Microbiology*
B A , M S , University of Iowa, Ph D., University of Ca ifornia Berkeley

Schmidt, Peter A (1978) ..... *Associate Professor of Technology, Chair, Department of Manufacturing Technology*
B.S , in Ed. Northern I linois Un versity,
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Schmidt, Randall B. (1968) ..... *Associate Professor of Art*
B A , Hamline University, Minnesota, M.A University of New Mexico

Schoen, Robert A. (1966) ..... *Assistant Professor of Technology*
B S , M S , Arizona State University *Assistant Director, Division of Technology*

Schoenwetter, James (1967) ..... *Professor of Anthropology*
A B , University of Chicago, M S , Un versity of Arizona, Ph D , Southern I linois Un versity

Schon, Isabel (1974) ..... *Associate Professor of Education*
B S , Mankat State C l ege, M A., Mich gan State University, Ph D , Univers ty of Co orado

Schroder, Dieter K (1981) ..... *Professor, Research, Engineering*
B S E E , M.S E E , McG l Un versity; Ph D , Un vers ty of I l no s

Schroeder, Milton R (1969) ..... *Professor of Law*
B A , Wes eyan University, J D., University of Chicago

Schroeter, John R. (1980) ..... *Assistant Professor of Economics*
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Schuback, Gertrud B. (1966) ..... *Instructor of German*
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Schwada, John W. (1971) ..... *Past President of the University; Professor Emeritus of Political Science*
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Scott, Craig O. Capt. (1979) ..... *Assistant Professor of Military Science*
B S , M.S , Rensse aer Polytechnic Institute

Scott, Walter T. (1961) ..... *Professor Emeritus of Mathematics*
B A , M.A., Ph D., Rice University

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Searfoss, Lyndon W. (1973) ..... *Associate Professor of Education*
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Sebald, Hans (1963) ..... *Professor of Sociology*
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Sehested, Colene R. (1967) ..... *Assistant Professor of Nursing*
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Seipp, Kenneth F. (1963) ..... *Professor of Music*
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Self, Stephen (1979) ..... *Assistant Professor of Geology*
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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., Univers ty of Washington, Ph.D , University of Illinois

Seperich, George J. (1976) ..... *Associate Professor of Agriculture; Director, Division of Agriculture*
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Shafer, Robert E. (1966) ..... *Professor of English; Director, English Education*
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Shaw, Milton C. (1978) ..... *Professor of Engineering*
B S M E., Drexel University; M E Sc , Sc.D., Un versity of Cincinnati, Dr.H C , University of Louvain

Shell, Leon G. (1967) ..... *Associate Professor of Counselor Education; Dean of Students*
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Shen, C. C. (1982) ..... *Associate Professor of Engineering*
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Sherman, Thomas L. (1964) ..... *Professor of Mathematics*
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Sheydayi, E. Yury (1973) ..... *Associate Professor of Architecture*
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Shinn, Thelma J. (1975) ..... *Associate Professor of English*
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Shipp, Vernon E. (1966) ..... *Assistant Professor of Art*
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Shirreffs, Janet H. (1977) ..... *Associate Professor of Health Science*
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Shofstall, Weldon P. (1950) ..... *Professor Emeritus of Secondary Education*
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Shrock, David L. (1974) ..... *Associate Professor of Transportation*
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Shuman, I. Gayle (1974) ..... *Associate Professor of Justice Studies*
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Silvaroli, Nicholas J. (1963) ..... *Professor of Education; Director, Reading Education*
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Silver, Benjamin (1971) ..... *Assistant Professor of Journalism and Telecommunication*
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Simmons, Douglas J. (1963) ..... *Assistant Professor of French*
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Singhal, Avi C. (1977) ..... *Associate Professor in Engineering*
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Skibo, Edward B. (1982) ..... *Assistant Professor of Chemistry*
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Smith, A. Wade (1981) ..... *Assistant Professor of Sociology*
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Smith, Janet Kiholm (1981) ..... *Assistant Professor of Economics*
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Smith, L. Christian (1971) ..... *Assistant Professor of History*
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Smith, Lehi T. (1959) ..... *Professor of Mathematics*
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Smith, Marion W. (1952) ..... *Associate Professor of Music*
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Smith, Ralph E. (1970) ..... *Professor of Accounting*
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Smith, Richard L. (1967) ..... *Professor of Engineering; Chair, Department of Industrial and Management Systems Engineering*
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Snyder, Lester M. Jr. (1967) ..... *Professor of Counselor Education; Associate Dean, College of Education*
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So, Ronald Ming Cho (1981) ..... *Associate Professor in Engineering*
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Solan, David S. (1981) ..... *Assistant Professor of Leisure Studies*
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Somervill e, Susan C. (1978) ..... *Associate Professor of Psychology*
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Sommerfeld, Milton R. (1968) ..... *Professor of Botany, Chair, Department of Botany and Microbiology*
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Sparks, Charles F., Captain (1979) ..... *Assistant Professor of Military Science*
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Spence, John C. H. (1976) ..... *Associate Professor of Physics*
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Spinosa, Frank (1965) ..... *Professor of Music*
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Squires, Rose L. (1981) ..... *Assistant Professor of Nursing*
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Stadmiller, Jack E. (1963) ..... *Associate Professor of Engineering Communications*
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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) ..... *Associate Professor of Education*
B.A., M.A., Ed.D., University of Florida

Stahnke, Herbert L. (1941) ..... *Professor Emeritus of Zoology*
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Staley, Frederick A. (1970) ..... *Associate Professor of Education*
B.A., M.A., Western Michigan University, Ph.D., Michigan State University

Stazer, Frank S. (1955) ..... *Associate Professor of Music*
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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

Stearns, MaryBeth (1981) ..... *Professor of Physics*
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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*
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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 Marketing*
B.S , M.S., University of Illinois, Ph.D., University of Texas, Austin

Stevens, George E. (1979) ..... *Associate 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 Univers ty, M.S., University of Southern California

Stewart, Donald G. (1964) ..... *Associate Professor of Mathematics*
B.A., M S., University of Utah; Ph.D., Univers ty of Tennessee, Knoxv lle

Stewart, Ernest I. (1959) ..... *Professor Emeritus of Health Science*
B.S., M.S., Utah State Un versity; 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

Stites, William H. (1954) ..... *Professor of Communication*
B A , Louisiana Polytechnic Institute; M A., Ph D., University of Denver

St. Louis, Robert D. (1982) ..... *Associate Professor of Quantitative Systems*
A B., Rockhurst College; M S , Ph D , Purdue University

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

Stolz, Richard W. (1982) ..... *Assistant Professor of Finance*
B.A , Linfield College, M.A , Syracuse University, Ph D., Michigan State University

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 Cal'forn a

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

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*
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Strojnik, Ales (1969) ..... *Professor of Physics*
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Strom, Robert D. (1969) ..... *Professor of Education*
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Stuler, John H. (1962) ..... *Professor of Art*
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Stump, Edmund (1976) ..... *Associate Professor of Geology*
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Stumpf, Angela M. (1959) ..... *Associate Professor of Nursing*
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Stutsman, Paul S. (1967) ..... *Associate Professor Emeritus of Chemistry*
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Stutz, Jean C. (1981) ..... *Assistant Professor of Agriculture*
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Sugges, Peter R. (1981) ..... *Assistant Professor of Management*
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Sullivan, Deborah (1967) ..... *Assistant Professor of Sociology*
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Sullivan, Howard J. (1971) ..... *Professor of Education*
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Sullivan, John J. (1976) ..... *Assistant Professor Emeritus of Education*
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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*
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Svoboda, William S. (1969) ..... *Professor of Education*
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Swafford, James R. (1971) ..... *Assistant Professor of Microbiology*
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Swagert, S. Laird (1971) ..... *Professor Emeritus of Political Science*
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Swaim, S. Daniel (1975) ..... *Associate Professor of Music*
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Swanson, Roger M. (1968) ..... *Associate Professor of English*
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B.S., M.B.A., Clarion State College Ph.D., The Ohio State University

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Tambs, Lewis A. (1969) ..... *Professor of History*
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Tate, Donald J. (1958) ..... *Professor of Administrative Services*
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B.S., Mount St. Scholastica; M.S., University of Iowa

Taylor, Jack J. (1960) ..... *Professor of Art*
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Taylor, Janet (1977) ... *...Associate Professor of Art*
B.F A , Cleveland Institute of Art; M F A , Syracuse Un versity

Taysom, Elvin D. (1953) . ... *...Professor of Agriculture*
B.S , Un vers ty of Idaho; M.S , Utah State University; Ph D., Wash ngton State Un versity

Tenney, Lester I. (1969) ... *.Professor of Insurance*
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Terrigino, Anthony V Sergeant Major (1981) .. ... *Senior Instructor in Military Science*

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B S N , DePau University; M.S N , Univers ty of Il ino s

Theobald, Clarabelle (1962) ... *.Associate Professor of Nursing*
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Thomas, M. George (1981) ... ... *...Assistant Professor of Sociology*
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Thomason, Leslie L. (1969) ... ... *...Professor Emeritus of Technology*
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Thompson, Lee P. (1955) . ... *Professor of Engineering*
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Thompson, Truet B (1959) ... *.Professor of Engineering*
B.S., B S E E., Louisiana Po ytechnic Inst tute, M S , Oklahoma State Univers ty, Ph D Northwestern Un versity

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Thomson, Tom R. (1961) ... *.Professor of Chemistry*
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Tice, Thomas E (1967) ... *.....Professor of Engineering*
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Towe, Bruce (1981) ... *.Associate Professor of Engineering*
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B.S., Lew s and C ark Col ege, M S , Oregon St te Univers tv Ph D , Stanford Un vers tv

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We'ss, Neil A. (1970).... ... . *Associate Professor of Mathematics*
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Newby, H Elizabeth (1980) ... *Visiting Associate Professor of Law*
LL B , Un vers ty of Western Aust a ia, M A , n vers ty of Sheffie d
Parry, C ive (1970) ... *Visiting Professor of Law*
LL B , U nivers ty f Birm ngham, LL B , M A LL D , Un vers ty of Cambr dge
Peterson, Brenda S 1979) ... *Visiting Lecturer of English*
B A Un vers ty of Ca if rn a, Dav s
Reed, Barbara L. 1982) ... *Visiting Assistant Professor of Accounting*
B.S , Wi mington Co lege, M S , D B A , Ar zona State Un vers ty
Rice, James C. (1979) ... *Visiting Research Professor of Zoology*
B Sc Corne l Univers ty Ph D , Un versity of Toronto
Rodriguez Lee, Maria ... *Visiting Assistant Professor of Spanish*
B A , U n vers ty of Texas M A , Ph D Un vers ty of Colorado

Roe, Keith B. (1979)..... *Visiting Associate Professor of Engineering*

Russo, James R. (1980)..... *Visiting Assistant Professor of English*
B A , M A , M.F A Ph D , Un versity of Ar zona

Schmid, Maureen (1981) ..... *Visiting Assistant Professor of English*
B A , St Mary's Co ege, Notre Dame, M.A Univers ty of Notre Dame Ph D State University of New York, Buffa

Shipley, Mary L. (1978)... ..... *Visiting Professor of Design Sciences*
B.F.A , Un versity of Southern Ca ifornia M A , Ph D Case Western Reserve Univers ty

Van Esso, Andrew E. (1978) ..... *Visiting Assistant Professor of Justice Studies*
B A., M.A., Loy la University, M A , Ph D , Northwestern Univers ty

Vil aseca, F. Eugenio (980) ..... *Visiting Assistant Professor of Engineering*
B S E , Universidad Tecnica Federico, M.S Univers ty of Notre Dame, Ph D., Ar z na State Univers ty

Umlah, Donald E. (1981). ..... *Visiting Professor of Social Work*
M S S W , Ph.D., Un vers ty of Texas at Ar ington

Wehinger, Peter A (1981) ..... *Visiting Professor of Physics*
B S , Union Co lege, Schenectady, M S., Ind ana Un vers ty B oom ngton, Ph D , Case Institute of Tec no gy

Whitmore, Brad ey C. (1982) . ..... *Visiting Assistant Professor of Physics*
B S , M.S., Ph.D., Un vers ty of M ch gan

Wolcott, Harry F (1980)..... *Visiting Professor of Education*
B S., Un vers ty Californ a, Berke ey, M.A San Francisco State C l ege Ph D , Sta ford Univers ty

Wong, Paul (1979)..... *Visiting Professor of Social Work*
B.A., M.A., Ph D , University of Cal fornia, Berke ey

LECTURERS

Cain, H. Thomas (1967) ..... *Lecturer in Anthropology*
B A , University of Wash ngton; M A , University of Ar zona

DesJardin, Margaret E. (1949) ..... *Lecturer Emeritus in Dance*

Dominguez, Majel (1977) ..... *Part time Lecturer in Sociology*
B A , M.A , Univers ty of Wyom ng Ph D , A izona State University

Dykhu'zen, Ronald C. (1981) ..... *Lecturer in Engineering*
B S , University of Virgin a M S U vers ty of Il nois

Ehret, Patricia M. (1980) ..... *Lecturer in Speech and Hearing Science*
B A , Elmira Co lege, M S , Ga laudet Co lege

Ferrall, J. Eleanor (1969) ..... *Lecturer in Public Affairs*
A B , Heidelberg Co lege; M A , Ar zona State Un versity

Fries, Robert H (1975)..... *Lecturer in Engineering*
B M E., M S., Ohio State University

Gereboff, Barbara (1978) ..... *Part time Lecturer of Sociology*
B.A , Simmons Col ege Boston Mass , Ph D., Boston Univers ty, Boston, Mass. pending

Gibbs, Christine (1980) ..... *Lecturer in Public Affairs*
B.A University of Arizona, M.P.A , Ar zona State Univers ty

Horwitch, Arnold M (1974) ..... *Lecturer in Humanities*
Ph B., University of Chicago; M A , Arizona State Univers ty, M S , Lowe l Technological Institute

Ikegami, Kazukuni (1981) ..... *Lecturer in Architecture*
B S.E , Osaka Institute of Technology, M Arch University of Texas, Austin

Ingraham, Leonard W. (1973).. ..... *Lecturer in Education*
B.S., City College of City Un versity, M A , Ed.D., Teachers Col ege, Columb a Univers ty

Kay, Wendell P. (1975).. ..... *Lecturer in Law*
B.A , DePauw University, J D., Northwestern University

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

Manion, Patrick W (1980).. ..... *Lecturer in Public Affairs*
B A , M P A., Arizona State University

McDonald, Kenneth A. (1978)..... *Lecturer in Public Affairs*
B S , Univers ty of Detro t, M.A., Ar zona State Un versity

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 Col ege New York, M A , M D., University of Iowa

Noel, David E. (1981)... *Lecturer in Quantitative Systems*
B S , M B A , Western Il inois Un vers ty

Sm'th, Scott L. (1981) *Lecturer in Economics*
B S , George Mason University

Turner, Al en C. (1980) *Lecturer in Public Affairs*
B S , Seatt e Pacific Co ege, M A , Univers ty of Kentucky

Wil iams, Dudley A. (1982) *Lecturer of Communication*
B A , Un versity of Mary and, M A , Univers ty of Hawa i, Ph D , Ohio University

Zwick, Rodney R., (1981). *Lecturer in Leisure Studies*
B S., M S , Michigan State Un vers ty

ADJUNCT FACULTY

Ayres, James E (1982). *Adjunct Instructor of Anthropology*
B A , Fresno State Un versity, M A., University of Arizona

Canby, William C , Jr. (1967)... *Adjunct Professor of Law*
A B , Yale University, LL.B Un vers ty of M nnesota

Cheung, Susanna (1979).. *Adjunct Lecturer of Home Economics*
B S , Univers ty of Washington, M A , Ar zona State Univers ty

Coke, F. Van Deren (1983).. *Adjunct Professor of Art*
B A , Univers ty of Kentucky, M F A , Ind ana Un versity

Costilow, Ralph N (1982) *Adjunct Professor of Botany and Microbiology*
B.A., West V rg n a Un versity, M S , North Caro na State Col ege, Ph D , Mich gan State Co lege

Cox, Jerry R .... *Adjunct Associate Professor of Agriculture*
B S , M S , New Mex co State University Ph D Un vers ty f Wyom ng

Daspit, C Phillip (1981)... *Adjunct Associate Professor of Speech and Hearing Science*
B S , M D , Louisiana State U vers ty

Dearen, Dan (1975). *Adjunct Professor of Health Services Administration*
B S Texas Tech Univers ty, M A , Ed D , Ar zona State U n versity

DeBano, Leonard F. *Adjunct Associate Professor of Agriculture*
B S , Colo ado State n versity, M S , U tah State University, Ph.D Univers ty of Cal fornia, Berkeley

Dockstader, Frederick J. (1983) . *Adjunct Professor of Art*
A B M A , Northe n Arizona University, Ph D , Western Reserve Un vers ty

Dover, C J (1982) . *Adjunct Professor of Communication*
B A , Kent State U n versity M A , Western Reserve University

Drought, R Alice (1982) ... *Adjunct Assistant Professor of Social Work*
B A , M A , Ph D , Un vers ty of W scons n

Foster, Joyce (1972)... *Adjunct Professor of Zoology*
B A., M A DePauw Unive s ty Ph D Arizona State Un vers ty

Gibbs, William R (1962) *Adjunct Professor of Physics*
B S , M S , Un versity of Texas, Ph D., R ce Un vers ty

Glick, Paul C *Adjunct Professor of Sociology*
B A , Depauw U n vers ty M A , Ph D , Un versity of Wisconsin, Madison

Greenberg, James F (1981). *Adjunct Assistant Professor of Anthropology*
B A , M A , Ph D., University of Mich gan

Hecht, Frederick (1978).... *Adjunct Professor of Zoology*
B.A , Dartmouth College M D , University of Rochester

Heller, Gloria (1982)... *Adjunct Assistant Professor of Social Work*
M A., Co umbia University

Hendrix, Donald Louis (1981) *Adjunct Associate Professor of Botany and Microbiology*
B.A , Centra Washington Un versity; M S , University of Washington, Ph D., Wash ngton State University

Huckins, Charles A. (1979)..... *...Adjunct Professor of Botany and Microbiology*
B A , Brown Un vers ty, M S , Ph D , Cornel University

Kenney, Kathryn W. (1979) . .. . *..Adjunct Lecturer in Speech and Hearing Science, Clinical Supervisor, Speech and Hearing Clinic*
B S., M.S., Arizona State University

Kisslinger, Leonard S. (1982) ..... *...Adjunct Professor of Physics*
B S , St Louis Un vers ty, M S , Ph D , Indiana Univers ty

Knipe, Duane D. (1972)... ..... *...Adjunct Associate Professor of Agriculture*
B S , M S., New Mex co State Univers ty, Ph D , University of Arizona

Koff, Theodore H. (1982). *Adjunct Assistant Professor of Social Work*
M.S , Columbia Univers ty, Ed D , Un versity of Ar zona

LaSota, John A. Jr. (1972)... *....Adjunct Professor of Law*
LL B , Un vers ty of Ar zona

Lee, Sheryl (1979) ..... *. Adjunct Lecturer of Home Economics*
B S M P H , Un versity of California at Berkeley

Lockhart, Carol (1975) ..... *Adjunct Assistant Professor of Health Services Administration*
B.S., Frances Payne B ton School of Nursing, M S , Un versity f Ca forn a, San Franc sco

Maresca, Robert L. (1977) . ..... *Adjunct Associate Professor of Speech and Hearing Science*
B S., Yale University, M.D A bany Medica

McCaw, Barbara K (1978)..... *. Adjunct Professor of Zoology*
B.A , M.A., Stanford Un versity, Ph D , University of Oregon

Merlan, Francesca C. (1980) ..... *Adjunct Assistant Professor of Anthropology*
B.A , San Franc sco State Co lege, M A , Ph D , Univers ty of New Mex co

Mogey, John M. (1980) ..... *..Adjunct Professor of Sociology*
B.A , M A D Sc , Queen s Univers ty, Belfast Northern Ire and

Obitz, Fred (1975)..... *....Adjunct Assistant Professor of Counselor Education*
B A., University of Colorado; M A , Ph.D , U n versity of Utah

O'Grady, Ingrid P. (1981).. ..... *..Adjunct Assistant Professor of Anthropology*
B A., M A , University of Ar zona; Ph D , Catho ic Un vers ty of Amer ca

Patton, David R. (1964)..... ..... *Adjunct Associate Professor of Agriculture*
B S , West Virg n a Univers ty, M.S., Virg n a Polytechn c Institute, Ph D Un versity of Arizona

Plog, Frederick T. (1975).. ..... *Adjunct Professor of Anthropology*
B.A., Northwestern University; M A Ph D., Un vers ty of Chicago

Powell, Joseph (1977).. ..... *. Adjunct Assistant Professor of Health Services Administration*
B C.E , University of Co orado; M C E , Rensselaer Polytechn c Inst tute

Prather, William F. (1980).. ..... *..Adjunct Professor of Speech and Hearing Science*
B.A., Un versity of Cal forn a, M A , Ph.D University of Iowa

Radin, John W. (1982) ..... *.. Adjunct Professor of Botany and Microbiology*
B S., Ph D , Un versity of Cal fornia

Rice, Grace Elizabeth (1978) ..... *....Adjunct Assistant Professor of Anthropology*
B A., Reed Col ege, Ph.D , University of Cal forn a

Rowe, David N. (1979) ..... *....Adjunct Professor of Political Science*
A.B , Princeton University, M A , Un versity of Southern Cal forn a, Ph D , University of Ch cago

Ryan, Carl R. (1980) ..... *...Adjunct Professor of Engineering Electrical and Computer Engineering*
B.S E.E , University of Arkansas; M S E E., Iowa State University; Ph D , University of M ssouri, Rol a

Salvatore, Anthony P (1977) ..... *..Adjunct Associate Professor of Speech and Hearing Science*
B S M S , Emerson College, Ph D , Un vers ty of Pittsburgh

Sample, Tish (1978). ..... *...Adjunct Assistant Professor of Anthropology*
A B , Wh tman College, M A , Un vers ty of Cal fornia, Ph D , U n versity of W sconsin

Severson, Kieth E..... *Adjunct Associate Professor of Agriculture*
B A , University of M nnesota, M S , Ph D , Un vers ty f Wyom ng

Shakin, Carl M. (1982) ..... *Adjunct Professor of Physics*
B.S , New York University, M.A , Ph D , Harva d University

Shoemaker, Alice (1979) ..... *..Adjunct Lecturer of Home Economics*
B A , Goshen College, M S , Purdue Un versity

Snyder, Richard C. (1979)... ..... *Adjunct Professor of Political Science*
A B , Un on Co lege, Schenectady, M A Ph D., Columb a Un ver ity

Soleri, Paolo (1975) ..... *Adjunct Professor of Planning*
D. Arch., Pol tecnico di Torino

Stark, Louisa R. (1981) ..... *Adjunct Professor of Anthropology*
B A , Barnard Col ege, M.A , Columbia Univers ty, Ph D., New York University

Starr, Mortimer P. (1982) ..... *Adjunct Professor of Botany and Microbiology*
B.A , Brook yn College M S., Ph D , Cornell Univers ty

Sutton, Samuel J (1975) ..... *Adjunct Professor of Law*
B A , B S University of Ar zona, J D , George Washington University

Testa, D'Jean (1982) ..... *Adjunct Assistant Professor of Social Work*
B S , Arizona State Univers ty

Whaley, Patricia (1975) ..... *Adjunct Lecturer in Speech and Hearing Science; Director Speech and Hearing Clinic*
B S., M Ed , Univers ty of Georg a

Zettler, Hugo F (1977) ..... *Adjunct Assistant Professor of Law*
B S Arizona State Univers ty, J.D , Un vers ty of Ar zona

University Library

Donald E. Riggs (1979) ..... *University Librarian*
B A G envi le State Col ege, M A , West Virginia University M L.S , University of P ttsburgh; Ed D , Virg n a Po ytechnic Institute and State University

Gater, Helen L. (1970) ..... *Associate University Librarian*
B A Fort Hays Kansas State Col ege, M A , Univers ty of Denver

Corey, Constance H (1973) ..... *Assistant University Librarian for Management Services*
B A , Denison Un versity, M L.S , L n versity of Ar zona, M B A , Ar zona State Un versity

Foster, Sallie F (1977) ..... *Assistant University Librarian for Automation and Systems*
B A., M L S , Un vers ty of Ca ifornia, Berke ey

Batalden, Sandra (1977) ..... *Assistant Librarian Collection and Acquisitions Service*
B A , M.A Univers ty of M nnesota

Biblarz, Dora (1980) ..... *Associate Librarian; Head, Collection and Acquisitions Service*
B A , Univers ty of Ca ifornia, Los Angeles; M A , Univers ty of California, Davis; M L S , L niversity of Cal fornia Los Ange es

Blouin, Deborah K (1971) ..... *Associate Librarian, Reference Service*
B A Cedar Crest Co lege, M.L S , State Un versity of New York, Albany

Borovansky, Vlad mir T. (1968) ..... *Librarian; Head, Noble Library*
M L.S., Charles Un versity (Prague, Czechos ovak a)

Brem, Walter V. Jr (1979) ..... *Assistant Librarian, Reference Service*
B A , M.A. Univers ty of Ca ifornia, Santa Barbara, M L S., Univers ty of California Berkeley

Brownson, Charles W (1980) ..... *Associate Librarian, Reference Service*
B.A , South Dakota State Univers ty M A , Un versity of Oregon M L.S , Univers ty of Ca ifornia, Berkeley

Burke, Rebecca J (1981) ..... *Affiliate Librarian, Government Documents Service*
B A , San Jose State L n versity, M L S , Un versity of Arizona

Conrow, Jane A. (1968) ..... *Librarian; Head, Access Services*
B A , M L S , Indiana Un vers ty

DeFato, Rosalinda 1970) ..... *Associate Librarian, Reference Service*
B A , St John's L n vers ty, M L S L n vers ty of Ca ifornia, Los Angeles

Dusenbury, Carolyn A (1980) ..... *Associate Librarian; Head, Reference Service*
B S L n vers ty f Ca forn a, Santa Barbara M L S , Un versity of California Los Ange es

Ferrall, J E anor (1969) ..... *Librarian, Reference Service*
A B He delberg Co lege, M.A , Ar zona State University

Knepp, Kenneth B. (1968) ..... *Associate Librarian, Catalog Service*
B A L niversity of the Pacific, B D , Garrett heo og ca Sem nary, M A , University of Denver

Larson, Donna R (1972) ..... *Librarian; Head, Government Documents Service*
A B , M A L S , L n vers ty of M chigan

Leibold, Anne M (1977) ..... *Associate Librarian Collection and Acquisitions Service*
M A , n vers ty of Par s

Machovec, George (1977) ..... *Assistant Librarian, Science Reference Service*
B S , M L S , Un versity of Ar zona

McColgin, Ronda L. (1970) ..... *Associate Librarian, Catalog Service*
B A., Ar zona State University, M.S.L S University of Southern Ca ifornia

McDonald, Arlys L. (1970) ..... *Associate Librarian; Head, Music Library*
B.Mus , St Mary of the Plains; M. Mus , University of I l nois

Meister, Marcia (1978) ..... *Assistant Librarian, Government Documents Service*
B.A , M.A., Un versity of Wisconsin, Madison

Miller, Rosanna (1974) ..... *Associate Librarian Head, Map Service*
B.A , M A., Ar zona State University; M L S., University of Arizona

Palais, Elliot S. (1959-62, 1966) ..... *Librarian, Collection and Acquisitions Service*
B A , Bowdoin Col ege, A M L.S., Univers ty of Michigan

Pinckard, Mary Margaret (1982) ..... *Assistant Librarian, Head Science Reference Service*
B.S , University of New Hampshire, M L.S., University of Ar zona

Rhodes, Diane B. (1980) ..... *Assistant Librarian Catalog Service*
B S , Col ege of Wil iam a d Mary, M L.S , Univers ty of Wisconsin, Mad son

Rich, Stephen K. (1976) ..... *Assistant Librarian, Reference Service*
B A , Amherst College; M L S , Indiana Un versity

Richardson, Larry L (1982) ..... *Assistant Librarian; Head, Instruction and Orientation*
B A , University of Oregon, M.A , Monterey Institute of Foreign Studies, M A L S , University of W sconson, D A , University of Wash ngton

Romer, James W. (1981) ..... *Assistant Librarian, Collection and Acquisition Services*
B A , Erskine College; M A , M L S , Ph D , Univers ty of North Carolina

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 Franc sco State Col ege, M.A , Californ a State Univers ty, Chico, M A , University of Denver

Schneberger, Lois I. (1969) ..... *Librarian, Head Catalog Service*
B A., Viterbo College; M L S , Kansas State Teachers Co lege

Steel, Virginia (1981) ..... *Assistant Librarian, Reference Service*
B.A , University of Rochester, M A , Univers ty of Chicago

Stewart, Douglas J. (1982) ..... *Assistant Librarian, Reference Service*
B.A., M A., University of Co orado M A., University of Denver

Swaty, Mary A. (1968) ..... *Associate Librarian, Catalog Service*
B.A., University of Missouri; M L S., Ind ana Univers ty

Sylvester, Virginia R. (1981) ..... *Affiliate Librarian, Access Services*
B A , Hobart and William Smith Colleges, M.L S Rutgers Univers ty

Thomas, Alfred Jr. (1939) ..... *University Archivist, University Archives*
B A., M A., Arizona State Univers ty

Vanderhoff, Barbara A. (1968) ..... *Associate Librarian, Head, Serial Records*
B.A., Fort Hays Kansas State College; M.A , Un versity of Denver

Voth, Annette (1978) ..... *Associate Librarian; Music Library*
B. Mus , University of Kansas, Lawrence; M L S , M A , University of California, Berke ey

Walters, Sheila A. (1971) ..... *Assistant Librarian, Science Reference Service*
B.A , University of Oklahoma, M L S , Louisiana State Univers ty

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 Univers ty

Wu, Ai Hwa (1964) ..... *Associate Librarian, Catalog Service*
B.A , Nationa Taiwan University; M L S., Univers ty of Washington

Wick, Constance S. (1981) ..... *Affiliate Librarian, Science Reference Service*
B S., City College of New York, M L S , University of Ar zona

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

Brown, Richard L. (1982) ..... *Director*
B.A., University of California, Los Angeles; J.D., Indiana University; M.L.L., University of Washington

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

Alcorn, Marianne S. (1981) ..... *Reference Circulation Librarian*
B.A., University of Washington; M.L.S., University of Southern California

Au, Chih Chun (1970) ..... *Head, Technical Services*
B.A., National Taiwan University; M.A., University of Chicago

Chase, Marcelle P. (1983) ..... *Reference Librarian*
J.D., University of Brussels, Belgium; M.S., Ball State University

Firestone, Sharon A. (1977) ..... *Acquisitions Serials Government Documents Librarian*
B.A., M.L.S., University of Washington; M.A., Arizona State University

Student Health Service

Roth, Monty (1982) ..... *Director*
B.S., Oklahoma State; M.D., University of Oklahoma

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

Steckl, L. Ruth (1981) ..... *University Physician*
University of Vienna Medical School; Fellow of American Academy of Pediatrics

Steinhauser, Gale (1981) ..... *University Physician*
M.D., State University of New York Downstate Medical Center

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 of Manitoba, Winnipeg, Canada

Minke, William C. (1973) ..... *University Psychiatrist, P/T*
M.D., University of 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 Organization

Academic Administration

Vice President Academic Affairs ..... *Jack B. Kinsinger*
Assistant Academic Vice President ..... *Elmer R Gooding*
Assistant Academic Vice President .....
Assistant Academic Vice President .....
Assistant Vice President for Research Director, Grants and Contracts..... *Harold B. Hunnicutt*

Colleges and Schools

College of Liberal Arts ..... *Guido G. Weigend, Dean*
College of Architecture ..... *Gerald R McSheffrey Dean*
College of Business Adm'nistration ..... *L William Seidman, Dean*
College of Education ..... *Robert T Stout, Dean*
College of Engineering and Applied Sc ences ..... *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 ..... _____, *Dean*
College of Public Programs ..... *Nicholas L Henry, Dean*
Graduate College ..... *Charles M Woolf, Dean*
School of Social Work ..... _____ *Dean*
Continuing Education and Summer Sessions ..... *Denis J. Kigin, Dean*

Instruction Units

Accounting ..... _____, *Chair*
Administrative Services ..... *Lohnie J Boggs, Chair*
Aeronautical Technology ..... *William H Reed*
Aerospace Studies ..... *Col Charles H Keck Chair*
Agriculture ..... *George Seperich, Director*
Anthropology ..... *Brian Foster Chair*
Architecture ..... *Roger L. Schluntz Chair*
Art ..... *Leonard Lehrer, Director*
Botany and Microbiology ..... *Milton R. Sommerfeld, Chair*
Chemical and Bio Engineering ..... *Imre Zwiebel, Chair*
Chemistry ..... *Morton E Munk Chair*
Civil Engineering ..... *Charles O'Bannon, Chair*
Communication ..... *Robert Gover Chair*
Computer Science ..... *William Lewis Chair*
Construction ..... *Vernon Hastings, Director*
Counselor Education ..... *William Cabianca, Chair*
Study of Justice, Center for ..... _____, *Director*
Dance ..... *Elizabeth C Lessard Chair*
Design Sciences ..... *Tom Witt Chair*
Economics ..... *William Boyes Chair*
Educational Administration and Supervision ..... *Richard Wootton Chair*
Educational Psychology ..... _____, *Chair*
Educational Technology and Library Science ..... *Norman Higgins, Chair*
Electrical and Computer Engineering ..... *Richard Kelly, Chair*
Electronic Technology ..... *Thomas A Kanneman*
Elementary Education ..... *Jon Engelhardt Chair*
Engineering Core and Special and Interdisciplinary Programs ..... *George C Beakley, Director/Associate Dean*
English ..... *Nicholas A. Salerno, Chair*
Finance ..... *Michael Joehnk, Chair*

Foreign Languages ..... _____, *Chair*
Geography ..... *W. Donald McTaggart, Chair*
Geology ..... *Paul Knauth, Chair*
Health and Physical Education ..... *Gary S. Krahenbuhl, Chair*
Health Services Administration, Center for ..... *Charles L. Eveland, Director*
Higher and Adult Education ..... *Richard C. Richardson, Chair*
History ..... *Fred Giffin, Chair*
Home Economics ..... *Helene Hoover, Chair*
Industrial and Management Systems Engineering ..... *Richard L. Smith, Chair*
Industrial Technology ..... *Zenas A. Prust, Chair*
Journalism and Telecommunication ..... *ElDean Bennett, Chair*
Leisure Studies ..... *Glenn Cheatham, Chair*
Management ..... *Harold Fearon, Chair*
Marketing ..... _____, *Chair*
Manufacturing Technology ..... *Peter A. Schmidt*
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APPENDIX A

MEMORANDUM _____ Off e of the President
965 5606

November 9, 1982

TO: All Employees and Students

FROM: J. Russell Nelson, President

SUBJECT: Policy Statement on Equal Employment Opportunity and Affirmative Action

Arizona State University reaffirms its commitment to increasing opportunities at all levels of employment and participation in its programs and activities by all faculty, staff, and students without regard to race, color, religion, national origin, sex, age, handicap, or veteran status.

Our commitment extends to recruiting and hiring, promotion, and other personnel actions such as compensation, benefits, transfers, layoffs, return from layoff, terminations, University sponsored training, education, tuition assistance, and social and recreational programs.

The Office of Assistant to the President for Equal Employment Opportunity, Affirmative Action, and Minority Affairs has been established to advise, advocate, administer, coordinate, monitor, and supervise all programs in the areas of equal employment, affirmative act'on, and minority affairs.

The Office of Assistant to the President is the umbrella for authorizing personnel practices for complying with, coordinating, and administering all federal and state laws and regulations per taining to discrimination and affirmative action in employment, programs, and activitie of the University. The federal and state laws and regulations include but are not limited to

Title VI of the Civil Rights Act of 1964, as amended

Title VII of the Civil Rights Act of 1964, as amended

Title IX of the Education Amendments of 1972, as a ended

Executive Order 11246, as amended and regulations

Revised Order Number 4

Sections 503 and 5 4 of the Rehabilitation Act of 1973 and regulations

Vietnam Era Veterans Readjustment Assistance Act of 1974 and regulations

Equal Pay Act of 1963 and regulations

Age Discrimination in Employment A t of 1967, as amended in 1978

Age Discrimination Act of 1975 and regulations

Arizona Civil Rights Act of 1965, as amended

Arizona State University Policy on Sexual Harassment, 1982

Through the Office of Assistant to the President, matters involving allegations of discriminati n in employment, educational programs or activities are channelled for inve tigation and res lution Any employee or student may vi it Luis Aranda, As istant to the President for Equal E ployment Opportunity and Affirmative Action, in confident al ty to d scuss any oncern and to explore available options without fear of jeopardizing either job or status with the Univer ity. T e office is located in the Academic Serv ces Build ng, roo 113; the telephone number i 965 5057.

With the support of every individual at Arizona State University, the affirmat ve act n effort should ultimately provide inclusion and utilization of all minoritie and w en in an appropr ate manner at every level of responsibility and endeavor. I ask that you give equa employment op portunity and affirmative action your utmost attention and that you direct your energies to ts ultimate success.

Revised 11 4 82
Supercedes 10 27 81

J. Russell Nelson
President

APPENDIX B

UNIVERSITY POLICY FOR STUDENT APPEAL PROCEDURES ON GRADES

Informal: This procedure must be undertaken first. Grade grievance disputes must be filed within the regular semester immediately following the issuance of the grade in dispute, whether enrolled in the University or not.

A. The aggrieved student must first undergo the informal procedure of conferring with the instructor, stating the evidence (if any) and reasons for questioning that the grade received was not given in good faith. The instructor is obliged to review the matter, explain the grading procedure utilized, and show how the grade in question was determined. If the instructor is a graduate assistant and this interview does not resolve the difficulty, the student may then go to the faculty member in charge of the course (regular faculty member or director of the course sequence) with the problem.

B. If the grading dispute is not resolved in Step A, the student may appeal to the department chair or other appropriate chair of the area within the department (if any). The department chair may confer with the instructor to handle the problem. Step B applies only in departmentalized colleges.

C. If these discussions are not adequate to settle the matter to the complainant's satisfaction, the student may then confer with the dean of the college concerned (or the dean-designate), who will review the case. If unresolved, the dean or designate may refer the case to the college academic grievance hearing committee to review the case formally. In most instances, however, the grievance procedure will not go beyond this level.

Formal: The following procedure takes place after Steps A, B, and C (or A and C) have been completed.

D. Each college has on file in the Office of the Dean (and in each department of the college) the procedures and composition of the undergraduate or graduate academic grievance hearing committee for student grievances. Each college committee shall operate under grievance procedures as stated which satisfy due process requirements. The committee shall always meet with the student and the instructor in an attempt to resolve the differences. At the conclusion of the hearing, the committee shall make a written report containing its recommendations and provide copies to the student concerned, the instructor, the department chair (if any) and the dean.

E. Final action in each case will be taken by the dean after full consideration of the committee's recommendation. Grade changes (if any and if recommended by the committee) will be made by the instructor (or the dean of the college in the absence of the faculty member). The dean shall have authority to take action as is deemed necessary by the case and shall so inform the student, instructor, department chair (if any) and the Registrar of action taken.

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