

NOTE: One course in the area of global awareness* and one course in historical awareness* *must* appear in the final list of courses offered in the student's graduation program of study. If desired, these can be included in the humanities and fine arts/social and behavioral sciences course selections.

* See pages 57-66 for acceptable courses in these categories.

† Required for graduation.

Agribusiness and Environmental Resources Core

All students pursuing a B.S. degree in the school will complete the following general core courses:

	<i>Semester Hours</i>
AGB 300 Livestock Management	3
AGB 302 Introduction to Agribusiness	3
AGB 310 Crop Management	3
ERA 346 Environmental Conservation	3
Total	12

The following proficiency core courses are required of all students:

	<i>Semester Hours</i>
AGB 130 Plant Science and	
AGB 150 Animal Science	6
or BIO 181, 182 General Biology (8)	
* CHM 101 Introductory Chemistry	4
or CHM 113 General Chemistry (4)	
and CHM 115 General Chemistry	
with Qualitative Analysis (5)	
* ECN 111 Macroeconomic Principles	3
* ERA 350 Applied Quantitative Methods	3
* MAT 115 College Algebra and	
Trigonometry	4
or MAT 117 College Algebra (3)	
and MAT 118 Plane Trigonometry	
(2) or MAT 210 Brief Calculus (3)	
A minimum of one computer course	3
(Acceptable list in School of Agribusiness and	
Environmental Resources Office)	
Total	22-31

* These courses are a part of the General Studies requirements.

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:

	<i>Semester Hours</i>
ACC 211, 212 Elementary Accounting	6
AGB 312 Agricultural Marketing	3
AGB 332 Agribusiness Finance	3
AGB 342 Agribusiness Management I	3
AGB 364 Agribusiness Technology	3
AGB 412 Agricultural Commodities	3
AGB 443 Agribusiness Management II	3
AGB 444 Agribusiness Analysis	3
AGB 455 Agricultural Marketing Channels	3
AGB 458 International Agribusiness	3
AGB 474 Agribusiness Policy and Government	
Regulations	3
AGB 490 Recent Advances in Agribusiness	1
ECN 112 Microeconomic Principles	3
Total	40

Agribusiness, as a concentration, contains the following options:

General agribusiness 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. Functional, institutional and behavioral aspects of marketing are examined while studying the flows of products and services through the various market channels for agricultural inputs, commodities and food. Emphasis is placed on up-to-date management/marketing methods that will allow graduates to successfully meet challenges in the food and fiber industries. Graduates are qualified to make significant contributions in a broad range of career opportunities which exist in agribusiness. Many start career paths which will lead to upper-level agribusiness management/marketing positions.

International agribusiness 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 knowledge 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.

Food industry focuses on the scientific and technical competence required for employment in this field. Strong emphasis is given to basics such as food chemistry, food processing and food safety. This unique program offers employment opportunities for graduates in food industries, regulatory agencies and consumer organizations.

Pre-veterinary medicine is primarily designed to meet the entrance requirements of professional veterinary medical schools in the United States and Canada. Selection of this area will permit students to complete the pre-veterinary requirements for entrance to professional veterinary school. The curriculum permits the student to obtain some course work in agribusiness, especially as it relates to professional practice and industry. This background also provides an important alternative for the student who does not actually enter veterinary school. Completion of all requirements for a B.S. degree in Agribusiness at ASU is provided by completing additional credits, if desired. A pre-veterinary medicine student who has been accepted to a school of veterinary medicine and who also elects to earn a Bachelor of Science degree in the School of Agribusiness and Environmental Resources may do so by completing a minimum of 30 semester hours at ASU and by completing the Agribusiness and Environmental Resources 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 grade point average 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 related jobs in agribusiness and government.

Typical Curriculum for Agribusiness

		Semester Hours
First Year		
AGB 130	Plant Science	3
AGB 150	Animal Science	3
CHM 101	Introductory Chemistry	4
ENG 101, 102	First-Year Composition	6
MAT 115	College Algebra and Trigonometry ...	4
	Social and Behavioral Sciences Courses ¹	6
	General Elective Courses	6
Total		32
Second Year		
ACC 211, 212	Elementary Accounting	6
AGB 302	Introduction to Agribusiness	3
ECN 111	Macroeconomic Principles	3
ECN 112	Microeconomic Principles	3
	Agribusiness Electives Courses	9
	Humanities and Fine Arts Courses ¹	6
	General Elective Courses	3
Total		33
Third Year		
AGB 312	Agricultural Marketing	3
AGB 332	Agribusiness Finance	3
AGB 342	Agribusiness Management I	3
AGB 364	Agribusiness Technology	3
AGB 300	Livestock Management	3
AGB 310	Crop Management	3
ERA 346	Environmental Conservation	3
ERA 350	Applied Quantitative Methods	3
	Option Courses	6
Total		30
Fourth Year		
AGB 412	Agricultural Commodities	3
AGB 443	Agribusiness Management II	3
AGB 444	Agribusiness Analysis	3
AGB 455	Agricultural Marketing Channels	3
AGB 458	International Agribusiness	3
AGB 474	Agribusiness Policy and Government Regulations	3
AGB 490	Recent Advances in Agribusiness	1
	Option Courses	9
	General Elective Courses	3
Total		31

¹ See pages 42-45 and 48-55 for requirements and approved list.

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 management concentration will study application of these principles to

wildland ecosystems. Students in the urban horticulture concentration will study the application of these principles in garden, landscape and greenhouse environments.

Natural resource management, as a concentration, includes the following options:

Resource agribusiness combines the technical aspects of the resource ecology area with solid background in agribusiness. An emphasis is placed on the combination of a technical background with the knowledge of business concepts and skills which will provide the background for managing people, products and services associated with resource related agribusiness. Employment opportunities for students following this option will be primarily with these industries.

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.

Water and soil management deals with the wise use of these important resources. Wise use is essential if environmental quality and productivity are to be maintained in view of the hazards posed by erosion, pollution and sedimentation. Course work in this option emphasizes soil science; however, a strong foundation in the biological and agricultural sciences is required. Students choosing this option can pursue employment with government agencies or private industries which are concerned with managing, wisely utilizing and protecting these resources.

Students selecting the natural resource management concentration are required to take the following courses:

	<i>Semester Hours</i>
ERA 325 Soils	3
ERA 326 Soils Laboratory	1
ERA 333 Water Resources	3
ERA 360 Range Ecosystems	4
ERA 440 Crop Growth and Development	3
ERA 460 Applied Systems Ecology	3
ERA 490 Recent Advances in Environmental Resources	1
ENG 301 Writing for the Professions	3
Total	21

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 course work 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.

Students selecting the urban horticulture concentration are required to take the following courses:

	<i>Semester Hours</i>
AGB 130 Plant Science	3
CHM 231 Elementary Organic Chemistry	4
ERA 301 Arboriculture	3
ERA 325 Soils	3
ERA 326 Soils Laboratory	1
ERA 380 Landscape Plants	3
ERA 381 Plant Propagation	3
ERA 440 Crop Growth and Development	3
ERA 450 Horticultural Plant Problem	3
ERA 498 PS: Pest Management	3
Total	29

**Typical Curriculum for
Environmental Resources in Agriculture
First Year**

	<i>Semester Hours</i>
CHM 101 Introductory Chemistry	4
ENG 101, 102 First-Year Composition	6
MAT 115 College Algebra and Trigonometry	4
Computer Course	3
Social and Behavioral Sciences Courses ¹	8
General Elective Courses	6
Total	31

Second Year

BIO 181, 182 General Biology	8
ERA 325 Soils	3
ERA 326 Soils Laboratory	1
Humanities and Fine Arts Courses ¹	8
* Option Requirements	10
Total	30

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Third Year

AGB 310	Crop Management	3
AGB 300	Livestock Management	3
AGB 302	Introduction to Agribusiness	3
ERA 350	Applied Quantitative Methods	3
ERA 346	Environmental Conservation	3
*	Option Requirements	18
	Total	33

Fourth Year

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

* *Option requirements as listed for individual programs.*

¹ See pages 42-45 and 48-55 for requirements and approved list.

AGRIBUSINESS

AGB 101 Food Chain. (2) F

Dependence of the quality, quantity and cost of national food supplies on technology, marketing and world agricultural policies. [*Satisfies General Studies Requirement: G*]

130 Plant Science. (3) S

Plant growth and development in the rural and urban environment. 2 lectures, 3 hours lab.

150 Animal Science. (3) F

Comparative growth, development and propagation of farm animals. 2 lectures, 3 hours lab.

160 Veterinary Medicine Today. (2) N

Introduction to the role of the veterinarian as related to the fields of food supply and veterinary medicine.

300 Livestock Management. (3) F

Methods of managing livestock enterprises, economics, loss prevention and marketing. Prerequisite: AGB 150.

302 Introduction to Agribusiness. (3) F

Impact of national policy and world agriculture on the cost, quantity and quality of the U.S. food resources.

305 Nutritional Science. (3) N

Energy and nutrients in living systems. Corequisite: CHM 101 or equivalent.

306 Nutritional Science Laboratory. (1) N

Experimental trials involving the principles of nutrition and the physiological roles of nutrients in metabolism. 3 hours lab. Corequisite: AGB 305.

310 Crop Management. (3) S

Crop production and management principles and their application to crop growth and development. Prerequisite: AGB 130.

312 Agricultural Marketing. (3) F

Marketing arrangements for agricultural products.

332 Agribusiness Finance. (3) S

Agribusiness investment management and financial institutions that serve agriculture. Prerequisite: ECN 111.

335 Establishing an Agribusiness. (3) F

Establishing entrepreneurship in agriculture, including legal status, financing, planning, marketing and management. Prerequisite: junior standing.

342 Agribusiness Management I. (3) S

Principles of management: planning, organizing, integrating, measuring and developing people in agribusiness organizations.

353 Applied Animal Nutrition. (3) S

Feedstuffs, feeding standards and their application in meeting nutritional needs of animals producing food and fiber.

364 Agribusiness Technology. (3) S

Processing and preservation of food products. Prerequisites: CHM 101 or 113; MAT 115 or 210.

365 Food Technology Laboratory. (1) F

Experiments and procedures in processing and packaging foods. 3 hours lab. Corequisite: AGB 364.

368 Food Processing. (3) F

An introduction to processed food quality assurance, statistical sampling and inspection procedures. Prerequisites: AGB 364; ERA 350.

369 Food Analysis. (3) F

Processing control and scientific instrumentation used in food quality assurance laboratories. 2 lectures, 3 hours lab. Prerequisites: CHM 225, 226.

370 Companion Animals to Man. (3) N

Selection, breeding, health and care of pets. Includes their social and economic impact on urban living.

371 Pet Nutrition. (3) N

Review and application of nutrition principles in feeding man's companion animals. Prerequisite: BIO 100 or CHM 101.

390 Agricultural Accounting. (3) N

Basic accounting applications commonly used by agricultural industries, including tax and management information systems.

402 Agricultural Cooperatives. (3) N

Organization, operation and management of agricultural cooperatives.

403 Agribusiness Public Relations. (3) N

The image of agriculture, including consideration of the agricultural press. Prerequisite: AGB 312.

404 Sales and Merchandising in Agribusiness. (3) N

The principles and techniques of selling and commodity merchandising in the agricultural industries. 2 lectures, 3 hours lab.

405 Future Food Supply. (3) N

Food and agricultural supply forecasting, scenario development and analysis, and alternative response strategies.

412 Agricultural Commodities. (3) F

Trading on futures markets. Emphasis on the hedging practices with grains and meats. Prerequisite: AGB 312 or one marketing or finance course.

413 Financial Commodities. (3) S

Trading on futures markets. Emphasis on the hedging practices with financial and currency instruments. Prerequisite: AGB 332 or FIN 300.

414 Advanced Commodity Trading. (3) N

Advanced analysis of trading techniques with emphasis on hedging in the futures markets. Prerequisite: AGB 412 or 413.

425 Food Safety. (3) S

Food hazards prevention, detection, assessment and neutralization. Regulatory agency enforcement programs are emphasized. Prerequisite: AGB 364.

426 Food Chemistry. (4) S

The biochemical and chemical interactions that occur in raw and processed foods. 3 lectures, 3 hours lab. Prerequisites: CHM 115, 231.

428 Comparative Nutrition. (3) N

Effects of nutrition on animal systems and metabolic functions. Prerequisites: AGB 305; CHM 231.

433 Diseases of Domestic Animals. (3) N

Control and prevention of infectious and noninfectious diseases of domestic animals. Prerequisite: MIC 201 or 210.

435 Animal Physiology I. (4) N

Control and function of the nervous, muscular, cardiovascular, respiratory and renal systems of domestic animals. 3 lectures, 3 hours lab. Cross-listed as BME 435. Prerequisites: BIO 181; CHM 113.

436 Animal Physiology II. (3) N

Control and function of the endocrine, digestive and reproductive systems of domestic animals. Principles of adaptation of animals to their environment. Cross-listed as BME 436. Prerequisite: AGB 435 or ZOL 360.

437 Animal Physiology Laboratory. (1) N

Selected physiological experiments to accompany AGB 436. 3 hours lab. Cross-listed as BME 437. Corequisite: AGB 436.

439 Veterinary Practices. (3) F, S

Observation of and participation in veterinary medicine and surgery supervised by local veterinarians. Prerequisite: advanced pre-veterinary student.

440 Food Marketing. (3) S

Food processing, packaging, distribution, market research, new food R&D and social implications. Prerequisite: AGB 364.

443 Agribusiness Management II. (3) F

Principles of human resource management with emphasis on the special problems of agribusiness systems. Prerequisite: AGB 342.

444 Agribusiness Analysis. (3) S

Identifies the size, scope and organization of the various agriculturally oriented industries.

445 World Crop Management. (3) N

Latest techniques in producing and harvesting major irrigated field crops. Includes crop planning. 2 lectures, 3 hours lab. Prerequisite: AGB 310.

450 International Agricultural Development. (3) F

Transition of developing countries from subsistence to modern agriculture. Technology transfer and food improvement programs are emphasized. Prerequisite: AGB 312. [Satisfies General Studies Requirements: SB, G]

451 International Food Resources. (3) N

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

Transition and development of raw agricultural commodities into nutritional food products. Emphasis given to food expansion in developing countries. Prerequisite: AGB 302 or 364.

453 World Agricultural Resources. (3) S

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) N

Dimensions, locations, mix, methods and changes of international trade in agricultural products. Prerequisite: AGB 312.

455 Agricultural Marketing Channels. (3) S

Operational stages of agricultural commodities in normal distribution systems and implementation of marketing strategies. Prerequisite: AGB 312.

458 International Agribusiness. (3) N

Identification and analysis of methods, problems and future of international agribusiness operations. Emphasizes special problems associated with international agribusiness systems. Prerequisite: AGB 312. [Satisfies General Studies Requirements: SB, G]

460 Agribusiness Management Systems. (4) S

The development and use of decision support systems for agribusiness management and marketing. 3 lectures, 3 hours lab. Prerequisites: AGB 332, 342; ERA 350.

474 Agribusiness Policy and Government Regulations. (3) F

Factors involved in the development and implementation of Federal laws and their impact on policy procedures that influence agribusiness. Prerequisites: AGB 312, 342.

490 Recent Advances in Agribusiness. (1) F, S

Reports and discussions of current topics and problems associated with agribusiness. May be repeated for credit.

505 Commodity Analysis. (3) N

Analysis of commodity markets. Prerequisite: 1 year of economics or marketing.

508 Advanced Agricultural Marketing. (3) F

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) F

Assessment and current problems in managing human and financial resources in agribusiness. Case studies and analysis of special agribusiness problems. Prerequisite: AGB 342.

511 Advanced Agribusiness Management II. (3) S

Analysis of organization behavior, change and resource requirements within agribusiness systems. Prerequisite: AGB 342.

512 Food Industry Management. (3) S

Operations and management of food processing factories, food distribution centers and retail food handling firms.

516 International Agricultural Techniques. (3) N

Coordination of production and marketing techniques to consumption objectives with agricultural products in foreign countries.

518 World Agricultural Development. (3) N

Factors that influence production, processing and marketing of agricultural products in developing countries.

520 Advanced Agribusiness Analysis I. (4) S

Vertical integration and differentiation in food and agricultural industries. 4 hours lecture, recitation. Prerequisites: AGB 508, 510 and 532 or equivalents.

521 Agribusiness Coordination. (4) N

Organizational alternatives for agribusiness with emphasis on cooperatives and trading companies. 4 hours lecture, recitation. Prerequisites: AGB 508, 510 and 532 or equivalents.

525 Advanced Agribusiness Management Systems. (3) N

Development and use of decision support systems for agribusiness management decision making. Prerequisites: AGB 510, 532.

527 Agribusiness Research Methods. (3) N

The use of model building, hypothesis testing and empirical analysis in solving agribusiness problems.

530 Advanced Agribusiness Policy. (3) N

Policymaking history, structure and process. Prerequisite: AGB 508.

450 Horticultural Plant Problems. (3) F

Identification and control of biotic and abiotic factors which cause common problems to horticultural plants. Prerequisites: ZOL 354; a plant pathology course.

452 Soil, Water and Irrigation. (3) S

Water measurement, conveyance and conservation with emphasis on crop production and soil-plant water relations. Prerequisite: ERA 325.

460 Applied Systems Ecology. (3) S

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

Functional design and integrated management of greenhouse and hydroponic systems. 2 lectures, 3 hours lab. Prerequisites: AGB 130; ERA 325.

470 Land Reclamation. (3) N

Problems of re-establishing vegetation on disturbed sites. Special revegetation techniques, surface modifications and government regulations. 1 weekend field trip. Prerequisites: ERA 446, 407, 420, 448; or instructor approval.

475 Range Animal Management. (3) N

Principles and techniques for management of domestic and non-domestic animals using rangeland ecosystems. Emphasis on practical applications of management. Weekend field trips. Prerequisite: Instructor approval.

480 Natural Resource Planning. (3) N

Principles and techniques of planning for management and conservation of natural ecosystems. Use of optimization models and decision theory. Preparation of management plan. 3 lectures, 1 weekend field trip. Prerequisites: ERA 402; senior standing.

490 Recent Advances in Environmental Resources. (1) N

Current literature and significant developments involving environmental resources. May be repeated for credit.

540 Plant Responses to Environmental Stresses. (3) N

Reaction of plants to environmental stresses; herbivores, fire, pesticides, mechanical treatments, aerial pollutants and soil amendments. 1 weekend field trip. Prerequisites: BOT 360; ERA 420; or instructor approval.

548 Plants, Soils and Environmental Quality. (3) N

Effects of air quality on plants and soils, and their role in removing contaminants from the atmosphere. Prerequisite: ERA 325.

550 Vegetation Dynamics. (3) N

Succession concept and its use in site evaluation. Habitat type concept. Herbivory as an ecological process. Prerequisites: BOT 420; ERA 364; or instructor approval.

560 Systems Ecology. (3) N

Quantitative description and mathematical modeling of ecosystem structure and function. Techniques for model construction and simulation. 2 lectures, 3 hours lab. Prerequisites: 6 hours in ecological studies; computer programming; ERA 350 or equivalent.

570 Reclamation of Critical Habitats. (3) N

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. 2 lectures, 3 hours lab. Field trips. Prerequisites: ERA 448, 470, 540, 550; or instructor approval.

581 Plant Tissue and Cell Culture. (3) F

Asceptic, clonal propagation of plants via isolated cells, tissues and organs. 2 lectures, 3 hours lab. Prerequisites: BOT 360; ERA 381 or 440.

Special Courses: ERA 484, 494, 498, 499, 500, 580, 584, 590, 591, 592, 593, 594, 598, 599. (See pages 36-37.)

School of Construction and Technology

Paul E. Russell, Ph.D., Director

Purpose

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

The Construction program and its options provide a well integrated program which will give the student proficiency for a professional construction career, and also develop ideals, judgment, character and breadth of view necessary for a successful constructor as well as significant cultural attitudes.

The technology programs provide the opportunity to earn a degree in a technological field which stresses theory reinforced by laboratory application, in other words, a more applied approach than engineering students experience. The Engineering Technology and Industrial Technology programs offer challenging career opportunities in industry and government for the forward looking student. The technology graduate in industry becomes a member of the total engineering effort, contributing an applications-orientation to complement the engineer's more theoretical concepts. A student will be educated to render practical decisions with safety and economy in mind; to install and operate technical systems; develop or improve a product; to revise systems; and to provide customer support when needed.

Degrees

Bachelor of Science degree programs, and options within each major, are offered in the five departments as shown on page 242. Each curriculum includes some elective courses which are reserved for the student's use to add a unique emphasis or dimension. These credits are traditionally referred to as technical electives and are normally restricted to upper-division courses in technology, construction, engineering, or computer science. In each case, the choice of technical electives must be approved by the student's faculty advisor and department chair. Requirements for each of the majors offered are described on the following pages.

In addition to the undergraduate degrees offered in Construction and Technology, a graduate degree, Master of Technology (M.Tech.) is offered by each of the four departments in technology in accordance with the details given on page 244. See the *Graduate Catalog* for complete details.

Admission

See pages 22-27, 40-42, 244-245, 247 for information regarding requirements for admission, transfer, retention, disqualification and reinstatement.

A pre-professional category is available for applicants deficient in regular admission requirements.

The Department of Construction requires secondary school units totalling 3½ units in mathematics, including geometry, advanced algebra and trigonometry. Students having omissions or deficiencies in subject matter preparation will 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, (or MAT 117 College Algebra and MAT 118 Plane Trigonometry) and PHY 101 Introduction to Physics. Vocational and craft-oriented courses taught at community colleges will not be accepted for credit towards a bachelor's degree in Construction.

Entry into a program in one of the departments of technology as a freshman student assumes three (3) years of high school math (algebra I, II, and geometry). High school chemistry and physics are 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).

Students who begin their college education at institutions other than ASU with intent to transfer to ASU should consult the given major requirements and seek equivalent courses at the transfer institution. Any transfer courses from a community college will be applied only as lower-division credit.

The requirement for admission of transfer students into Construction or Technology is a 2.25 GPA. The freshman and sophomore programs of study are designed to facilitate transfer of junior and community college students or associate degree graduates.

International students are required to have a TOEFL score of 550 for admission to a Construction major and 500 for admission to a Technology major.

Degree Requirements

Refer to the individual department descriptive material for specific departmental degree requirements.

Graduation Requirements

In order to qualify for graduation from the School of Construction and Technology, a student must have

an overall grade point average of at least 2.00 for the required courses in the major field.

General Information

Professional Accreditation and Affiliations.

The Department of Construction 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).

The programs in Aeronautical Engineering Technology, Electronic Engineering Technology, and Manufacturing Engineering Technology are accredited by the Accreditation Board for Engineering and Technology.

Special Programs

ASU 2 + 2 Programs. The School of Construction and Technology maintains a cooperative agreement with most community colleges within the State of Arizona, and also with selected out-of-state colleges and universities to structure courses that will be directly transferable into the Construction and Technology programs at ASU.

ASU 3 + 2 Programs. The Department of Construction is participating in the ASU 3+2 programs with Grand Canyon College and Southwestern University. See page 248 for details

Cooperative Education. The co-op program includes one or more periods of employment within the degree curriculum, the employment necessarily relating to a student's major. A student who chooses this program will graduate with both the academic background and practical experience gained from working with professionals in his or her chosen field.

Complete information on eligibility requirements are given on page 248 under special programs—cooperative education.

Construction

ASSOCIATE PROFESSORS:

BADGER (COB 268), BURTON, MULLIGAN,
ROUNDS, WEBER

ASSISTANT PROFESSOR:

SHING

PROFESSORS EMERITI:

HASTINGS, MICHELS, PETERMAN, SELLECK,
WARD, WOODING

Purpose. Construction careers are so broadly diversified that no single curriculum will fit the student for universal entry into all fields. As an example, heavy construction 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 options to suit individual backgrounds, aptitudes and objectives. These options are not absolute but generally match major divisions of the construction industry.

Degrees. The Department of Construction offers the Bachelor of Science degree with a major in Construction. Five options are available:

- General Building
- General Development
- Heavy Construction
- Military Construction
- Special Construction

Each option 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 construction contracting. The military construction option compliments the heavy construction option, but permits the use of 18 semester hours of ROTC credits for appropriate technical electives and management type courses.

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

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.

Degree Requirements

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 33) 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.

Construction-B.S. Students in all options will be required to complete a construction core of science-based engineering, construction and management courses. Since the semester 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 semester hours. The sequential arrangement of coursework is shown below.

English Proficiency (6 semester hours)	<i>Semester Hours</i>
† ENG 101, 102 First-Year Composition	6
or ENG 105 Advanced First-Year Composition (Must pass exemption examination—see placement examinations for proficiency, page 246.)	

General Studies Requirements
(35 semester hours)

<i>Literacy and Critical Inquiry*</i> (6 semester hours minimum)	
† COM 225 Public Speaking	3
† TCE 400 Technical Communications	3
<i>Numeracy</i> (6 semester hours minimum)	
† MAT 270 Calculus I	4
or MAT 260 (3) and MAT 261 (3)	
† ECE 106 Introduction to Computer-Aided Engineering	3

*Humanities and Fine Arts/
Social and Behavioral Sciences**
(15 semester hours minimum)

(At least one course must be of upper-division level; two courses must be from same department; and two departments or more must be represented in total selection.)

Humanities and Fine Arts	9 to 6
One course must be an approved Architecture (APH*) course	
Social and Behavioral Sciences	6 to 9
† ECN 111 Macroeconomic Principles (3)	
† ECN 112 Macroeconomic Principles (3)	

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Natural Sciences

(8 semester hours minimum)

† PHY 111	General Physics	3
† PHY 112	General Physics	3
† PHY 113	General Physics Laboratory	1
† PHY 114	General Physics Laboratory	1

Total General Studies 35

NOTE: One course in the area of global awareness* and one course in historical awareness* *must* appear in the final list of courses offered in the student's graduation program of study. If desired, these can be included in the humanities and fine arts/social and behavioral sciences course selections.

* See pages 42-55 and 57-66 for requirements and approved list.

† Required for graduation.

Construction Core Requirements Common to All Options

	Semester Hours
ACC 211 Elementary Accounting	3
CON 221 Static Mechanics	3
CON 243 Introduction to Construction Materials and Specifications	3
CON 251 Microcomputer Applications for Constructors	3
CON 252 Construction Equipment	2
CON 323 Strength of Materials	3
CON 341 Surveying	3
CON 366 Construction Methods	3
CON 383 Construction Estimating	3
CON 389 Construction Cost Accounting and Control	3
CON 495 Construction Planning and Scheduling	3
CON 496 Construction Contract Administration	3
ECE 105 Introduction to Languages of Engineering	3
GNB 306 Business Law	3
STP 226 Elements of Statistics	3
Total Common to All Options	44

Primary Core for all Options Except General Development

	Semester Hours
CEE 310 Testing of Materials for Construction	3
CEE 380 Hydraulics and Hydrology	3
CEE 450 Soil Mechanics in Construction	3
CON 244 Construction Graphics	2
CON 273 Electrical Construction Fundamentals	4
CON 331 Construction Safety	2
CON 345 Mechanical Systems	3
CON 374 Systems Management for Construction	2
CON 424 Structural Design	3
CON 453 Construction Labor Management	3

CON 463 Foundations and Concrete Structures	3
Total Primary Core Required	31

Secondary Core for the General Development Option

	Semester Hours
ACC 212 Introductory Management Accounting	3
APH 313 History of Western Architecture	3
COM 222 Argumentation	3
CON 483 Advanced Building Estimating	3
FIN 300 Fundamentals of Finance	3
FIN 361 Managerial Finance	3
GPH 111 Introduction to Physical Geography	4
PUP 301 Introduction to Urban Planning	3
REA 251 Real Estate Principles	3
Total Secondary Core Required	28

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.

The course work for the first two years is the same for all options except military construction and general development. The specific lower-division requirements are shown below:

First Semester

	Semester Hours
ECN 111 Macroeconomic Principles	3
ENG 101 First-Year Composition	3
MAT 270 Calculus	4
PHY 111 General Physics	3
PHY 113 General Physics Laboratory	1
Humanities and Fine Arts Elective ¹	8
Total	17

Second Semester

APH Elective	2
CON 252 Construction Equipment	2
ECN 112 Macroeconomic Principles	3
ECE 105 Introduction to Engineering Languages	3
ENG 102 First-Year Composition	3
PHY 112 General Physics	3
PHY 114 General Physics Laboratory	1
Total	17

Third Semester

CON 221 Static Mechanics	3
CON 243 Introduction to Construction Materials and Specifications	3
CON 244 Construction Graphics	2
COM 225 Public Speaking	3
ECE 106 Introduction to Computer-Aided Engineering	3
STP 226 Elements of Statistics	3
Total	17

Fourth Semester

ACC 211	Elementary Accounting	3
CON 251	Microcomputer Applications for Constructors	3
CON 273	Electrical Construction Fundamentals	4
CON 323	Strength of Materials	3
	Basic Science Elective	3
	Total	16

¹ See pages 42-45 and 48-51 for requirements and approved list.

One of the following five options is to be selected by each student.

Option in General Building Construction

The general building option provides a foundation for students who wish to follow careers as managers or owners of firms engaged in the construction of residential, commercial and institutional structures. While conventional building is still a major factor in this field, modern educational focus is on building systems required for the mass development and production of large scale projects. General construction is treated as an integrated process from conception through delivery of completed facilities to users.

	<i>Semester Hours</i>	
Requirements		
CON 472	Land Development Feasibility	2
CON 483	Advanced Building Estimating	3
REA 251	Real Estate Principles	3
REA 411	Real Estate Law	3
	Approved Technical Elective	2
	Basic Science Elective	3
	Total	16

Option in General Development

The general development option prepares the student to participate in the development of land and buildings. Courses will equip them to understand the economics, acquisition, financing, marketing and managing of developments, which normally vary with location, projected "highest and best" use and owner requirements.

	<i>Semester Hours</i>	
Requirements		
CON 472	Land Development Feasibility	2
CON 484	Internship	6
CON 494	ST: Construction Process	3
REA 411	Real Estate Law	3
	Approved Technical Elective	2
	Basic Science Elective	3
	Total	19

Option in Heavy Construction

The heavy construction option 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.

	<i>Semester Hours</i>	
Requirements		
CON 344	Route Surveying	3
CON 482	Cost Engineering	2
CON 486	Heavy Construction Estimating	3
GNB 307	Business Law II	3
	Approved Technical Elective	2
	Basic Science Elective	3
	Total	16

Option in Military Construction

The military construction option is open only to students in the four year ROTC program leading to a commission in the U.S. Army. It prepares students for careers in either the military or engineering/highway construction field.

	<i>Semester Hours</i>	
Requirements		
CON 344	Route Surveying	3
CON 486	Heavy Construction Estimating	3
MIS 301	Advanced Military Science	3
MIS 302	Advanced Military Science	3
MIS 401	Advanced Military Science	2
MIS 402	Advanced Military Science	2
	Total	16

Option in Specialty Construction

Specialty construction includes areas such as mechanical, electrical, air conditioning, roofing, concrete, commercial and industrial refrigeration and fire protection systems. This option is also intended to provide a program for those students interested in such areas as utility contracting, quarrying 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 department chair.

	<i>Semester Hours</i>	
Requirements		
CON 455	Construction Office Methods	3
CON 468	Conceptual and Electrical Estimating	3
CON 482	Cost Engineering	2
	Approved Technical Electives	5
	Basic Science Elective	3
	Total	16

262 CONSTRUCTION

CONSTRUCTION

CON 221 Static Mechanics. (3) F, S

Vectors, forces and moments, force systems, equilibrium, analysis of basic structures and structural components, friction, centroids, moments of inertia. Cross-listed as ETC 211. Prerequisites: MAT 261 or equivalent; PHY 111, 113.

243 Introduction to Construction Materials and Specifications. (3) F, S

Construction materials and components. Emphasizing material descriptions, usages and incorporation into the structure. Lab, field trips. Prerequisite: sophomore standing.

244 Construction Graphics. (2) F, S

Sketching and architectural drafting of building materials and systems. Computer graphic applications for construction. Field trips. Lecture, 4 hours lab. Prerequisite: ECE 106 or equivalent.

251 Microcomputer Applications for Constructors. (3) F, S

Application of the microcomputer as a problem-solving tool for the constructor. Characteristics of microcomputer hardware and operating systems. Use of spreadsheets, statistical packages and database management. Prerequisites: ECE 106; STP 226 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.

273 Electrical Construction Fundamentals. (4) F, S

Circuits and machinery. Power transmission and distribution, with emphasis on secondary distribution systems. Measurements and instrumentation. Field trips. 3 lectures, 3 hours lab. Prerequisites: MAT 270; PHY 112, 114.

323 Strength of Materials. (3) F, S

Analysis 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. (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: CON 244, 251; STP 226.

341 Surveying. (3) F, S

Theory and field work in construction and land surveys. 2 lectures, 3 hours lab. Prerequisite: MAT 118.

344 Route Surveying. (3) F

Simple, compound and transition curves: reconnaissance, preliminary and location surveys. Calculation of earthwork. Dimensional control for construction projects. 2 lectures, 3 hours lab. Prerequisite: CON 341.

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, lecture, lab. Prerequisites: CON 243, 251; PHY 111, 113. Corequisite: CEE 380.

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, lecture, lab. Prerequisites: CON 243, 244, 252, or equivalent.

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 instructor approval.

383 Construction Estimating. (3) F, S

Methods and techniques used in estimating construction costs. Standard approach to quantity surveys emphasized. Practice in take-offs, costing and final bid preparation, Microcomputer usage for semester project. Lecture, project workshop. Prerequisites: CON 243, 244, 251; construction major or instructor approval.

389 Construction Cost Accounting and Control. (3) F, S

Nature of construction cost. Depreciation and tax theory, variable equipment costs. Cash flow theory, investment models, profitability and analysis. Computer applications. Funding sources and arrangements. Builder's insurance. Prerequisites: ACC 211; CON 251 or equivalent; CON 383. [Satisfies General Studies Requirement: N3]

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. Lecture, lab. Prerequisites: ECN 112; CON 374. [Satisfies General Studies Requirement: H]

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: 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, lecture, recitation. Prerequisites: CEE 450; CON 323, 424

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. Microcomputer applications in the analysis process. Field trips. Prerequisites: CON 251, 383, 389.

477 Residential Construction. (3) F

Study of design concerns, construction material and contract administration problems related to residential construction. Owner and contractor relationship. Field trips. Prerequisite: junior standing or instructor approval.

482 Cost Engineering. (2) S

The time-value of money. Comparison of alternative, depreciation methods and impact on taxes, replacement and break-even analysis. Construction financing and analysis. Prerequisite: CON 389.

483 Advanced Building Estimating. (3) F, S

Concepts of pricing and markup, development of historic costs, life cycle costing, change order and conceptual estimating, emphasizing microcomputer methods. Prerequisites: CON 251, 383.

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

495 Construction Planning and Scheduling. (3) F, S
Various network methods of project scheduling, such as AOA and AON using Pert, manual, bar-charting, line-of-balance and VPM techniques. Microcomputers used for scheduling, resource allocation and time/cost analysis. Prerequisites: CON 251, 383, 389; construction major or instructor approval. [*Satisfies General Studies Requirement: N3*]

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, ENG 301 or equivalent; CON 374; or instructor approval.

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: CON 496; ECN 500; or instructor approval.

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, 495; or instructor approval.

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: CON 294, 394, 484, 494, 498, 499, 580, 583, 590, 591, 592, 594, 598. (See pages 36-37.)

Departments of Technology

Degree Requirements—B.S.

All baccalaureate degree programs in the departments of technology require completion of the university English proficiency requirement, a General Studies component and a technology core component. All programs in the engineering technologies also require completion of an engineering technology core in addition to requirements of the chosen major and option. All programs in Technology require a minimum of 132 semester hours.

The specific course requirements for the General Studies, technology core and the engineering technology core are listed below. Refer to the individual majors or options for their additional required courses.

English Proficiency

+ ENG 101, 102 First-Year Composition6
or ENG 105 Advanced First-Year Composition (3)

General Studies

*Literacy and Critical Inquiry**
(6 semester hours minimum)

One course to be chosen from university-approved list. Course will be sophomore-level and include a series of formal, graded written or spoken assignments in composing critical discourse3

+ TCE 400 Technical Communications3

Numeracy

(6 semester hours minimum)

+ MAT 115 College Algebra and Trigonometry4
+ ECE 106 Introduction to Computer-Aided Engineering3

Humanities and Fine Arts/

Social and Behavioral Sciences*

(15 semester hours minimum)

(At least one course must be of upper-division level; two courses must be from same department; and two departments or more must be represented in total selection.)

Humanities and Fine Arts9 to 6

Social and Behavioral Sciences6 to 9

+ ECN 111 Macroeconomic Principles (3)
or ECN 112 Microeconomic Principles (3)

Natural Sciences

(8 semester hours minimum)

+ PHY 111 General Physics3
+ PHY 112 General Physics3
+ PHY 113 General Physics Laboratory1
+ PHY 114 General Physics Laboratory1

Total General Studies36

NOTE: One course in the area of global awareness* and one course in historical awareness* *must* appear in the final list of courses offered in the student's graduation program of study. These can be included in the humanities and fine arts/social and behavioral sciences course selections. See list of acceptable courses.

* See pages 42-45 and 57-66 for requirements and approved list.

+ Graduation requirement for the baccalaureate degree.

Technology Core

The following courses comprise the technology core, and are required in all baccalaureate degree programs in the departments of technology:

264 DEPARTMENTS OF TECHNOLOGY

		<i>Semester Hours</i>
CHM 101	Introductory Chemistry 4 or CHM 113 General Chemistry (4) or CHM 114 General Chemistry for Engineers (4)	4
ECE 105	Introduction to Languages of Engineering 3	3
MAT 260	Technical Calculus I 3 or STP 420 Introductory Applied Statistics (3)	3
TCE 100	Structured Problem Solving with BASIC 3	3
TCE 201	Applied Electrical Science 4	4
TCE 230	Engineering Materials and Processing 3 or TCE 250 Digital Systems and Microprocessors (3)	3
Total Technology Core		20

Engineering Technology Core

The following courses comprise the engineering technology core, and are required in all baccalaureate degree programs in the engineering technologies:

		<i>Semester Hours</i>
ETC 205	Electronic Devices and Circuits 4 or ETC 307 Electrical Power Circuits and Machines (4)	4
ETC 211	Applied Engineering Mechanics: Statics 3	3
ETC 313	Applied Engineering Mechanics: Materials 3 or ETC 312 Applied Engineering Mechanics-Dynamics (3)	3
ETC 340	Applied Thermodynamics and Heat Transfer 3 or ETC 331 Semiconductor Materials Science/Devices (3)	3
MAT 261	Technical Calculus II 3	3
MAT 262	Technical Calculus III 3 or STP 420 Introductory Applied Statistics (3)	3
Total Engineering Technology Core		19

TECHNOLOGY CORE

TCE 100 Structured Problem Solving with BASIC. (3) F, S, SS

Methods of defining, organizing, developing ideas and solutions to problems using computer and structured BASIC language as a tool. Corequisite: MAT 115.

201 Applied Electrical Science. (4) F, S, SS

Principles of electricity, passive elements and d-c and a-c circuit analysis. Laboratory exploration of circuit concepts and techniques using instrumentation and the computer as a tool. 3 hours lecture, 3 hours lab. Prerequisite: TCE 100.

230 Engineering Materials and Processing. (3) F, S, SS
Materials, their structures, properties, fabrication characteristics and applications. Material forming, joining and finishing processes. Automation and quality control. Prerequisites: CHM 101, 113 or 114.

250 Digital Systems and Microprocessors. (3) F, S
Fundamentals of digital systems and microprocessors, with Boolean Algebra and combinational logic. Microprocessor programming and applications. 3 hours lecture, demonstration. Prerequisites: ECE 105; TCE 201. [Satisfies General Studies Requirement: N3]

400 Technical Communications. (3) F, S, SS
Planning and preparing technical publications and oral presentations based on directed library research related to current technical topics. Prerequisites: senior standing as a CEAS major; completion of first-year English requirements plus sophomore critical writing course. [Satisfies General Studies Requirement: L2]

Special Courses: TCE 294, 394, 484, 494, 498, 591. (See pages 36-37.)

ENGINEERING TECHNOLOGY CORE

ETC 205 Electronic Devices and Circuits. (4) F, S
Active device characteristics, models and basic electronic circuit design principles. 3 lectures, 3 hours lab. Prerequisites: TCE 201; MAT 260.

211 Applied Engineering Mechanics: Statics. (3) F, S, SS
Vectors, forces and moments, force systems, equilibrium, analysis of basic structures and structural components, friction, centroids, moments of inertia. Cross-listed as CON 221. Prerequisites: MAT 261 or equivalent; PHY 111, 113.

307 Electrical Power Circuits and Machines. (4) F, S
Principles and analysis of electrical power circuits and components, transformers, rotating machines and related control equipment. 3 lectures, 3 hours lab. Prerequisites: TCE 201; PHY 112, 114.

312 Applied Engineering Mechanics: Dynamics. (3) S
Masses; motion kinematics; dynamics of machinery. Prerequisites: ETC 211; MAT 261.

313 Applied Engineering Mechanics: Materials. (3) F, S, SS
Stress, strain, relations between stress and strain, shear, moments, deflections, combined stresses. 2 hours lecture, 3 hours lab. Prerequisite: ETC 211.

331 Semiconductor Materials Science/Devices. (3) F, S
Introduction to mechanical and electro-magnetic properties of materials used in electronics. Semiconductor physics and solid state device characteristics, material properties. 3 hours lecture. Prerequisites: CHM 101 or 113; ECE 105; EET 310; PHY 112, 114.

340 Applied Thermodynamics and Heat Transfer. (3) F, S, SS
Thermodynamic systems and processes, first and second laws of thermodynamics, properties of pure substances, applications to heat engines and special systems. Fundamentals of conduction, radiation and convection. Prerequisites: MAT 261; PHY 112, 114.

Special Courses: ETC 294, 394, 484, 494, 498, 591. (See pages 36-37.)

Aeronautical Technology

ASSOCIATE PROFESSORS:

(TCB 203), PEARCE, REED,
ROPER, SALMIRS

ASSISTANT PROFESSORS:

CARLSEN, GESELL

INSTRUCTOR:

ROGERS

LECTURER:

NELSON

PROFESSORS EMERITI:

COX, SCHOEN, THOMASON

The Department of Aeronautical Technology offers two majors leading to a Bachelor of Science degree. The options within these majors are as follows:

Aeronautical Engineering Technology

Aeronautical Technology
Helicopter Technology

Aeronautical Management Technology

Aircraft Flight Management
Airway Science Management

Graduates are prepared for entry into the aerospace industry in productive, professional employment or, alternatively, for graduate study. The curricula emphasize the recognized principles underlying the application of technical knowledge as well as current technology, preparing the graduate to adapt to the rapid and continual changes in aerospace technology.

General Information

Student Organizations. The department hosts the local chapter of Alpha Eta Rho, the international professional aviation fraternity. Students also are eligible for membership in Tau Alpha Pi, the national honor society for engineering technology and the Precision Flight Team, which competes in regional and national flying safety competitions.

Aeronautical Engineering Technology—B.S.

The Aeronautical Engineering Technology curriculum is designed to prepare the technologist for technical support of engineering activities throughout the aerospace field. Areas of responsibility include the application of applied engineering prac-

tice related to fixed wing aircraft and aerospace vehicle design, helicopter applications, internal combustion engines, combustion processes, turbomachinery, systems analysis, computer modeling, quality assurance and non-destructive testing and low speed wind tunnel applications.

Advisor-approved alternates for transfer credit for listed courses may vary from the total required semester hours indicated. Such variances shall not reduce the minimum of 132 semester hours required for the degree.

The Aeronautical Engineering Technology students are required to complete the technology core, the engineering technology core and the following courses as part of their General Studies under humanities/social sciences:

	<i>Semester Hours</i>
ECN 111 Macroeconomic Principles	3
One Upper-division Humanities and Fine Arts	3

In the technology core (see page 263), the following course is required:

	<i>Semester Hours</i>
MAT 260 Technical Calculus I	3

In the engineering technology core (see page 264), the following courses are required:

	<i>Semester Hours</i>
ETC 313 Applied Engineering Mechanics: Materials	3
ETC 340 Applied Thermodynamics and Heat Transfer	3
MAT 262 Technical Calculus III	3
or AET 472 Applied Linear Analysis (3)	

The following courses are required in both options: AET 280, 281, 287, 310, 320, 321, 322, 409, 414, 487; ETC 312; IEE 300; MET 432.

The following courses are also required for the option listed:

Aeronautical technology: AET 288, 415, 417, 490; Elective Hours 3.

Helicopter technology: AET 360, 461, 462, 463, 464.

Suggested Course Pattern for Freshmen

First Semester	<i>Semester Hours</i>
CHM 101 Introductory Chemistry	4
ECN 111 Macroeconomic Principles	3
ENG 101 First-Year Composition	3
MAT 115 College Algebra and Trigonometry	4
TCE 100 Structured Problem Solving with BASIC	3
Total	17

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Second Semester

ECE 105	Introduction to Languages of Engineering	3
ENG 102	First-Year Composition	3
MAT 260	Technical Calculus I	3
PHY 111	General Physics	3
PHY 113	General Physics Laboratory	1
TCE 230	Engineering Materials and Processing	3
Total		16

Aeronautical Management Technology—B.S.

The Aeronautical Management Technology curriculum is designed to combine a thorough technical training with an interdisciplinary general university education. The graduate is prepared to assume responsibilities in a wide area of managerial and technically related areas of aviation. The student is prepared with a background in aircraft structures, reciprocating and turbine engines, performance, design, management skills, business principles, systems analysis and a variety of course work specific to aircraft flight, airport operations and air transportation systems. The degree offers two options: airway science management and aircraft flight management. These curricula have the approval of the Federal Aviation Administrator and can lead to employment in that agency. The two options are described separately below.

Option in Aircraft Flight Management

(Flight training is certified by the Federal Aviation Administration.)

Aircraft flight management 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 private pilot, commercial pilot and flight instructor certificates, and also the instrument pilot, instrument instructor and multi-engine pilot ratings.

This curriculum concentrates on flying, plus the technical, management and computer-related applications necessary to operate aircraft in the high density environment of today's airspace. This career option leads to development, administration and enforcement of safety regulations including airworthiness and operational standards in civil aviation. It emphasizes critical thinking, and cognitive, analytical and communication skills.

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.

Aircraft flight management students are required to complete the following courses as part of their General Studies under humanities/social sciences:

	<i>Semester Hours</i>
One Upper-division Humanities and Fine Arts	3
ECN 111 Macroeconomic Principles	3
PGS 100 Introduction to Psychology	3
COM 100 Introduction to Human Communication	3

In the technology core (see page 263), the following course is required:

	<i>Semester Hours</i>
MAT 260 Technical Calculus I	3

In addition, the following listed courses are required: AET 182, 183, 220, 222, 280, 281, 287, 288, 308, 314, 322, 342, 382, 383, 385, 386, 387, 389, 392, 393, 394, 408, 410, 444, 489; GPH 212; IST 452; MGT 301, 311.

Suggested Course Pattern for Freshmen

	<i>Semester Hours</i>
First Semester	
AET 182 Private Pilot Ground School	3
CHM 101 Introductory Chemistry	4
ENG 101 First-Year Composition	3
MAT 115 College Algebra and Trigonometry	4
TCE 100 Structured Problem Solving with BASIC	3
Total	17

Second Semester

AET 183 Private Pilot Certificate	1
ECE 105 Introduction to Languages of Engineering	3
ENG 102 First-Year Composition	3
GPH 212 Introduction to Meteorology	3
MAT 260 Technical Calculus I	3
PHY 111 General Physics	3
PHY 113 General Physics Laboratory	1
Total	17

Option in Airway Science Management

The management option is designed to prepare graduates for managerial and supervisory positions throughout the air transportation industry. A depth of technical training is included along with a broad exposure to business and management courses. This program of study, interdisciplinary in nature, will prepare the aeronautical career-oriented student for such positions as air traffic control specialist, air carrier manager, airport manager and general aviation operations manager.

Airway science management students are required to complete the following courses as part of their General Studies under humanities/social sciences:

	<i>Semester Hours</i>
Humanities and Fine Arts	6
(must be upper-division, selected from two different departments)	
ECN 111 Macroeconomic Principles	3
ECN 112 Microeconomic Principles	3
SOC 301 Principles of Sociology	3

In the technology core (see page 263), the following course is required:

	<i>Semester Hours</i>
MAT 260 Technical Calculus I	3

In addition, the following listed courses are required: AET 101, 201, 280, 281, 287, 288, 308, 342, 408, 410, 444, 489; COM 110, 210, 410; IEE 300, 431; IST 452; MGT 301, 311, 352, 423; PGS 100, 315; POS 300; elective hours 2.

Suggested Course Pattern for Freshmen

	<i>Semester Hours</i>
First Semester	
AET 101 Introduction to Aeronautics	3
ENG 101 First-Year Composition	3
TCE 100 Structured Problem Solving with BASIC	3
MAT 115 College Algebra and Trigonometry	4
PGS 100 Introduction to Psychology	3
Total	16
Second Semester	
ECE 105 Introduction to Languages of Engineering	3
ECN 111 Macroeconomic Principles	3
ENG 102 First-Year Composition	3
MAT 260 Technical Calculus I	3
PHY 111 General Physics	3
PHY 113 General Physics Laboratory	1
Total	16

AERONAUTICAL TECHNOLOGY

(Flight instruction costs are not included in university tuition)

AET 101 Introduction to Aeronautics. (3) F Evolution of aviation. Aircraft types and uses. Principles of flight. Technical development of equipment/systems. Air-space use.

182 Private Pilot Ground School. (3) F, S, SS Ground school leading to FAA Private Pilot Certification. Student may begin flight training with instructor approval. Aerodynamics, air navigation, performance, regulations.

183 Private Pilot Certificate. (1) F, S, SS Flight training for the FAA private pilot certificate. Satisfactory completion of FAA tests is required. Pre- or corequisite: AET 182.

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.

201 Air Traffic Control. (3) S Ground and air operations. Weather services communications and routing. Flight plans and IFR operations. Departures and arrivals. Airport conditions and emergencies.

220 Aviation Meteorology. (3) F, S Evaluation, analysis, interpretation of atmospheric phenomena. Low and high altitude weather from the pilot's viewpoint. Nephology.

222 Instrument Pilot Ground School. (3) F Ground school leading to the FAA Instrument Pilot Rating. Ten hours simulator required. Pre- or corequisite: private pilot certificate; AET 220.

280 Aerospace Structures and Materials. (3) F, SS Basic aerodynamics, aerospace vehicle structural design and materials. Manufacturing processes, assembly and repair techniques and hardware selection. 2 lectures, 4 hours laboratory. Prerequisites: PHY 111, 113.

281 Aerospace Systems. (3) S, SS Modern aircraft and aerospace vehicle systems (hydraulics, pneumatics, auxiliary, control, instrument, etc.), weight and balance, inspection requirements and methods. 2 lectures, 4 hours laboratory. Prerequisites: PHY 111, 113.

287 Aircraft and Aerospace Powerplants. (3) F, S, SS Theory of internal combustion engines, components, performance analysis, engine accessories, systems and environmental control. 2 lectures, 4 hours laboratory. Prerequisites: PHY 111, 113; or instructor approval.

288 Gas Turbine and Turbomachinery. (3) F, S, SS Development and theory of gas turbine engines. Thrust and performance analysis. Engine components, systems, aerodynamic problem applications and environmental control. 2 lectures, 4 hours laboratory. Prerequisites: PHY 111, 113; or instructor approval.

308 Air Transportation. (3) F Air commerce related to the transportation system. Historical development of air transportation, regs, the regulators and the regulatory climate within the National Airspace System. Prerequisite: AET 101 or equivalent. *[Satisfies General Studies Requirement: G]*

310 Instrumentation. (2) F Measurement system responses and the characteristics of experimental data. Methods of collecting and analyzing data. Prerequisites: MAT 261; TCE 201.

314 Commercial Pilot Ground School. (3) S Ground school leading to Commercial Pilot certification. Ten hours simulator required. Prerequisites: private pilot certificate; AET 220.

320 Applied Aerodynamics I. (3) F Introduction to potential and viscous flows and their relationship to aircraft lift and drag. Prerequisites: AET 280; ECE 106; MAT 262.

321 Applied Aerodynamics II. (3) S Wind tunnel and flight test theory, measurements and analysis. Aircraft stability and control. 2 lectures, 2 hours laboratory. Prerequisite: AET 320.

322 Aircraft Design I. (3) F, S, SS Basic applied aerodynamics, propeller performance and airplane performance analysis. Prerequisites: AET 280, 287; ECE 106; MAT 260; PHY 112, 114.

342 Aviation Law/Regulations. (3) F, S Study which encompasses the field of aviation within the context of the U.S. Common Law system. Public law, admin-

istrative rulemaking, sovereignty, enforcement and case law analysis. Prerequisite: AET 101 or 182 or equivalents.

360 Introduction to Helicopter Technology. (3) S
Introduction to the working functions of modern rotary wing aircraft. Rotary wing flight theory, aerodynamics, controls, flight and power requirements. Prerequisites: junior standing; PHY 112, 114.

381 Instrument Pilot Rating. (1) F, S, SS
Flight training for the FAA Instrument Pilot Rating. Satisfactory completion of FAA Instrument Rating required. Not for AET majors. Prerequisite: AET 222.

382 Air Navigation. (2) F '89
Advanced D.R.; theory/application of VLF, INS, Loran, pressure pattern, grid navigation. Corequisite: AET 222 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 222, 314; flying time, 150 hours minimum.

385 Flight Instructor Ground School. (3) F
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 Ground School. (1) F
Ground school preparation for the FAA Multi-Engine Rating. Prerequisites: AET 287, 383; 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.

392 Flight Instructor Instrument Ground School. (2) S
Ground school preparation for FAA Instrument Flight Instructor Rating. Prerequisite: AET 386 or instructor approval.

393 Flight Instructor Instrument Rating. (1) F, S, SS
Flight training for the FAA CFII. CFII certificate required for course completion. Corequisite: AET 392.

394 Multi-Engine Land, Airplane Flight Instructor Rating. (1) F, S, SS
Normal and emergency flight operations. Instruction techniques and procedures associated with light multi-engine land, airplane. Prerequisite: AET 389.

408 National Airspace System. (3) S
Airway facilities. Operations and communications, air route traffic control centers and flight service stations. Navigation aids, airport environment, certification and security. Prerequisite: AET 201 or 222.

409 Nondestructive Testing and Quality Assurance. (3) F, S, SS
Purpose of inspection and quality assurance. Theory, application of nondestructive inspection methods. Application of pertinent standards, specifications and codes. 2 lectures, 4 hours laboratory. Prerequisites: AET 280 or TCE 230; TCE 400; senior standing in technology or instructor approval.

410 Aviation Safety. (2) F
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
Development and evaluation of evidence, analysis and recommendations for preventive practices. Prerequisite: junior standing.

414 Applied High Speed Aerodynamics. (3) F
Basic concepts of compressible fluid mechanics including internal and external flows. Prerequisites: ETC 340; MAT 262.

415 Propulsion. (3) S
Principles, thrust, performance cycles, combustion systems, mechanical, material and other design considerations, ram jets, rockets and advanced propulsion systems. Prerequisite: AET 414.

417 Aerospace Systems Design. (3) F
Analysis and design of rockets, missiles and satellites. Thermal design of aerospace systems. Introduction to orbital mechanics. Computer simulations and applications. Prerequisites: AET 322; ETC 313; MAT 262.

444 Airport Management and Planning. (3) S
Career orientation into administration and management of modern public airports, to include an overview of planning, funding and development of airport facilities. Prerequisite: AET 308 or instructor approval.

461 Applied Helicopter Aerodynamics and Performance Measurements. (3) F
Hovering theory, vertical flight, blade motion and rotor control. Aerodynamics of forward flight stability. Prerequisites: AET 322, 360.

462 Aerodynamics of Wind Tunnel Models. (3) S
Helicopter model types, design considerations, propulsion, loads, surfaces, mountings, instrumentation. Prerequisites: AET 321, 461.

463 Aircraft/Helicopter Handling Qualities. (3) F
FAR's, MILSPEC's, human resources, analytical techniques, simulator and flight test techniques. Wind tunnel data acquisition and analysis. Prerequisite: AET 461.

464 Flow Modeling Validation. (3) S
Flow model concepts, flow models in airplane and helicopter design. Test requirements, data analysis, error analysis. Prerequisite: AET 462.

472 Applied Linear Analysis. (3) N
Linear algebra, differential equations and computer methods applied to problems in engineering technology. Prerequisites: ECE 106; MAT 262. [Satisfies General Studies Requirement: N1]

484 Aeronautical Internship. (1-3) F, S, SS
Work experience assignment at airports or with aerospace industry commensurate with student's program. Special projects guidance by industry with university supervision. Prerequisites: advisor approval; junior standing.

487 Aircraft Design II. (3) F, S
Basic aerodynamics and airplane performance analysis methods applied to practical design project. Prerequisite: AET 322.

489 Airline Administration. (2) S
Administrative organizations, economics of airline administration, operational structure, relationship with federal government agencies. Prerequisite: AET 308 or instructor approval.

490 Mathematical Modeling of Aerospace Systems. (2) S
Methods of analyzing and optimizing aerospace systems, using basic statistics and well-known numerical methods with emphasis on computer simulation. Prerequisite: MAT 261. [Satisfies General Studies Requirement: N2]

Special Courses: AET 294, 484, 494, 498, 499, 500, 580, 583, 584, 590, 591, 592, 593, 594, 598. (See pages 36-37.)

Electronics and Computer Technology

PROFESSORS:

McHENRY (TC 301A), MAISEL

ASSOCIATE PROFESSORS:

FORDEMWALT, McBRIEN, MUNUKUTLA,

STRAWN, WOOD, YOUNG

ASSISTANT PROFESSORS:

BAXTER, EDWARDS, KILIAN, PETERSON

VISITING ASSISTANT PROFESSOR:

SADDLER

Purpose. Electronic Engineering Technology is a technological field of specialization which requires the application of scientific and engineering knowledge and methods combined with technical skills in support of electrical/electronic 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 electronic engineering technologist is a member of the electrical engineering team that consists of electrical engineers, electronic engineering technologists and electronic engineering technicians.

The electronic engineering technologist is applications oriented, building upon a background of applied mathematics including the concepts and applications of calculus. Utilizing applied science and state-of-the-art technology, the electronic technologist is able to: produce practical, workable and safe results quickly and economically, install and operate technical systems, configure hardware for unique applications 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.

Degrees. The Department of Electronics and Computer Technology offers the Bachelor of Science degree with a major in Electronics Engineering Technology (B.S./EET). Four options are available:

- Computer Systems
- Electronic Systems
- Microelectronics
- Telecommunications

The *computer systems* option combines applied electronics and computer hardware-software concepts and applications. It has been formulated to meet the needs of persons who wish to engage in digital and computer systems applications as a career focus.

The *electronic systems* option is aimed at preparing persons for careers in instrumentation, control and power systems applications. This option allows a student to develop a broad based knowledge of electrical/electronic fundamentals with an applications perspective. Sixteen of the 23 specialization hours are specified and the remaining 7 hours will be approved technical electives. The ECT department has had a concentration in electronic systems or instrumentation and systems control for many years. The course patterns in support of these emphasis areas have been well developed and will continue to provide strong support for the electronics systems option under the B.S./EET program. There are several departmental faculty currently involved in leading the course work in electronic systems.

The *microelectronics* (UET) option combines applied electronics, monolithic and hybrid integrated circuit processing and applications, device and component fabrication and manufacturing. The objective of this option is to prepare persons to assume positions in the area of microelectronics manufacturing with immediately applicable knowledge as well as to develop a strong foundation of electronics fundamentals and methods. Students should be 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. Graduates of this program have various career opportunities in industry, particularly in semiconductor processing, fabrication, manufacturing and device product application areas. The continuing explosion in semiconductor and related technologies and their applications to electronic and computer-related products offer unique and challenging opportunities. Graduates of this program option will secure positions in processing, manufacturing, operations and applications areas in industry as members of the diverse scientific engineering team.

The *telecommunications* option has been structured to take advantage of the recent changes in the telecommunications industry. The program provides orientation to the entire spectrum of telecommunications activities from the basics of radio and television to the applications of satellites in modern communications applications.

A Master of Technology degree program, with a concentration in Electronics Engineering Technology, is available for qualified B.S. graduates. The undergraduate program options are supported as emphasis areas in the master's degree program. See the *Graduate Catalog* for more information.

270 ELECTRONICS AND COMPUTER TECHNOLOGY

General Information

Student Organizations. The department hosts one of the local chapters of the Institute of Electrical and Electronic Engineers (IEEE), the International Society for Hybrid Microelectronics (ISHM) and the Instrument Society of America (ISA). Students may also be elected to membership in Tau Alpha Pi, the national honor society for engineering technology.

Electronics Engineering Technology—B.S.

The departmental curriculum is organized into two categories: technical studies consisting of core areas and the option specialty area, and General Studies consisting of courses selected to meet the university's General Studies requirement as well as the math/science requirement of TAC/ABET. A minimum of 50 upper-division hours is required, including at least 24 semester hours of EET, CET or UET upper-division hours to be taken at ASU. Complete program of study guides with typical four-year patterns are available from the department for each option.

The technical studies curriculum component consists of 90 semester hours of course work which includes the technology core (20 hours), engineering technology core (19 hours), electronics engineering technology core (28 hours) and an option (23 hours). The General Studies* portion of the B.S./EET curriculum has been carefully structured to meet the specific requirements of the university as well as to include the content required by TAC/ABET, the professional accrediting agency for such curricula.

Degree Requirements

In addition to the General Studies required courses listed on page 263, the following courses are required:

	<i>Semester Hours</i>
Literacy and Critical Inquiry Elective:	
COM 225 Public Speaking	3
Social and Behavioral Science Elective:	
ECN 112 Microeconomic Principles	3

* See pages 42-66 specific General Studies requirements and the approved course list.

The following courses are required as part of the technology core:

	<i>Semester Hours</i>
CHM 113 General Chemistry (UET only)	4
TCE 250 Digital Systems and Microprocessors	3

The following courses are required as part of the engineering technology core:

	<i>Semester Hours</i>
ETC 205 Electronic Devices and Circuits	4
ETC 312 Applied Engineering Mechanics: Dynamics	3
or ETC 340 Applied Thermodynamics and Heat Transfer (3) UET ONLY	
ETC 331 Semiconductor Materials Science/ Devices	3

Electronics Engineering Technology Core Requirements:

	<i>Semester Hours</i>
CSC 183 Applied Problem Solving with FORTRAN	3
CET 350 Digital Logic Principles	4
CET 354 Microcomputer Principles	4
EET 208 Electric Circuits	3
EET 301 Electric Networks I	3
EET 310 Electronic Circuits	4
EET 372 Communication Systems	3
EET 396 Professional Orientation*	1
UET 415 Electronics Fabrication Principles	3
Total	28

* Students must register for EET 396 the semester in which they are enrolled in the 87th hour of credit (ASU plus transfer hours). If this occurs in summer session, students should register for EET 396 the prior spring semester.

Electronics Engineering Technology Options

Computer systems: Required courses: CET 452, 456, 457, 473; plus 7 hours of *approved* technical electives.

Electronic systems: Required courses: EET 406, 430, 460; ETC 307; plus 7 hours of *approved* technical electives.

Microelectronics: Required courses: CHM 116; EET 430; UET 416, 418; plus 7 hours of *approved* technical electives.

Telecommunications systems: Required courses: CET 473; EET 404, 470, 478; plus 7 hours of *approved* technical electives.

**Electronics Engineering Technology
Program of Study**

**Typical First- and Second-Year Sequence
Freshman Year**

	<i>Semester Hours</i>
First Semester	
CHM 101 Introductory Chemistry .....4 or CHM 113 General Chemistry (UET ONLY)	4
ECN 111 Macroeconomic Principles .....3	3
ENG 101 First-Year Composition .....3	3
MAT 115 College Algebra and Trigonometry ....4	4
TCE 100 Structured Problem Solving with BASIC .....3	3
Total	17
Second Semester	
ECE 105 Introduction to Languages of Engineering .....3	3
ENG 102 First-Year Composition .....3	3
PHY 111 General Physics I .....3	3
PHY 113 General Physics Laboratory I .....1	1
MAT 260 Technical Calculus I .....3	3
TCE 201 Applied Electrical Science .....4	4
Total	17

Sophomore Year

First Semester	
ECE 106 Introduction to Computer-Aided Engineering .....3	3
EET 208 Electric Circuits .....3	3
ETC 205 Electronic Devices and Circuits .....4	4
MAT 261 Technical Calculus II .....3	3
PHY 112 General Physics II .....3	3
PHY 114 General Physics Laboratory II .....1	1
Total	17
Second Semester	
COM 225 Public Speaking .....3	3
ECN 112 Microeconomic Principles .....3	3
ETC 211 Applied Engineering Mechanics: Statics .....3	3
MAT 262 Technical Calculus III .....3	3
TCE 250 Digital Systems and Microprocessors .....3	3
Total	17

ELECTRONIC ENGINEERING TECHNOLOGY

EET 208 Electric Circuits. (3) F, S
Graphical and analytical analysis of electric circuits, transient and sinusoidal excitation. Applications of circuit theorems and computer solutions. Prerequisite: TCE 201. Co-requisite: MAT 261.

301 Electric Networks I. (3) F, S
Analytical and graphical analysis of electric networks, transients, steady-state sinusoidal frequency response and transfer functions using calculus essentials and Laplace transforms. Prerequisites: EET 208; MAT 261.

310 Electronic Circuits. (4) F, S
Analysis and design of bipolar and FET electronic circuits using the model approach. Amplifier and transfer function principles. With lab. Prerequisites: EET 208; ETC 205.

372 Communication Systems. (3) F, S
Systems analysis and design of AM, FM, PCM and SSB communication systems. Noise and distortion performance of communication systems. Prerequisites: CET 350; EET 301, 310.

396 Professional Orientation. (1) F, S
Technical, professional, economic and ethical aspects of electronics/computer engineering technology practice and industrial organization. Lectures, projects. Prerequisite: junior standing.

401 Electric Networks II. (3) A
Graphical and analytical analysis of discrete systems. Time, frequency and transform domain techniques. waveform analysis. Computer solutions. Prerequisite: EET 301.

404 Transmission Lines and Waveguides. (4) S
Theory and application of transmission lines, waveguides and microwave components. Analysis and matching using the Smith Chart. With lab. Prerequisite: EET 301.

406 Control System Technology. (4) S
Control system components, analysis of feedback control systems, stability, performance, application. With lab and computer simulations techniques. Prerequisites: EET 401 (or EET 301 and MAT 262).

410 Linear Electronic Circuits. (4) F
Frequency response and feedback design of multistage electronic circuits and systems. Linear integrated circuitry. SPICE analysis. Lecture, lab. Prerequisites: EET 301, 310.

420 Operational Amplifier Theory and Application. (4) A
Differential and operational amplifier circuitry, feedback configurations, op-amp errors and compensation, linear and nonlinear circuitry. Applications. Lecture, lab. Prerequisites: EET 301, 310.

422 Electronic Switching Circuits. (4) S
Analysis and design of electronic circuits operating in a switching mode. Waveshaping, timing, logic. SPICE analysis. Lecture, lab. Prerequisites: CET 350; EET 301, 310.

430 Instrumentation Systems. (4) F
Measurement principles and instrumentation, techniques. Signal and error analysis. Lecture, lab. Prerequisites: CET 350; EET 301, 310.

440 Electrical Power Systems Technology. (3) S
Electrical power systems analysis, transmission, distribution, instrumentation, protection and related system components. Prerequisite: ETC 307.

460 Industrial Electronics. (4) S
Analysis and design of electronic circuits for control and instrumentation. Lecture, lab. Prerequisites: CET 350; EET 301, 310.

470 Communication Circuits. (4) S
Analysis and design of passive and active communication circuits. Coupling networks, filters, impedance matching. Modulation and demodulation techniques. Computer solutions. Lecture, lab. Prerequisites: EET 372; MAT 262.

478 Communication Transmission System Design. (4) S
Signal propagation, transmission. Antenna principles and applications. Cable TV and other communication transmission system design. Lecture, lab. Prerequisites: EET 404, 372; MAT 262.

482 Industrial Practice: Internship/Coop. Programs. (1-4) F, S, SS
Specially assigned or approved activities in electronic industries or institutions. Report required. Maximum of 10 credits. Prerequisite: majors only enrolled at junior-senior level.

272 ELECTRONICS AND COMPUTER TECHNOLOGY

490 Electronics Project. (1-4) F, S, SS
Individual or small group projects in applied electronics with emphasis on laboratory practice or hardware solutions to practical problems. Prerequisite: instructor approval.

501 Digital Signal Processing and Application I. (3) A
Fundamentals and application of discrete signals and systems application of DFT and FFT, design of recursive filters using computer techniques. Prerequisites: EET 401 or instructor approval, MAT 262.

502 Digital Signal Processing and Applications II. (3) S
Design and application of nonrecursive, discrete filters, convolution with FFT, power spectrum analysis, random signals. Prerequisite: EET 501.

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 301; EET 501 or MAT 262.

510 Linear Integrated Circuits and Applications. (3) F
Analysis, design and applications of linear integrated circuits and systems. Prerequisites: CET 350; EET 301, 310.

522 Digital Integrated Circuits and Applications. (3) S
Analysis, design and applications of integrated circuits and systems. Prerequisites: CET 350; EET 301, 310.

530 Electronic Test Systems and Applications. (3) F
Analysis, design and application of electronic test equipment, test systems, specifications, documentation. Prerequisites: CET 354; EET 301, 310.

540 Electrical Power Systems. (3) S
Electrical power system analysis, transmission, distribution, instrumentation, protection and related system components. Prerequisites: EET 301; ETC 307.

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: CET 350; EET 301, 310.

574 Communication Circuits and Applications. (3) S
Analysis and design of microwave circuits using s-parameters and computer aided design. Matching networks, couplers, filters and amplifiers. Prerequisites: ECE 106; EET 372, 404.

576 Modern Telecommunication Systems. (3) S
Applied analysis and design of satellite, land and fiber optic systems. Applications of coherent system design and compensation. Fourier and Laplace analysis. Prerequisites: EET 372, MAT 262 or instructor approval.

578 Communication Transmission Systems. (3) S
Electromagnetic signal propagation and transmission, antenna principles and application. Cable TV and other communication transmission systems. Prerequisites: EET 372, 404, MAT 262.

Special Courses: EET 294, 484, 494, 498, 499, 580, 584, 590, 591, 592, 593, 594, 598, 599. (See pages 36-37.)

COMPUTER ENGINEERING TECHNOLOGY

CET 350 Digital Logic Principles. (4) F, S
Combinational logic analysis and design and sequential circuit analysis and design with laboratory. Lecture, lab. Prerequisites: ECE 106, TCE 250.

354 Microcomputer Principles. (4) F, S
Microcomputer organization, principles and assembly language programming with laboratory. Prerequisites: TCE 250.

408 Digital Control and Simulation. (3) F
Digital systems analysis, control techniques and computer simulation and design. Prerequisites: CET 354; CSC 183; EET 400.

452 Digital Logic Applications. (4) S
Design of sequential machines using system design techniques and complex MSI/LSI devices with laboratory. Prerequisites: CET 350; CSC 183.

456 Minicomputer Systems and Programming. (3) S
Assembly language programming. Input-output and offline diagnostics. Utility operating system and software. Prerequisites: CET 354; CSC 183 or 100.

457 Microcomputer Systems and Applications. (4) F
Applications of mini-and/or micro-computer hardware and software. Special purpose controllers, interface design. Lecture, lab. Prerequisites: CET 354; CSC 183; EET 310.

473 Digital/Data Communication Systems. (4) F
Signals, distortion, noise, error detection/correction. Transmission and system design. Interface techniques and standards. Digital hardware. Applications. With lab. Prerequisites: CET 350; EET 372; TCE 250.

485 Digital Testing Techniques. (3) S
Hardware/software aspects of digital testing technology; board and logic test equipment. Prerequisites: CET 350; CSC 183; EET 310.

486 Electronics Computer Aided Design. (3) F
CAD/CAM for electronics manufacturing. Printed-circuit layout, documentation, schematic plotting. Prerequisites: CSC 183; EET 310; TCE 250.

508 Computer Process Control Technology. (3) F
Process computer control hardware, software. Sampled-data control systems, process modeling, microprocessor control techniques, computer-aided design, simulation. Process applications. Prerequisites: CET 354; EET 401 or 406.

552 Digital Systems and Applications. (3) S
Analysis, design and applications of digital networks and systems. Prerequisites: CET 350, 354; CSC 183.

556 Computer Software Technology. (3) S
Assembly language programming techniques and operations, operating system characteristics, systems software applications. Prerequisite: CET 354.

557 Microcomputers and Applications. (3) F
Applications of small computer systems, mini- and micro-computer hardware and software. Prerequisites: CET 354; CSC 100 or 183; EET 310.

Special Courses: CET 294, 484, 494, 498, 499, 580, 584, 591, 592, 593, 594, 598, 599. (See pages 36-37.)

MICROELECTRONICS ENGINEERING TECHNOLOGY

UET 415 Electronics Fabrication Principles. (3) F, S
Electronic equipment design and fabrication principles and practice. Completion of electronics hardware design project and report. Lecture, lab. With lab fee. Prerequisite: senior standing.

416 Monolithic Integrated Circuit Technology. (4) F
Processing and fabrication of monolithic bipolar and MOS integrated circuits. Lecture, lab. Prerequisite: ETC 331.

418 Hybrid Integrated Circuit Technology. (4) S
Layout, fabrication, design and manufacture of thin and thick film hybrid circuits. Lecture, lab. Prerequisites: EET 310; ETC 331.

432 Semiconductor Packaging and Heat Transfer. (3) S
Packaging theory and techniques; hermetic and plastic assembly; thermal management; electrical characteristics and reliability. Prerequisites: ETC 331 and 340; or equivalent.

437 Integrated Circuit Testing. (3) F
Principles, techniques and strategies employed in wafer level and final product testing; both destructive and non-destructive. Prerequisite: UET 416.

513 Microelectronics Technology. (3) A
Special processes, techniques and advances in monolithic and hybrid technology. Emphasis on manufacturing practice and product application for LSI and VLSI. Prerequisite: instructor approval.

516 Monolithic IC Technology and Applications. (3) F
Processing, fabrication and manufacturing of monolithic integrated circuits. Applications. Prerequisite: ETC 331 or equivalent.

518 Hybrid IC Technology and Applications. (3) S
Theory, processing, fabrication and manufacturing of hybrid microelectronics devices and products. Applications. Prerequisite: ETC 331 or equivalent, or instructor approval.

Special Courses: UET 294, 484, 494, 498, 499, 580, 584, 590, 591, 592, 593, 594, 598, 599. (See pages 36-37.)

Industrial Technology

PROFESSOR:

PARDINI (TC 203H)

ASSOCIATE PROFESSORS:

BOWERS, DAHL, HIRATA, HOROWITZ,
LAWLER, MATSON, ROE, SCHILDGEN

ASSISTANT PROFESSOR:

ABERLE

PROFESSORS EMERITI:

AUTORE, BROWN, BURDETTE, BURK, KEITH,
KIGIN, LITRELL, PRUST, ROOK, STADMILLER,
WATKINS, WILCOX

Purpose. The purpose of industrial technology is to provide students with a broad technical and managerial background in a variety of disciplines related to industry.

Typically the programs are applications oriented to include functional knowledge and understanding of materials and production processes, industrial management and human relations, problem solving, the physical sciences, mathematics, computer science and current technological skills.

Degrees. The Department of Industrial Technology offers four options leading to a Bachelor of Science degree. The four options are:

- Graphic Communications
- Industrial Management
- Industrial Technology Education
- Interactive Computer Graphics

Industrial Technology—B.S.

Degree Requirements

In addition to the technology core courses, option core courses, area of emphasis courses, English proficiency and General Studies requirements, the following industrial technology core courses are required:

			<i>Semester Hours</i>
ITC	200	Impact of Communications Technology on Society	3
ITC	202	Design and Enterprise	3
ITC	443	Occupational Safety	3
ITC	444	Industrial Organization	3
Total			12

A minimum of 132 semester hours of approved credits are required to complete this major.

Option in Graphic Communications (GRC)

The purpose of the graphic communications option is to prepare people for a wide variety of professional positions in the printing and graphic communications industry. The graphic communications option offers a blend of technological and managerial skills and knowledge. It has been specifically designed to prepare graduates to address the opportunities and increased competitive challenges taking place in the industry as a result of technological change, and turbulent economic and human relations concerns.

All courses are industry responsive. The students are exposed to case histories and problems related to actual industry issues. Students, throughout the entire four-year curriculum, are exposed to practical, situational analysis and effective problem-solving techniques. As a prerequisite for graduation, students are expected to acquire job-related industry experience as practical preparation for making an immediate contribution to an employer's business.

Students are required to take designated graphic communications courses during the first two years of the program. After the sophomore year, each student must select an area of emphasis in consultation with an advisor. The areas of emphasis are: operations management, sales/marketing and technology.

Graphic Communications Core

To achieve its objectives, the graphic communications option offers the following required and technical elective courses:

274 INDUSTRIAL TECHNOLOGY

		<i>Semester Hours</i>	
GRC	135	Graphic Communications	3
GRC	237	Image Preparation	3
GRC	331	Quality Assurance for the Reproduction Processes	3
GRC	332	Film Assembly and Platemaking	3
GRC	333	Sheet-Web Press Technology	3
GRC	334	Photo-Mechanical Reproduction	3
IST	446	Supervisory Relationships	3
IST	455	Industrial Sales and Demand	3
IST	491	Introduction to Labor Concerns	3
Total			27

Areas of Emphasis (Technical Electives)

31 semester hours

After selecting the area of emphasis which best suits the student's interests, courses are to be selected, with an advisor, that relate to the following topics:

Operations management: Production management; plant information systems; planning and scheduling for manufacturing; plant design, organizations and layout; conformance requirements for government regulation; optimization of production systems; industrial cost accounting; supervisory techniques; computer graphics applications; decision-making in a manufacturing environment; product development and management; printing systems maintenance; manufacturing strategy; instrumentation for graphic arts manufacturing; materials testing and performance prediction; production coordination; traffic management.

Sales/marketing: Markets for printing; print and electronic media; finance, personnel and human relations; sales management; strategic planning; market planning; sales service; customer education; estimating and job costing.

Technology: Scientific properties of graphic communications materials; evaluation of new technologies; creation, management and transmission of digital imaging information; integrated computer graphics; quality management and process control; analytical modeling for manufacturing systems; applied electronics for the graphic communications industry; technological planning and forecasting; printing plant engineering; environmental control.

Typical Freshman Year Course Pattern (Faculty Advisor Approval Required)

		<i>Semester Hours</i>	
First Semester			
ENG	101	First Year Composition	3
ECN	111	Macroeconomic Principles	3
GRC	135	Graphic Communications	3
MAT	115	College Algebra and Trigonometry	4

TCE	100	Structured Problem Solving with BASIC	3
Total			16

Second Semester

CHM	101	Introductory Chemistry	4
		or CHM 113 General Chemistry (4) or CHM 114 General Chemistry for Engineers (4)	
ECE	105	Introduction to Languages of Engineering	3
ENG	102	First-Year Composition	3
GRC	237	Image Preparation	3
		Humanities and Fine Arts Elective ¹	3
Total			16

¹ See pages 42-45 and 48-51 for requirements and approved list.

Each student is advised to seek assistance in planning transferable courses.

Option in Industrial Management (IST)

The purpose of this option is to prepare supervisors and high-level personnel for management and marketing functions in marketing, industry, manufacturing and public service organizations.

The industrial management option is articulated with the Maricopa County Community College District, Pima Community College and Yavapai College. Consulting an advisor is required to coordinate the course selection for transfer to the industrial management areas of emphasis.

Classes are scheduled to accommodate the student who is employed in a full-time position. Classes are also scheduled at facilities where the demand is sufficient to justify a class.

Prior to completion of the degree, the student must show evidence of adequate and appropriate occupational experience.

Industrial Management Core

To achieve its objectives, the industrial management option requires the following courses:

			<i>Semester Hours</i>
IST	446	Supervisory Relationships	3
IST	450	Industrial Training	3
IST	451	Materials Control	3
IST	452	Industrial Supervision	3
IST	453	Safety Supervision	3
IST	461	Production Supervision Principles	3
IST	470	Project Management	3
IST	491	Introduction to Labor Concerns	3
PGS	430	Industrial Psychology	3
Total			27

Areas of Emphasis (Technical Electives)

31 semester hours

A technical support area must be chosen by the student in consultation with an advisor. Typical areas of emphasis are: aeronautics, construction, electronics, fire science, graphic communications, safety and health, interactive computer graphics and manufacturing. Articulation agreements are to be followed by consulting an advisor.

Electives must be approved by the advisor to fulfill the graduation requirements of 132 semester hours.

Typical Freshman Year

Course Pattern

(Faculty Advisor Approval Required)

	<i>Semester Hours</i>
First Semester	
CHM 101 Introductory Chemistry	4
ECN 111 Macroeconomic Principles	3
ENG 101 First-Year Composition	3
MAT 115 College Algebra and Trigonometry	4
TCE 100 Structured Problem Solving with BASIC	3
Total	16
Second Semester	
ECE 105 Introduction to Languages of Engineering	3
ENG 102 First-Year Composition	3
PGS 100 General Psychology	3
PHY 111 General Physics	3
PHY 113 General Physics Laboratory	1
Area of Emphasis Elective	3
Total	17

Each student must seek assistance in planning transferable courses.

Option in Industrial Technology Education

The industrial/technology education option consists of three areas of emphasis: industrial arts education, technical teacher education, and vocational teacher education.

Students in each of these areas of emphasis combine technology courses, professional education, and General Studies to prepare for educational careers. Concentration in a variety of technical fields is available.

Industrial Arts Education. This program is in cooperation with the College of 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 automobiles, interactive computer graphics, electronics, graphic communi-

cations, manufacturing and construction. A minimum of 60 semester hours, approved by an advisor, is required in technical and ITE 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.

For this particular option, the 20 semester hours of technology core are not required. In its place the student will complete additional courses in an area of emphasis.

Industrial Arts Education Core

The following courses are required of all industrial arts education students:

	<i>Semester Hours</i>
ECE 105 Introduction to Languages of Engineering	3
GRC 135 Graphic Communications	3
ITE 402 Occupational Analysis and Course Development	3
ITE 442 Facility Planning and Management	3
ITE 480 Teaching Industrial and Vocational Subjects	3
TEC 230 Engineering Materials and Processing	3
Total	18

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.

Typical Freshman Year

Course Pattern

(Faculty Advisor Approval Required)

	<i>Semester Hours</i>
First Semester	
CHM 101 Introductory Chemistry	4
ENG 101 First-Year Composition	3
ITC 200 Technology of Communications	3
MAT 115 College Algebra and Trigonometry	4
TCE 100 Structured Problem Solving with BASIC	3
Total	17
Second Semester	
ECE 105 Introduction to Languages of Engineering	3
ENG 102 First-Year Composition	3
GRC 135 Graphic Communications	3
PGS 101 General Psychology	3
PHY 111 General Physics	3
PHY 113 General Physics Laboratory	1
Total	16

Industrial arts education students transfer to the College of Education when they are classified as juniors. The student must meet the College of Education requirements. Professional education courses are designated by the College of Education.

Industrial/Technology Education Core

To achieve its objective, the industrial/technology education option requires the following courses:

	Semester Hours
ITE 402 Occupational Analysis and Course Development	3
ITE 442 Facility Planning and Management	3
ITE 446 Instructional Aids and Materials	3
ITE 480 Teaching Industrial and Vocational Subjects	3
ITE 485 Teaching Internship	4
ITE 491 Organization and Management of Co-Op Programs	3
Total	19

Areas of Emphasis (Technical Electives)
30 semester hours

After selecting the area of emphasis, courses are to be selected with an advisor that relate to the following areas of emphasis: industrial arts education, technical teacher education, and vocational teacher education.

Electronic communications: Required: ETC 307; TCE 201; plus an additional 13 hours of *approved* technical electives.

Manufacturing: Required: TCE 230; MET 231; plus an additional 13 hours of *approved* technical electives.

Visual communications: Required: ECE 105, 106; GRC 135; ICG 212, 312; plus an additional 4 hours of *approved* technical electives

Technical teacher education: The objective of 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.

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.

**Typical Freshman Year
Course Pattern
(Faculty Advisor Approval Required)**

	Semester Hours
First Semester	
CHM 101 Introductory Chemistry	4
ENG 101 First-Year Composition	3
ITC 200 Technology of Communications	3
MAT 115 College Algebra and Trigonometry	4
TCE 100 Structured Problem Solving with BASIC	3
Total	17

Second Semester	
ECE 105 Introduction to Languages of Engineering	3
ENG 102 First-Year Composition	3
MAT 260 Technical Calculus I	3
PGS 101 General Psychology	3
Technical Elective	3
Total	15

Each student is advised to seek assistance in planning transferable courses.

Option in Interactive Computer Graphics (ICG)

The purpose of the interactive computer graphics (ICG) option is to prepare students to enter the diverse field of computer graphics applications as professionals who are immediately productive and who have the breadth of educational experiences to advance into positions of leadership.

Typical career paths may include:

- Applications Supervision and Management
- Design (specialty areas such as electronics, mechanical, manufacturing, illustration, etc.)
- Training (administration/instruction)
- Operational Services and Support Supervision
- Applications Development/Testing/Implementation
- Graphics System Analysis
- Sales/Marketing/Field Service
- Technical Graphics and Publications

Interactive Computer Graphics Core

	Semester Hours
ICG 212 Design Documentation	3
ICG 310 Computer Graphics Fundamentals	3
ICG 312 Computer Assisted Graphics	3
ICG 314 The CIM Database	3
ICG 412 Computer Graphics Modeling	3
ICG 417 Computer Graphics Systems	3
IST 446 Supervisory Relationships	3
IST 455 Industrial Sales and Demand	3
IST 461 Production Supervision Principles	3
Total	27

Areas of Emphasis (Technical Electives)

31 semester hours

Technical support areas and courses must be chosen by the student in consultation with an advisor. Certain courses may be required in some areas.

**Typical Freshman Year
Course Pattern
(Faculty Advisor Approval Required)**

	<i>Semester Hours</i>
First Semester	
CHM 101 Introductory Chemistry	4
ENG 101 First-Year Composition	3
MAT 115 College Algebra and Trigonometry	4
TCE 100 Structured Problem Solving with BASIC	3
Humanities and Fine Arts Elective ¹	3
Total	17
Second Semester	
ECE 105 Introduction to Languages of Engineering	3
ECN 111 Macroeconomic Principles	3
ENG 102 First-Year Composition	3
MAT 260 Technical Calculus I	3
PHY 111 General Physics	3
PHY 113 General Physics Laboratory	1
Total	16

¹ See pages 42-45 and 48-51 for requirements and approved list.

INDUSTRIAL TECHNOLOGY CORE

ITC 200 Impact of Communications Technology on Society. (3) F, S

Developing an awareness of issues such as privacy, depersonalization and control of information which have been affected by recent developments in communications technology. Activities include researching, evaluating findings and presenting arguments in support of positions. Prerequisite: ENG 102, 105 or 108.

202 Design and Enterprise. (3) F, S

Application concepts of design, creativity, problem solving, research, development, organizations and production as used in the working environment of technology. Prerequisite: ITC 200.

443 Occupational Safety. (3) F

Accident prevention, accident factors, methods of recording and reporting, analysis, psychological aspects, attitudes, recent legislation, safety consciousness and liability. Prerequisite: junior status.

444 Industrial Organization. (3) S

Industrial organization concepts. Topics relate to industrial relations, governmental regulations, organizational structure, labor relations, human factors and current industrial practices. Field trips. Prerequisite: junior status.

Special Courses: ITC 294, 394, 484, 494, 498, 591. (See pages 36-37.)

GRAPHIC COMMUNICATIONS

GRC 135 Graphic Communications. (3) F, S

Introduction to the technologies involved in the design image generation, transmission and production of multiple images for consumer utilization. 2 hours lecture, 4 hours lab. Field trips.

136 History of Printing in the Western World. (3) N

Historical perspective of technological developments in printing and social impacts on Western civilization in relation to other forms of communication. Field trips.

237 Image Preparation. (3) F

Basic principles of typographic layout. Preparation of thumbnails, roughs, comprehensives and mechanicals. Introduction to photocomposition systems. 2 hours lecture, 4 hours lab.

331 Quality Assurance for the Reproduction Processes. (3) N

Instrumentation and methodologies for materials testing and quality control in the major reproduction processes. Field trips.

332 Film Assembly and Platemaking. (3) N

Stripping negatives and positives; line, halftone, duo-tone, full color; contacting flats onto various types of lithographic plates. Field trips. 2 hours lecture, 4 hours lab. Prerequisite: GRC 135.

333 Sheet-Web Press Technology. (3) F

Function of the offset printing equipment. Lithographic dynamics of both sheet fed and web systems. 2 hours lecture, 4 hours lab. Prerequisite: GRC 332 or instructor approval.

334 Photo-Mechanical Reproductions. (3) F

Theory and production of line work, halftones, contact work and special effects for the graphic arts industry. 2 hours lecture, 4 hours lab.

335 Binding and Finishing. (3) F

Operations, involving cutting, trimming, perforating, stamping, die cutting, laminating, embossing and bindery process. Prerequisite: GRC 333.

336 Color Separation. (3) S

Methods of producing separation negatives and positives. Prerequisite: GRC 334.

337 Production Management. (3) N

Planning and controlling work flow of graphic arts products. Field trips. Prerequisite: GRC 135.

339 Estimating and Cost Analysis. (3) N

Estimating printing operations and materials; elements of cost finding using selected systems. Prerequisite: GRC 135.

433 Production Techniques. (3) N

Systematic production planning experience. 6 hours lecture, lab. Prerequisites: GRC 333, 334.

435 Plant Management. (3) N

Independent documentary research; equipment, personnel, plant site selection and plant management problems. Field trips. Prerequisite: GRC 337.

436 Gravure Technology. (3) N

In-depth study of the production sequences and processes related to the gravure method of printing. Prerequisite: GRC 336.

437 Advanced Color Reproduction. (3) F

Scientific analysis for the engineering of color reproduction systems used in the graphic arts industry. Field trips. Prerequisite: GRC 336.

438 Graphic Arts Techniques and Processes. (3) F, S, SS

Relating materials to graphic arts printed products-production practice. 2 hours lecture, 4 hours lab. Prerequisite: junior standing.

278 INDUSTRIAL TECHNOLOGY

439 Electronic Imaging for Publishing. (3) N
Detailed study of image preparation systems.

537 Current Issues in Quality Assurance. (3) N
Directed group study of selected issues relating to quality assurance in the printing and publishing industry.

Special Courses: GRC 484, 494, 498, 499, 500, 580, 584, 590, 591, 592, 593, 594, 598. (See pages 36-37.)

INDUSTRIAL MANAGEMENT

IST 402 Industrial Laws, Contracts and Regulations. (3) N

Review of city, state, county and federal laws that affect industrial and construction operations, materials, supplies and acquisition procedures.

442 Global Supervision Philosophies. (3) S
Analysis and comparison of significant supervision philosophies developed in various industrial nations and their potential application in the United States.

445 Industrial Internship. (1-10) F, S, SS
Work experience assignment in industry commensurate with student's program. Specialized instruction by industry with University supervision. Prerequisites: approval of advisor; junior-senior status; 2.50 GPA.

446 Supervisory Relationships. (3) S
Elements of human relations training and the consequences of supervisory behavioral patterns in effectively dealing with employees.

450 Industrial Training. (3) F
Training techniques and learning processes. Planning, developing and evaluating training programs in industry and governmental agencies. Prerequisite: advisor approval.

451 Materials Control. (3) F
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) S
Supervisory principles as applied to industrial and governmental agencies. Supervisor-employee relations, group morale, leadership techniques, policy interpretation and training. Prerequisite: advisor approval.

453 Safety Supervision. (3) S
Controlling physical conditions, environmental control, personal protection controls, cost analysis, systems safety analysis, auxiliary functions. Prerequisites: ITC 443, 444.

455 Industrial Sales and Demand. (3) F, S
Customer and sales strategies for industrial organizations, including current practice and future planning. Prerequisites: ECN 111; Advisor and instructor approval; junior or senior standing.

461 Production Supervision Principles. (3) N
Introduction to supervisory principles as applied to production of goods and services. Prerequisite: ECN 111.

470 Project Management. (3) S
Planning, organization, coordinating and controlling staff and project groups to accomplish the project objective.

480 Organizational Effectiveness. (3) N
Supervisory behavior managing people in the industrial environment to achieve organizational goals.

491 Introduction to Labor Concerns. (3) N
Introduction to labor relations, organization of labor unions and federations, collective bargaining, grievances and arbitration and applicable labor legislation.

549 Research Techniques and Applications. (3) F, S
Selection of research problems, analysis of literature, individual investigations, preparing reports, proposal writing.

598 Special Topics. (1-2) F, S
Special topics courses, including the following which are regularly offered, are open to qualified students:

- (a) Principles of Hazardous Materials and Waste Management
- (b) Regulatory Framework for Toxic and Hazardous Substances
- (c) Principles of Toxicology
- (d) Technologies for Storage, Treatment and Disposal of Hazardous Materials
- (e) Quantitative Analysis and Practical Laboratory Techniques
- (f) Industrial Hygiene
- (g) Air Pollution and Toxic Chemicals
- (h) Groundwater Hydrology: Monitoring Protection and Clean-up
- (i) Emergency Preparedness, Response and Planning for Hazardous Materials
- (j) Risk Assessment for Hazardous Materials
- (k) Fate of Toxic Substances in the Environment

Special Courses: IST 484, 494, 498, 499, 500, 580, 583, 584, 590, 591, 592, 593, 594, 598, 599, 600, 680, 683, 684, 690, 691, 692, 693, 700, 780, 783, 784, 790, 791, 792, 799. (See pages 36-37.)

INTERACTIVE COMPUTER GRAPHICS

ICG 212 Design Documentation. (3) A
Using microcomputer-based graphics systems for product design and documentation. Geometric shape analysis and description. Documentation techniques and standards. Dimensioning. Field trips. Lecture, lab. Prerequisite: ECE 106.

310 Computer Graphics Fundamentals. (3) A
Computer image creation, transformation and manipulation. Current techniques for database generation. Concepts of applications software development. Hands-on experience. Field trips. Lecture, lab. Prerequisite: programming background helpful but not necessary. [Satisfies General Studies Requirement: N3]

312 Computer-Assisted Graphics. (3) A
Using computer-aided design and drafting application software for advanced geometric construction. System and workstation configuration and productivity. Modeling applications. Field trips. Lecture, lab. Prerequisite: ICG 212. [Satisfies General Studies Requirement: N3]

313 Technical Illustration. (3) N
Pictorial drawing, shades and shadows and multi-media rendering techniques. Lecture, lab. Prerequisite: ICG 212 or equivalent

314 The CIM Database. (3) A
Preparing the product definition database for computer-integrated-manufacturing. Documentation and process requirements, systems and standards. Precision dimensioning. Field trips. Lecture, lab. Prerequisite: ICG 212; TCE 230 or equivalent.

412 Computer Graphics Modeling. (3) A
Establishing and manipulating 3D computer models. Applications including solids modeling concepts, design analysis, dynamic simulation and database interchange. Field trips. Lecture, lab. Prerequisite: ICG 312. [Satisfies General Studies Requirement: N3]

413 Graphic Applications. (3) N
Student selected modules: architectural, construction, civil/utility and electronic drawing; descriptive geometry, blueprint reading, computer graphics and others. Field trips. Lecture, lab. Prerequisite: ICG 212 or equivalent.

417 Computer Graphics Systems. (3) A

Planning, implementing, managing computer graphics systems. Applications, needs assessment, analysis of components, system ergonomics, interfacing, maintenance and human resources management. Field trips. Lecture, lab. Prerequisite: instructor approval.

517 Graphics Systems Development. (3) N

Research and development in computer graphics systems. Applied project management, development, evaluation and implementation. Field trips. Lecture, lab. Prerequisites: ICG 212, 312 and 412 or equivalents, or instructor approval.

Special Courses: ICG 484, 494, 498, 499, 580, 584, 590, 591, 592, 593, 594, 598, 599, 780, 783, 784, 790, 791, 792, 799. (See pages 36-37.)

INDUSTRIAL TECHNOLOGY EDUCATION**ITE 222 Wood Technology.** (2) N

Physical, structural and mechanical properties. Analysis of adhesives, preservatives and hybrid materials. Field trips. 6 hours lecture, lab.

321 Light Building Technology. (3) N

Principles and practices as related to light construction inclusive of preliminary considerations and functions through postconstruction concern. Field trips. 2 hours lecture, 4 hours lab. Prerequisite: instructor approval.

322 Design and Manufacture in Wood. (3) N

Furniture, cabinet, pricing, experimentation, modified wood products, joining, forming, laminating, structural design. Field trips. 6 hours lecture, lab. Prerequisite: ITE 222

361 Industrial Projects Design. (2) N

Design and development of projects for the classroom. 4 hours lecture, lab. Prerequisite: instructor approval.

377 Internal Combustion Engines. (3) N

Engine principles, design, performance testing; fuels. Field trips. 6 hours lecture, lab. Prerequisite: instructor approval.

402 Occupational Analysis and Course Development. (3) A

Selecting instruction units through task analysis techniques; industrial and vocational course and training program development. Prerequisite: instructor approval.

405 Improving Instruction in Industrial Education. (3) N

Methods, evaluation and instructional improvement in industrial education. Prerequisite: ITE 222.

421 Production Wood Technology. (3) N

Design and manufacture of products, economy of materials, structural factors, jigs and fixtures, work environment, assembling, finishing. Field trips. 6 hours lecture, lab. Prerequisite: ITE 222

424 Techniques of Construction. (3) N

Buildings, nonbuildings, planning, site preparation, structure, construction materials, personnel. Field trips. 6 hours lecture, lab. Prerequisite: ITE 222

427 Industrial Plastics. (3) N

Theory of thermoset plastics. Injection molding, vacuum forming, welding. Casting foam. Compression molding and fabrication. Field trips. 6 hours lecture, lab.

442 Facility Planning and Management. (3) N

Planning, organizing and managing industrial and vocational education laboratories; equipment and supply selection, facility arrangement. Field trips. Prerequisite: junior standing.

446 Instructional Aids and Materials. (3) N

Selection, preparation, construction and methods of use in industrial and vocational education. Prerequisite: instructor approval.

461 Hot Metal Techniques. (3) N

Properties of metals; sand and investment casting; pattern making. Field trips. 6 hours lecture, lab. Prerequisite: MET 200.

465 General Metals. (3) N

Numerical control, chipless machining; study of special interest in metalworking processes. 6 hours lecture, lab. Prerequisite: ITE 160.

470 Improving Instruction in Pre-Vocational Education. (3) N

Methods, evaluation and instructional improvement in pre-vocational education. Prerequisite: ITE 402.

471 Power Transmission. (3) N

Principles and servicing of clutches, transmissions, differentials, steering and suspension. 6 hours lecture, lab. Prerequisite: instructor approval.

478 Engine Analysis. (3) N

Automotive emission control, air conditioning operation, performance testing, ignition and fuel control. Field trips. Prerequisite: instructor approval.

480 Teaching Industrial and Vocational Subjects. (3) N

Teaching techniques, philosophy, organization, planning, evaluation of teaching efficiency. Prerequisite: junior standing.

485 Teaching Internship. (1-8) N

Classroom, laboratory and training procedures in post-secondary institutions, industry and/or governmental agencies. Prerequisites: ITE 402, 480, senior standing and departmental approval.

491 Organization and Management of Cooperative Programs. (3) N

Workstudy programs for industrial and vocational occupations in high schools and community colleges. Developing and coordinating programs. Instructional materials. Prerequisite: junior standing.

513 Experimental Activities. (3) N

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) N

Evaluative factors such as attitudes, behavioral factors, skills, technical information; instrument construction; evaluation of program effectiveness.

541 Vocational Education for Special Needs. (3) N

Organizing and administering vocational programs to meet special needs of youth and adults in schools, agencies, and industry.

542 History and Philosophy of Industrial and Vocational Education. (3) N

Evolution of modern programs, current concepts, future trends.

544 Industrial Processes in Special Education. (3) N

Emphasis on task analysis in development of manipulative activities for special needs learners.

545 Legal Aspects of Occupational Education. (3) N

Interpretation of federal and state acts, regulations, and responsibilities related to vocational education programs.

546 Post-Secondary Occupational Education. (3) N

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) N
Improving instruction, fund and material control, student personnel problems, curricular patterns.

549 Research Techniques and Applications. (3) N
Selection of research problems, analysis of literature, individual investigations, preparing reports, proposal writing.

Special Courses: ITE 484, 494, 498, 499, 580, 584, 590, 591, 592, 593, 594, 598, 599, 780, 783, 784, 790, 791, 792, 799. (See pages 36-37.)

Manufacturing Technology

ASSOCIATE PROFESSORS:

KELLEY (TC 201H), BOWERS, GRAHAM,
KISIELEWSKI, SCHMIDT

ASSISTANT PROFESSORS:

LAMERAND, PALMGREN, PELTIER, SHELLER

LECTURER:

KRINGS

PROFESSORS EMERITI:

AUTORE, CAVALLIERE, MINTER

Increased technological complexity and sophistication have 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, five options are available as listed below.

Degrees. The faculty of the Department of Manufacturing Technology offer a program of study leading to the Bachelor of Science degree with a major in Manufacturing Engineering Technology (B.S./MET). The five available options are:

- Computer Integrated Manufacturing Engineering Technology
- Manufacturing Engineering Technology
- Mechanical Engineering Technology
- Robotic and Automation Engineering Technology
- Welding Engineering Technology

Manufacturing Engineering Technology—B.S.

The program will appeal to persons interested in developing a career in the field of manufacturing with a primary focus on practice-oriented applications of existing or state-of-the-art manufacturing techniques.

The faculty maintain proficiency through contact with industry both by maintenance of the industrial advisory committee and through working directly in an appropriate field.

Those students who seek admission to the program from other programs within the College of Engineering and Applied Sciences may be admitted with a minimum GPA of 2.00. Students admitted to the program will be required to develop an area of specialization.

Degree Requirements

	<i>Semester Hours</i>
Technology Core	20
Engineering Technology Core	19
General Studies requirements	36
University English requirements	6
Manufacturing Engineering Technology Core	16
Selected option	35
Total Semester Hours Required	
	132

The following courses are required as part of the technology core:

	<i>Semester Hours</i>
CHM 114 General Chemistry for Engineers	4
MAT 260 Technical Calculus I	3
TCE 230 Engineering Materials and Processing	3

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

	<i>Semester Hours</i>
ETC 307 Electrical Power Circuits and Machines	4
ETC 313 Applied Engineering Mechanics: Materials	3
ETC 340 Applied Thermodynamics and Heat Transfer	3

Manufacturing Engineering Technology Core

	<i>Semester Hours</i>
MET 231 Manufacturing Processes	3
MET 300 Applied Metallurgy	3
MET 302 Welding Survey	4
MET 401 Statistical Process Control	3
MET 460 Manufacturing Capstone Project	3
or MET 461 Mechanical Capstone Project (3) or MET 462 Welding Capstone Project (3) (for Robotic and CIM projects, see department chair)	---
Total	16

Option in Computer Integrated Manufacturing Engineering Technology

Computer integrated manufacturing (CIM) has proven to be a powerful tool for increasing productivity in manufacturing. This impact will be greater in the future as the full potential of computers is integrated into the manufacturing factory. Computer integrated manufacturing engineering technology is concerned with the coordination of computer information and computer implementation in manufacturing.

Required courses: ICG 212, 314; MET 341, 345, 416, 443, 448, 451, 453; plus 7 hours *approved* technical electives.

Option in Manufacturing Engineering Technology

This option is designed to prepare technologists with both conceptual and practical applications of processes, materials and products related to metal-working 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: AET 409; MET 341, 344, 345, 346, 416, 442, 443, 444; plus 7 hours *approved* technical electives.

Option in Mechanical Engineering Technology

The primary objective of the mechanical engineering technology option is to prepare the student for entry-level work in mechanical design and test either in engineering or manufacturing departments in product-oriented industries. Major emphasis is placed on reducing the amount of time required by industry to make the graduate productive in any area of work. The student will obtain a well rounded academic background in the General Studies, basic sciences, mechanics and thermal sciences.

Required courses: AET 310; ETC 312; MET 331, 432, 433, 434, 436, 438; plus 7 hours of *approved* technical electives.

Option in Robotic and Automation Engineering Technology

The challenges to improve productivity, improve product quality, reliability and reduce costs must be addressed by integrating robots and automation in manufacturing. Robotic and automation technology will address the field of automating manufacturing processes.

Required courses: ICG 314; MET 341, 345, 346, 416, 444, 451, 452, 453; plus 7 hours *approved* technical electives.

Option in Welding Engineering Technology

This option 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 non-destructive testing and weldment design. The student also has the opportunity to work with robots in robotic welding applications. Also, a laser is available for investigating the area of high energy welding processes.

Graduates of this program have the capability to function in a variety of technical positions related to welding and manufacturing. Typically, a graduate from this program may work in the areas of: robotic welding, metallurgy, quality control, non-destructive evaluation, welding process evaluation and technical sales.

The industries where graduates may find employment are: aerospace, automotive, heavy machinery, heavy fabrication and energy production.

Required courses: AET 409; MET 321, 322, 325, 341, 346, 420, 421, 425; plus 7 hours of *approved* technical electives.

**First Two-Year Typical Curriculum for Manufacturing Engineering Technology
Freshman Year**

First Semester	<i>Semester Hours</i>
CHM 114 General Chemistry for Engineers	4
ENG 101 First-Year Composition	3
MAT 115 College Algebra and Trigonometry	4
TCE 100 Structured Problem Solving with BASIC	3
General Studies Elective (HU or SB) ¹	3
Total	17
Second Semester	
ECE 105 Introduction to Languages of Engineering	3
ENG 102 First-Year Composition	3
MAT 260 Technical Calculus I	3
PHY 111 General Physics	3
PHY 113 General Physics Laboratory	1
TCE 230 Engineering Materials and Processing	3
Total	16

282 MANUFACTURING TECHNOLOGY

Sophomore Year

First Semester

ECE 106	Introduction to Computer-Aided Engineering	3
MAT 261	Technical Calculus II	3
MET 231	Manufacturing Processes	3
PHY 112	General Physics	3
PHY 114	General Physics Laboratory	1
TCE 201	Applied Electrical Science	4
Total		17

Second Semester

ECN 111	Macroeconomic Principles	3
ETC 211	Applied Engineering Mechanics: Statics	3
MAT 262	Technical Calculus III	3
MET 345	Advanced Manufacturing Processes	4
General Studies Elective (HU or SB)		3
Total		16

¹ See pages 42-45 and 48-55 for requirements and approved list.

MANUFACTURING TECHNOLOGY

MET 110 Welding Survey. (3) N

Oxy-acetylene, arc, brazing, resistance and gas tungsten-arc welding procedures for ferrous and nonferrous metals. Lecture, lab.

116 Aeronautical Welding. (2) F

Oxy-acetylene and tungsten gas tungsten-arc welding procedures and brazing techniques used for aircraft structures. Lecture, lab.

231 Manufacturing Processes. (3) F

Metal removal processes emphasizing drilling, milling and lathe processes including tool bit grinding. Emphasis on production speeds and feeds. Lecture, lab. Prerequisites: ECE 106; TCE 230.

300 Applied Metallurgy. (3) F

Principles of metallurgy emphasizing concepts most relevant to typical manufacturing requirements; factors affecting properties and evaluation methods; metallography experiences. Lecture, lab. Prerequisite: TCE 230 or instructor approval.

302 Welding Survey. (4) F

Theory and application of industrial welding processes; introductory welding metallurgy and weldment design; SMAW, GTAW, GMAW, Oxy-acetylene, brazing experiences. Lecture, lab. Prerequisite: upper-class standing.

303 Machine Control Systems. (3) N

Theory and application of electromechanical, hydraulic, pneumatic, fluidic and electrical control systems for manufacturing. Lecture, lab. Prerequisites: MAT 260; TCE 201 or PHY 112.

321 Welding Processes. (3) N

Theory and application of the arc welding processes and oxy-fuel cutting; fixturing, procedures, safety, codes and experimental techniques are covered. Lecture, lab. Prerequisites: MET 302; PHY 112.

322 Welding Processes. (3) N

Theory and applications of EBW, LBW, solid state bonding, brazing and soldering. Lecture, lab. Prerequisites: MET 302; PHY 112.

325 Welding Power Source Analysis. (4) N

Design and operating characteristics of welding power sources and related equipment. Equipment selection, setup and troubleshooting procedures covered. Lecture, lab. Prerequisites: MET 302; PHY 112; TCE 201.

331 Design for Manufacturing I. (3) S

Introduction to design of machines and structures with emphasis on layout design drawing. Basics of gears, cams, fasteners, springs, bearing linkages, cylindrical fits, flat pattern development and surface finish requirements emphasized. Prerequisite: ETC 313.

341 Manufacturing Analysis. (3) S

Introduction to the organizational and functional requirements for effective production. Includes writing production operation plans. Prerequisite: MET 231.

343 Material Processes. (3) S

Industrial processing as applied to low, medium and high volume manufacturing. Basic and secondary processing, fastening and joining, coating, quality control.

344 Casting and Forming Processes. (3) S

Analysis of various forming processes to determine load requirements necessary for a particular metal forming operation. This information is used to select equipment and design tooling. Metal casting processes and design of casting. Introduction to powder metallurgy. Prerequisite: MET 300 or instructor approval.

345 Advanced Manufacturing Processes. (4) S

Metal removal processes emphasizing milling, grinding, turret and tracer lathe and cutter sharpening. Application of machinability theory to practice. Production feeds, speeds and tool wear measurement. Lecture, lab. Prerequisites: MET 231, 300 or instructor approval.

346 Numerical Control Point To Point and Continuous Path Programming. (3) N

Methods of programming, set-up and operation of numerical control machines emphasizing lathe and mill systems. Lecture, lab. Prerequisites: MET 231.

354 Mechanics of Materials. (4) F

Vectors, force systems, friction, equilibrium, centroids and moment of inertia. Concepts of stress, strain and stress analysis applies to beams, columns and combined loading. Non-majors only. Prerequisites: MAT 115; PHY 111.

401 Statistical Process Control. (3) S

Introduction to statistical quality control methods as applied to tolerances, process control, sampling and reliability. Prerequisite: MAT 115.

407 Aerospace Materials. (2) N

Materials used for aircraft powerplants and airframes; emphasis on criteria for selection in terms of mechanical properties and manufacturing processes. Prerequisite: TCE 230 or equivalent.

416 Applied Computer Integrated Manufacturing. (3) F, S

Techniques and practices of Computer Integrated Manufacturing with an emphasis on Computer Aided Design and Computer Aided Manufacturing. Prerequisite: MET 346 or instructor approval. [Satisfies General Studies Requirement: N3]

420 Welding Metallurgy. (4) N

Metallurgical principles applied to structural and alloy steel and aluminum weldments; laboratory emphasis on welding experiments, metallography and mechanical testing. Lecture, lab. Prerequisites: CHM 114; MET 300, 302.

421 Welding Metallurgy. (3) N

Metallurgical principles as applied to stainless steel, super alloy, titanium and other refractory metal weldments and braze joints. Prerequisites: CHM 114; MET 300.

425 Welding Codes. (2) S

Familiarization with and application of the various codes, standards, specifications applicable to weldments. Prerequisite: MET 302 or equivalent.

432 Applied Thermodynamics and Heat Transfer. (3) F, S

Thermodynamics of mixtures. Combustion process. Applications of thermodynamics to power and refrigeration cycles. Heat transfer: steady state conduction, convection and radiation. Prerequisite: ETC 340.

433 Thermal Power Systems. (4) N

Analysis of gas power, vapor power and refrigeration cycles. Components of air conditioning systems. Direct energy conversion. Psychrometry. Analysis of internal combustion engines and fluid machines. Fundamentals of conduction, radiation and convection. Lecture, lab. Prerequisite: MET 432.

434 Applied Fluid Mechanics. (3) S

Fluid statics. Basic fluid flow equations. Viscous flow in pipes and channels. Compressible flow. Applications to fluid measurement and flow in conduits. Prerequisite: ETC 340.

436 Turbomachinery Design. (3) N

The application of thermodynamics and fluid mechanics to the analysis of machinery design and power cycle performance predictions. Prerequisite: MET 432.

438 Design for Manufacturing II. (4) N

The application of mechanics in the design of machine elements and structures. The use of experimental stress analysis in design evaluation. Lecture, lab. Prerequisites: ETC 312; MET 231, 331.

442 Specialized Production Processes. (3) S

Non-traditional manufacturing processes emphasizing EDM, ECM, ECG, CM, PM, HERF, EBW, LBW, etc. Prerequisite: TCE 230.

443 N/C Computer Programming. (3) F

Theory and application of computer-aided N/C languages with programming emphasis with APT and suitable post-processors. Lecture, lab. Prerequisite: MET 346 or instructor approval.

444 Production Tooling. (3) F

Fabrication and design of jigs, fixtures and special industrial tooling related to manufacturing methods. Lecture, lab. Prerequisite: MET 345.

448 Expert Systems in Manufacturing. (3) S

Introduction to expert systems through conceptual analysis with an emphasis on manufacturing applications. Prerequisite: MET 231.

451 Introduction to Robotics. (3) F

Introduction to industrial robots. Topics included are: robot geometry, robot workspace, trajectory generation, robot actuators and sensors, design of end effectors and economic justification. Prerequisite: MET 303 or instructor approval.

452 Implementation of Robots in Manufacturing. (3) S

Robotic workcell design including end effectors, parts presentors and optimum material flow. Prerequisite: MET 451 or instructor approval.

453 Robotic Applications. (3) S

Lab course utilizing robots and other automated manufacturing equipment to produce a part. Students are required to program robots, as well as interface the robots with other equipment. Prerequisite: MET 303 or 325 or instructor approval.

460 Manufacturing Capstone Project. (3) S

Small group project applying manufacturing techniques with an emphasis on demonstrating state-of-the-art technology. Prerequisite: MET 416. [Satisfies General Studies Requirement: L2]

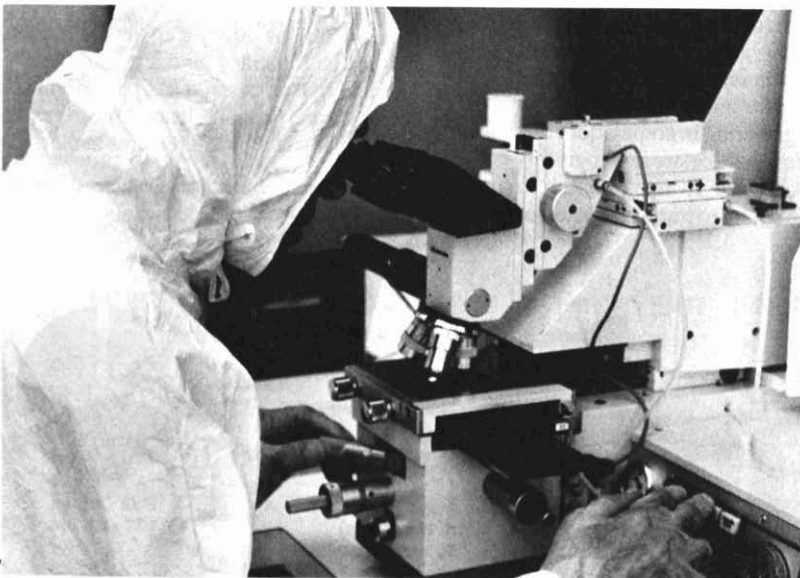
461 Mechanical Capstone Project. (3) F

Integration of materials, mechanics and power into analysis of engineering design of system components. Prerequisites: MET 432, 438.

462 Welding Capstone Project. (3) S

Design of welded structures and machine elements in terms of allowable stresses, joint configurations, process capabilities and cost analysis; welding procedures emphasized. Prerequisites: ETC 313; MET 302.

Special Courses: MET 484, 494, 498, 499, 500, 580, 584, 590, 591, 592, 593, 594, 598. (See pages 36-37.)



School of Engineering

George C. Beakley Jr., 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.

Admission

See pages 22-27, 40-42, 244-245, and 247 for information regarding requirements for admission, transfer, retention, disqualification and reinstatement.

In addition, 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 3 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.

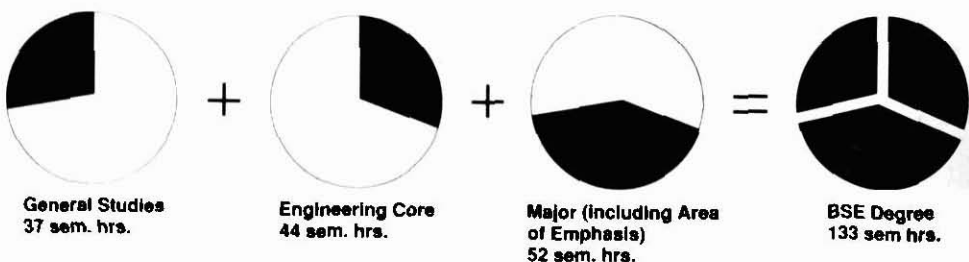
Students who have omissions or deficiencies in subject matter preparation may be required to complete additional university credit course work which may not be applied toward an engineering degree. One or more of the courses—MAT 115 College Algebra and Trigonometry, PHY 111, 113 College Physics (or PHY 105), ENG 101 Freshman Composition*, CHM 113 General Chemistry—are taken to satisfy omissions or deficiencies.

Degrees/Majors

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 chart shown on the following page.

The General Studies satisfy a university requirement and include literacy and critical inquiry, humanities and fine arts, social and behavioral sciences, numeracy and natural sciences (see pages 42-45). In addition, there are requirements in the areas

* See statement on placement examinations for proficiency—English, page 33.



of historical awareness and global awareness. These courses comprise approximately 28 percent 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 33 percent of the degree program.

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 majors available are of two types: (1) those associated with a particular department within the School of Engineering (for example, electrical engineering, civil engineering, etc.), and (2) those offered as special and interdisciplinary studies (for example, nuclear sciences, premedical engineering, etc.). In general, all curricula are extensions beyond the engineering core and cover a wide variety of subject areas within each field. 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."

Majors and areas of emphasis are offered by the six engineering departments: Chemical, Bio and Materials Engineering (CHE), Civil Engineering (CEE), Electrical and Computer Engineering (EEE), Industrial and Management Systems Engineering (IEE), Mechanical and Aerospace Engineering (MAE) and Special and Interdisciplinary Engineering (including Bioengineering). The majors of Bioengineering and Engineering Special and Interdisciplinary Studies are administered by the

Office of the Dean and are designed for those students whose educational objectives require more intensity of concentration or flexibility than is possible in the traditional departmental fields (see pages 326-335).

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 below 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

		<i>Semester Hours</i>
First Semester		
CHM 114	General Chemistry ¹	4
	or CHM 116 General Chemistry (4)	
ECE 105	Introduction to Languages of Engineering ²	3
MAT 290	Calculus I ³	5
	General Studies Electives (HU or SB) ⁴	6
	or ENG 101 First-Year Composition (3)	
	Total	18
Second Semester		
ECE 106	Introduction to Computer-Aided Engineering	3
ENG 102	First-Year Composition	3
	or ENG 105 Advanced First-Year Composition (3) ⁵	
MAT 291	Calculus II ³	5
PHY 121	University Physics I ⁶	3
PHY 122	University Physics Lab I	1
	General Studies Elective (HU or SB) ⁴	3
	Total	18

FIRST YEAR	SECOND YEAR	THIRD YEAR	FOURTH YEAR
GENERAL STUDIES			
ENGINEERING CORE			
		MAJOR	OPTION

- ¹ Chemical engineering, bioengineering, materials science and premedical engineering students will take CHM 113.
- ² Students with no computer background should enroll in CSC 181 Applied Problem Solving with BASIC before enrolling in ECE 105.
- ³ MAT 270, 271, 272 may be taken in lieu of MAT 290, 291 (only 10 hours may be used to satisfy graduation requirements). A math placement exam must be taken prior to enrollment in MAT 106, 115, 117, 270 or 290.
- ⁴ See pages 42-45 and 48-55.
- ⁵ Students not eligible for ENG 105 should complete ENG 101 in the preceding semester.
- ⁶ Students who have not completed one unit of physics in high school should complete PHY 111 and 113 (or PHY 105) 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 133 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.

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 133 semester hour course requirements, all students must satisfy the university English proficiency requirements (see page 33).
2. *General Studies* to ensure that the engineering student will acquire a satisfactory level of basic knowledge in the humanities and fine arts, social and behavioral sciences, literacy and critical inquiry, numeracy and natural sciences.

These subjects are so selected as to give the engineer an increased awareness of social responsibilities, to provide an understanding of related factors in the decision-making process and to provide a foundation for the study of engineering.

3. *Fundamental studies* in engineering and related subjects that will further develop the foundation for engineering and 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 societal concern. These studies include technical elective course work in an area of emphasis that may be selected by the student with the assistance of an advisor.

Also refer to the individual engineering department material for any additional specific departmental requirements.

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

English Proficiency	<i>Semester Hours</i>
ENG 101, 102 First-Year Composition	6
or ENG 105 Advanced First-Year Composition (3)	

General Studies

*Literacy and Critical Inquiry**

(6 semester hours minimum)

One course to be chosen from university approved list. Course will be sophomore-level and include a series of formal, graded, written or spoken assignments in composing critical discourse	3
† ECE 400 Engineering Communications	3

Numeracy

(6 semester hours minimum)

† MAT 290 Calculus I	5
or MAT 270 Calculus with Analytic Geometry I (4)	
† ECE 106 Introduction to Computer-Aided Engineering	3

Humanities and Fine Arts†

*Social and Behavioral Sciences**

(15 semester hours minimum)

(At least one course must be of upper-division level; two courses must be from same department; and two departments or more must be represented in total selection.)

Humanities and Fine Arts	9 to 6
Social and Behavioral Sciences	6 to 9
† ECN 111 Macroeconomic Principles (3) or ECN 112 Microeconomic Principles (3)	

Natural Sciences

(8 semester hours minimum)

† PHY 121	University Physics I.....	3
† PHY 122	University Physics Laboratory I.....	1
† PHY 131	University Physics II	3
† PHY 132	University Physics Laboratory II ...	1

Total General Studies 37

NOTE: One course in the area of global awareness* and one course in historical awareness* *must* appear in the final list of courses in the student's graduation program of study. These can be included in the humanities and fine arts/social and behavioral sciences course selections.

* Refer to pages 42-55 and 57-66 for specific requirements and approved list.

† Required for graduation.

Engineering Core

Semester Hours

CHM 114	General Chemistry	4
	or CHM 116 General Chemistry (4)	
ECE 105	Introduction to Languages of Engineering	3
ECE 210	Engineering Mechanics I: Statics	3
	or PHY 321 Newtonian Mechanics(3) ¹	
ECE 301	Electrical Networks I	4
MAT 291	Calculus II	5
	or MAT 271 (4) and MAT 272 (4)	
MAT 274	Elementary Differential Equations	3
	Approved Mathematics Content Electives	4
	Basic Science Elective	3
	Minimum five of the following six courses is required ²	15
ECE 312	Engineering Mechanics II: Dynamics	3
	or PHY 322 Analytical Mechanics (3) ¹	
ECE 313	Introduction to Deformable Solids	3
ECE 333	Electrical Instrumentation	3
	or ECE 334 Electronic Devices and Instrumentation (4)	
ECE 340	Thermodynamics	3
	or CHM 441 General Physical Chemistry (3)	
ECE 350	Structure and Properties of Materials	3
	or ECE 351 Engineering Materials (3) or ECE 352 Semiconductors and Devices (3) or CHM 442 General Physical Chemistry (3)	
	Microcomputer/Microprocessor Elective	3
	Select one:	
CHE 461	Process Control (3)	
CEE 400	Microcomputer Applications in Civil Engineering (3)	
CSC 220	Computer Organization and Assembly Language Programming (4)	
EEE 221	Digital Computer Fundamentals (4)	

IEE 463	Computer Aided Manufacturing and Control (3)
MAE 405	Microcomputer-Aided Processes for MAE (3)

Total Required Minimum Engineering Core 44

¹ Subject to department approval. If PHY 321 is selected, PHY 322 must also be completed.

² Courses to be selected subject to department approval. See departments' requirements.

Semester Hours

General Studies	37
Engineering Core	44
Major (including area of emphasis)	52
Requirements for each of the majors offered are described on the following pages.	

Total Degree Requirements 133
Plus university English proficiency requirements.

Graduation Requirements

In order to qualify for graduation from the School of Engineering a student must have a cumulative grade point average of 2.00, in addition to having a grade point average of at least 2.00 for the 52 semester hours of required courses in the major field.

Professional Accreditation

The undergraduate program majors—Bioengineering, Chemical Engineering, Civil Engineering, Computer Systems Engineering, Electrical Engineering, Industrial Engineering, Mechanical Engineering, Premedical Engineering and the Engineering Special and Interdisciplinary Programs are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).

ANALYSIS AND SYSTEMS

ASE 100 College Adjustment and Survival. (2) F, S
Exploration of career goals and majors. Emphasis on organization and development of study skills including time management, stress management and use of the library.

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

483 Probability for Engineers. (3) S
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

Statistical methods applied to engineering problems. Estimation, tests of hypotheses, regression, correlation, analysis of variance and nonparametric statistics. Prerequisite: ECE 383. [*Satisfies General Studies Requirement: N2*]

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

496 Professional Seminar. (0) F, S

Topics of interest to students in the engineering special and interdisciplinary studies.

500 Engineering Statistics. (3) F, S, SS

Statistical methods applied to engineering problems. Estimation, tests of hypotheses, regression, correlation, analysis of variance and nonparametric statistics. Open only to students without previous credit in ASE 485. Prerequisite: ECE 383 or 500.

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 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: ECE 386; MAT 242, 274.

Special Courses: ASE 294, 394, 484, 494, 498, 499, 591. (See pages 36-37.)

ENGINEERING CORE**ECE 105 Introduction to Languages of Engineering.** (3) F, S, SS

Computer programming using C and FORTRAN-77, freehand drawing, visualization and computer graphics. 1 lecture, 2 hours recitation, 3 hours lab. Prerequisites: algebra, CSC 181 or BASIC programming experience.

106 Introduction to Computer-Aided Engineering. (3) F, S

Computer-aided analysis and design, computer graphics, modeling, optimization and graphic documentation. 1 lecture, 2 hours recitation, 3 hours lab. Prerequisites: ECE 105; 1 year high school physics (or corequisite of PHY 105, PHY 112 or 131). [*Satisfies General Studies Requirement: N3*]

107 Freehand Drawing and Visualization. (1) F, S, SS

Representational drawing from direct observation to assist visualization, spatial awareness and perception. Techniques include contour, gesture and value drawing. Media include pencil and computer graphics. 3 hours lab.

210 Engineering Mechanics I: Statics. (3) F, S, SS

Force systems, resultants, equilibrium, distributed forces, area moments, fluid statics, internal stresses, friction, energy criterion for equilibrium and stability. Lecture, recitation. Prerequisites: ECE 106; PHY 121, 122. Corequisite: MAT 274.

301 Electrical Networks I. (4) F, S, SS

Introduction to electrical networks. Component models, transient and steady-state analysis. Lecture, recitation, lab. Prerequisites: ECE 106; MAT 274, PHY 131, 132.

312 Engineering Mechanics II: Dynamics. (3) F, S, SS

Kinematics and kinetics of particles, translating and rotating coordinate systems, rigid body kinematics, dynamics of systems of particles and rigid bodies, energy and momentum principles. Lecture, recitation. Prerequisite: ECE 210.

313 Introduction to Deformable Solids. (3) F, S, SS

Equilibrium, strain-displacement relations, stress-strain-temperature relations. Applications to force transmission

and deformations in axial, torsional and bending of bars. Combined loadings. Lecture, recitation. Prerequisites: ECE 210; MAT 274.

333 Electrical Instrumentation. (3) F, S, SS

Survey of electronics as applied to instrumentation/measurements. Diodes/transistors/basic transistor amplifiers/op-amps/digital logic gates as applied to electrical and electronic instruments. Electrical sensors/transducers. Lecture, lab. Prerequisite: ECE 301.

334 Electronic Devices and Instrumentation. (4) F, S, SS

Application of electric network theory to semiconductor discrete and integrated circuits. Electronic device and circuit applications, laboratory circuit design, testing and verification. Lecture, recitation, lab. Prerequisite: ECE 301.

340 Thermodynamics. (3) F, S, SS

Work, heat and energy transformations, relationships between properties; laws, concepts and modes of analysis common to all applications of thermodynamics in engineering. Lecture, recitation. Corequisites: ECE 312; MAT 274.

350 Structure and Properties of Materials. (3) F, S, SS

Basic concepts of material structure and its relation to properties. Application to engineering problems. Lecture, recitation. Corequisite: ECE 340.

351 Engineering Materials. (3) F, S

Structure and behavior of civil engineering materials. Laboratory investigations and test criteria. 2 lectures, 3 hours lab. Prerequisite: ECE 313.

352 Semiconductors and Devices. (3) F, S

Crystalline nature of solids, classical and quantum mechanical description of solids, excess carriers in semiconductors, junctions, transistors and integrated circuits. Prerequisites: ECE 334; MAT 274.

383 Probability and Statistics for Engineers. (2) F, S, SS

Probability, random variables, discrete and continuous distributions, descriptive statistics and sampling distributions. Prerequisite: MAT 272 or MAT 291. [*Satisfies General Studies Requirement: N2*]

384 Numerical Analysis for Engineers I. (2) F, S

Numerical solution of algebraic and transcendental equations and systems of linear equations. Numerical integration. Curve fitting. Error bounds and error propagation. Emphasis on use of digital computer. Prerequisites: ECE 105; MAT 272 or MAT 291.

385 Numerical Analysis for Engineers II. (2) S

Continuation of ECE 384. Numerical solution of partial differential equations and mixed equation systems. Introduction to experimental design and optimization techniques. Prerequisite: ECE 384.

386 Partial Differential Equations for Engineers. (2) F, S

Boundary value problems, separation of variables, Fourier series as applied to initial-boundary value problems. Prerequisite: MAT 274.

400 Engineering Communications. (3) F, S, SS

Planning and preparing engineering publications and oral presentations, based on directed library research related to current engineering topics. Prerequisite: senior standing in an engineering field and completion of first-year English requirements plus sophomore critical writing course. [*Satisfies General Studies Requirement: L2*]

500 Probability and Statistics for Engineers. (2) F, S, SS

Probability, random variables, discrete and continuous distributions, descriptive statistics and sampling distributions. Prerequisite: MAT 272 or MAT 291. Open only to students without previous credit for ECE 383.

Special Courses: ECE 294, 394, 484, 494, 498, 500, 591. (See pages 36-37.)

SOCIETY, VALUES AND TECHNOLOGY

STE 201 Technology and Social Change. (2) A
Technology as related to social change, contemporary impact of technology on society. Cross-listed as HPS 201. [Satisfies General Studies Requirement: HU]

310 Man and Machine. (2) A
Relation of man to machine examined in historical, political, and social terms. Comparisons with a look at artificial intelligence studies. Cross-listed as HPS 321. [Satisfies General Studies Requirement: HU, H]

311, 312 Science and Technology in History. (3) F, S
Development and application of scientific thinking from ancient times to present. First semester through 17th century. Second semester: 18th to present. Cross-listed as HPS 322, 323. [Satisfies General Studies Requirements: HU, H]

402 Technology, Society and Human Values. (3) A
Values which motivate mankind to create technology. Areas of conflict and resolution between basic human values and technology. Reading and discussion with visiting lecturers. Cross-listed as HPS 402. Prerequisite: junior standing or above. [Satisfies General Studies Requirement: HU]

411 Social Effects of Invention. (3) S
The role of science and invention, the private and public sector, in the development and application of technology. The issue of the personal and public responsibility of scientists and engineers is examined. Cross-listed as HPS 411.

Special Courses: STE 394, 484, 494, 498, 499, 591. (See pages 36-37.)

Chemical, Bio and Materials Engineering

PROFESSORS:

ZWIEBEL (COB B-210L), BERMAN,
CARPENTER, DORSON, GUILBEAU,
JACOBSON, KUESTER, SATER,
STANLEY, WAGNER

ASSOCIATE PROFESSORS:

BECKMAN, BELLAMY, CALE, COGHLAN,
HENDRICKSON, JINDAL, KRAUSE,
TORREST, TOWE

ASSISTANT PROFESSORS:

BEZANSON, BURROWS, DEY, RAUPP,
SHIN, WINTERS

PROFESSORS EMERITI:

REISER, SHAW

Historically, materials have had a tremendous impact on the advancement of civilization as reflected in the words "stone," "bronze," "iron" and "paper" attached to the various ages in the development of society. Until recently an arbitrary distinction was made between chemically reactive materials and relatively inert solid phase materials. As our technological know-how advances, we recognize that the fundamental principles, the molecular level

mechanisms, and the processing techniques are very similar regardless of the state, phase or shape of the materials. Understanding of these principles and their application to real systems is the key to future progress as specially designed materials are sought for the solution of complex technological problems. Therefore, it is logical that the educational program of future scientists and engineers dealing with the engineered materials be comprehensive, covering all aspects of the materials world.

Similarly, the human body and other living systems process materials by analogous steps as do the chemical industries. These living systems are small, sophisticated integrated plants utilizing pumps, aerators, separators and reactors involving fluid flow, thermodynamics, heat and mass transfer and other familiar principles. Therefore, it is appropriate that the subdisciplines of chemical, biomedical and materials engineering work together in both education and research.

Students aspiring to be engineers in either the chemical, biomedical or materials areas must prepare to solve a wide variety of problems utilizing chemistry, physics, mathematics, life sciences and engineering sciences. As professionals in industry they will apply these fundamentals to creatively develop, economically design and productively operate systems, constituent equipment and specialized analytical facilities.

The department offers two B.S.E. degrees, one in chemical engineering and one in materials science and engineering. The chemical engineering program provides opportunities for an area of emphasis in biomedical engineering. A B.S.E. degree program in Bioengineering and a B.S. degree program in Premedical Engineering are also available at ASU; they are described separately on pages 327 and 334.

Chemical Engineering—B.S.E.

Chemical engineers are generally concerned with chemical change. They design and operate processes which accommodate such changes, including the chemical activation of materials. Typically this involves complex multicomponent systems wherein the interactions between species have to be considered and analyzed. The new challenge in chemical engineering is to apply the principles of mass transfer, solution thermodynamics, reaction kinetics and separation techniques to technological endeavors such as integrated circuit design, solid state surface treatments and materials processing.

Consequently, in addition to the chemical and petroleum industries, chemical engineers find challenging opportunities in the plastics, solid state,

electronics, computer, metals, space, food, drugs and health care industries, where they practice in a wide variety of occupations like environmental control, surface treatments, energy and materials transformations, biomedical applications, fermentation, protein recovery, extractive metallurgy and separations. While a large percentage of the industrial positions are filled by graduates with bachelor's degrees, there are lucrative and creative opportunities in research and development for those who acquire post-graduate education.

Subspecializations have developed within the profession. However, 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.

Degree Requirements

The course work for the undergraduate degree can be classified into the following categories (in semester hours):

<i>General Studies</i>	38
See page 286 for School of Engineering requirements. (CHE 351 and 352 must be taken to satisfy the literacy and critical inquiry elective.)	
<i>Engineering core</i>	44
CHE 461; CHM 116, 331, 441, 442, ECE 105, 210, 301, 313, 333, 384, 385; MAT 291 (or 271 and 272), 274	
<i>Major</i>	51
CHE 311, 312, 331, 332, 333, 342, 432, 442, 451, 462; CHM 113, 332, 335, 343	

In addition, 13 hours of technical electives must be selected from among CHE upper-division or graduate-level courses or technical courses in other departments with advisor's approval. One elective course must have chemical content and be selected from CHE 458, 473; CHM 361 or any three semester hour 400-level CHM course.

To fulfill accreditation requirements and to adequately prepare for the advanced chemistry courses, Chemical Engineering majors are required to take the CHM 113 and 116 introductory chemistry sequence (CHM 117 and 119 are acceptable substitutes). Other freshman chemistry courses are *not acceptable*, and transfer students who have taken another chemistry course may be required to enroll in CHM 113 and 116.

The Chemical, Bio and Materials Engineering Department also offers graduate programs leading to the M.S.E., M.S. and Ph.D. degrees. These programs provide a blend of classroom instruction and research. A wide variety of topical and relevant

research projects are available for thesis topics. Students interested in these programs should contact the department for up-to-date descriptive literature.

Chemical Engineering Areas of Emphasis

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. Because of accreditation requirements, no substitution for CHE 462 will be allowed. 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: BME 411, 412, 413, 418, 435.

Premedical: Students planning on attending medical school should select courses from those listed under the biomedical emphasis. In addition, BIO 181 and 182 must be taken to satisfy medical school requirements but will not be counted toward the Chemical Engineering bachelor's degree.

Biochemical: BIO 340, 442; CHE 528, 556; CHM 461, 462, 467, 468.

Materials: ECE 350; MSE 355, 420, 431, 470, 472.

Energy conversion and conservation: CHE 553, 554, 556; MAE 436, 437, 438, 583.

Environmental control: CHE 553, 554, 556, 562; CEE 361, 362, 561.

Plant administration: CHE 553, 581; IEE 431; MGT 301.

Semiconductor processing: CHE 458; ECE 352; EEE 435, 436.

Simulation, systems control and design: CHE 556, 562, 563, 581; IEE 463.

Chemical Engineering Program of Study Typical Four-Year Sequence First Year

First Semester		<i>Semester Hours</i>
CHE 496	Professional Seminar	0
CHM 113	General Chemistry	4
ECE 105	Introduction to Languages of Engineering	3
ENG 101	First-Year Composition	3
MAT 290	Calculus I	5
General Studies Elective (HU or SB) ¹		3
Total		18

Second Semester

CHM 116	General Chemistry	4
CHE 496	Professional Seminar	0
ECE 106	Introduction to Computer-Aided Engineering	3
MAT 291	Calculus II	5
PHY 121	University Physics I	3
PHY 122	University Physics Lab I	1
Total		16

Second Year

First Semester

CHE 311	Material Balances	3
CHE 496	Professional Seminar	0
CHM 331	General Organic Chemistry	3
ENG 102	First-Year Composition	3
MAT 274	Elementary Differential Equations	3
PHY 131	University Physics II	3
PHY 132	University Physics Lab II	1
Total		16

Second Semester

CHE 312	Introduction to Thermodynamics	3
CHE 331	Transport Phenomena I: Fluids	3
CHE 496	Professional Seminar	0
CHM 332	General Organic Chemistry	3
CHM 335	General Organic Chemistry Lab	1
ECE 210	Engineering Mechanics I: Statics	3
ECE 384	Numerical Analysis for Engineers I	2
General Studies Elective (HU or SB) ¹		3
Total		18

Third Year

First Semester

CHE 332	Transport Phenomena II: Energy Transfer	3
CHE 342	Applied Chemical Thermodynamics	3
CHE 351	Measurements Lab	2
CHE 496	Professional Seminar	0
CHM 441	General Physical Chemistry	3
CHM 343	Physical Chemistry Lab	1
ECE 385	Numerical Analysis for Engineers II	2
General Studies Elective (HU or SB) ¹		3
Total		17

Second Semester

CHE 333	Transfer Phenomena III: Mass Transfer	3
CHE 352	Transport Laboratory	2
CHE 496	Professional Seminar	0
CHM 442	Physical Chemistry	3
ECE 301	Electrical Networks I	4
ECE 313	Introduction to Deformable Solids	3
General Studies Elective (HU or SB) ¹		3
Total		18

Fourth Year

First Semester

CHE 432	Principles of Chemical Engineering Design	3
CHE 442	Chemical Reactor Design	3
CHE 451	Chemical Engineering Laboratory	2
CHE 461	Process Control	3
CHE 496	Professional Seminar	0
Technical Elective		7
Total		18

Second Semester

CHE 462	Process Design	3
CHE 496	Professional Seminar	0
ECE 333	Electrical Instrumentation	3
ECE 400	Engineering Communications	3
Technical Elective		6
General Studies Elective (HU or SB) ¹		3
Total		18

Degree Requirements: 133 semester hours plus English proficiency.

¹ See pages 42-45 and 48-55 for requirements and approved list.

Materials Science

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. 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.

Degree Requirements

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

The courses for the undergraduate degree can be classified into the following categories (in semester hours):

<i>General Studies</i>	37
See page 286 for School of Engineering requirements.	
<i>Engineering core</i>	44
CHM 116, 441; CSC 220 (or IEE 463 or MAE 405 or ECE 333); ECE 105, 210 (or PHY 321), 301, 312 (or PHY 322), 313, 350, 383 (or 384 or 386); MAT 242, 274, 291 (or 271/272); PHY 361	
<i>Major</i>	52
CHE 311, 312, 351; CHM 113; MAE 351; MSE 355, 420, 430, 431, 440, 450, 470, 472, 492	

In addition, nine hours of electives must be selected from one of the areas of emphasis listed below.

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.

Chemical processing and energy systems. CHE 432, 442, 451; MAE 371, 372, 430, 433, 437, 438, 488; MSE 530, 531, 533.

Electronic materials. CHE 458, 548, 558; CHM 471; EEE 435, 539; MAE 437, 438; MSE 520, 521, 550, 562, 573; PHY 471, 481.

Manufacturing and materials processing. MAE 372, 403, 415, 422, 441, 442; MSE 441, 540, 560, 580.

Mechanical metallurgy. MAE 405, 415, 422, 441, 442, 520, 522, 524, 526, 527, 557; MSE 441, 480, 520, 521, 550, 558, 559, 560, 561, 573; PHY 361, 362, 363, 471, 487.

Physical metallurgy. CHM 471; MAE 372, 422, 488; MSE 441, 480, 520, 521, 550, 558, 559, 560, 561, 573; PHY 361, 362, 363, 471, 487.

Polymers and composites. CHM 331, 332, 438, 471; MAE 372, 520, 527; MSE 570.

**Materials Science and Engineering
Program of Study
Typical Four-Year Sequence**

First Year

	<i>Semester Hours</i>
First Semester	
CHM 113 General Chemistry	4
ECE 105 Introduction to Languages of Engineering	3
ENG 101 First-Year Composition	3
MAT 270 Calculus I	4
MSE 496 Professional Seminar	0
General Studies Elective (HU or SB) ¹	3
Total	17

Second Semester

CHM 116 General Chemistry	4
ECE 106 Introduction to Computer-Aided Engineering	3
ENG 102 First-Year Composition	3
MAT 271 Calculus II	4
MSE 496 Professional Seminar	0
PHY 121 University Physics I	3
PHY 122 University Physics Lab I	1
Total	18

Second Year

First Semester

CHE 311 Material Balance	3
ECE 210 Engineering Mechanics I: Statics	3
or PHY 321 Newtonian Mechanics (3)	
MAT 272 Calculus III	4
MAT 274 Elementary Differential Equations	3
MSE 496 Professional Seminar	0
PHY 131 University Physics II	3
PHY 132 University Physics Lab II	1
Total	17

Second Semester

CHE 312 Introduction to Thermodynamics	3
ECE 301 Electrical Networks I	4
ECE 312 Engineering Mechanics II: Dynamics	3
or PHY 322 Analytical Mechanics (3)	
ECE 313 Introduction to Deformable Solids	3
ECE 350 Structure and Properties of Materials	3
MSE 496 Professional Seminar	0
Literacy and Critical Inquiry Elective ¹	3
Total	19

Third Year

First Semester

CHM 441 General Physical Chemistry I	3
CSC 220 Computer Organization and Assembly Language Programming	4
or IEE 463 Computer-Aided Manufacturing and Control (3), or MAE 405 Microcomputer-Aided Processes for MAE (3), or ECE 333 Electrical Instrumentation (3)	

MAT 242	Elementary Linear Algebra	2
MSE 355	Introduction to Metallurgy	3
MSE 496	Professional Seminar	0
PHY 361	Modern Physics	3
General Studies Elective (HU or SB) ¹		3

Total 18 or 17

Second Semester

ECE 383	Probability and Statistics for Engineers	2
	or ECE 384 Numerical Analysis for Engineers I (2), or ECE 386 Partial Differential Equations for Engineers (2)	2
MAE 351	Manufacturing Processes Survey	3
MSE 420	Physical Metallurgy	4
MSE 496	Professional Seminar	0
Technical Elective		3
General Studies Elective (HU or SB) ¹		3
Total		18

Fourth Year

First Semester

CHE 351	Measurements Laboratory	2
MSE 430	Thermodynamics of Materials	3
MSE 450	X-Ray and Electron Diffraction	3
MSE 470	Polymers and Composites	3
MSE 496	Professional Seminar	0
Technical Elective		3
General Studies Elective (HU or SB) ¹		3
Total		17

Second Semester

ECE 400	Engineering Communications	3
MSE 431	Corrosion and Corrosion Control	3
MSE 440	Mechanical Properties of Solids	3
MSE 472	Integrated Circuit Materials Science	3
MSE 496	Professional Seminar	0
MSE 492	Capstone Design Project	3
Technical Elective		3
Total		18

Degree requirements: 133 semester hours plus English requirements.

¹ See pages 42-55 for requirements and approved list.

CHEMICAL ENGINEERING

CHE 311 Material Balances. (3) F, S
Principles of physics and chemistry applied to the formulation of material balances. Prerequisites: CHM 116; ECE 106; MAT 271 or 291.

312 Introduction to Thermodynamics. (3) F, S
Energy balance calculations and introduction of thermodynamic principles. Prerequisite: CHE 311.

321 Computational Techniques in Chemical Engineering I. (2) F, S
Computer methods for solving chemical engineering problems. Numerical solutions of algebraic systems and ordinary differential equations. Prerequisite: ECE 106. Corequisite: MAT 274.

322 Computational Techniques in Chemical Engineering II. (2) F, S
Methods for solving chemical engineering problems. Numerical solution of P.D.E.'s, regression analysis, optimization, statistical methods and experimental design. Prerequisites: CHE 321; MAT 272.

331 Transport Phenomena I: Fluids. (3) F, S
Transport phenomena with emphasis on fluid systems. Cross-listed as BME 331. Prerequisites: CHE 311; MAT 274; PHY 131.

332 Transport Phenomena II: Energy Transfer. (3) F, S
Continuation of transport principles with emphasis on energy transport in stationary and fluid systems. Prerequisites: CHE 312, 331; ECE 384. Corequisite: ECE 385.

333 Transport Phenomena III: Mass Transfer. (3) F, S
The application of transport phenomena to mass transfer and the design of mass transfer equipment. Prerequisites: 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. Prerequisites: CHE 312; ECE 384.

351 Measurements Laboratory. (2) F
Introduction to laboratory practices and the use of measurement devices. Prerequisite: CHM 116. Corequisites: CHE 311; CHM 335. [Satisfies General Studies Requirement: L1]

352, 353 Transport Laboratories. (2) S
The demonstration of transport phenomena principles with experiments in fluid flow, heat and mass transfer. Prerequisite for 352: CHE 331. Prerequisite for 353: CHE 332. Corequisite for 353: CHE 333. [Satisfies General Studies Requirement: L1 (352)]

411 Biomedical Engineering I. (3) F
Review of diagnostic and prosthetic methods using engineering methodology. Introduction to transport, metabolic and autoregulatory processes in the human body. Cross-listed as BME 411. Prerequisite: instructor approval.

412 Biomedical Engineering II. (3) S
Review of electrophysiology and nerve pacing applications, introduction to biomechanics and joint/limb replacement technology, cardiovascular and pulmonary fluid mechanics, application of mathematical modeling. Cross-listed as BME 412. Prerequisite: instructor approval.

413 Physiological Instrumentation. (3) S
Problems, concepts and techniques of biomedical instrumentation in static and dynamic environments. Cross-listed as BME 413. Prerequisites: BME 435 or AGB 435; ECE 334. [Satisfies General Studies Requirement: L2]

432 Principles of Chemical Engineering Design. (3) F
Sizing of unit operations equipment, such as fractionators, strippers, absorbers and extractors, with applications to complex industrial processes. Prerequisites: CHE 333, 342.

442 Chemical Reactor Design. (3) F, S
Application of kinetics to chemical reactor design. Prerequisite: CHE 342. Corequisite: CHE 333.

451 Chemical Engineering Laboratory. (2) F
Operation, control and design of experimental and industrial process equipment; independent research projects. 6 hours lab. Prerequisites: CHE 333, 352.

458 Semiconductor Material Processing. (3) N
Introduction to the processing and characterization of electronic materials for semiconductor applications. Prerequisites: CHE 333, 342.

461 Process Control. (3) F
Process dynamics, instrumentation and feedback applied to automatic process control. Lecture, lab. Prerequisite: ECE 301. [Satisfies General Studies Requirement: N3]

294 CHEMICAL, BIO AND MATERIALS ENGINEERING

462 Process Design. (3) S

Application of economic principles to optimize equipment selection and design; development and design of process systems. Prerequisites: CHE 432, 442.

473 Industrial Chemistry. (3) S

Reaction systems as encountered in large scale operations. Typical examples from inorganic, organic, polymer, biochemical, fermentation and electrochemical industries. Prerequisites: CHM 318 or 332; 442.

492 Chemical Engineering Projects. (1-5) S

Individual projects in chemical engineering operations and design. Prerequisite: Instructor approval.

496 Professional Seminar. (0) F, S

Professional and ethical aspects with a discussion of employment opportunities and responsibilities. Lectures, field trips.

501 Introduction to Transport Phenomena. (3) F, S

Transport phenomena with emphasis on fluid systems. Prerequisite: transition student with instructor approval.

502 Introduction to Energy Transport. (3) F, S

Continuation of transport principles with emphasis on energy transport in stationary and fluid systems. Prerequisite: transition student with instructor approval.

503 Introduction to Mass Transport. (3) F, S

The application of transport phenomena to mass transfer and the design of mass transfer equipment. Prerequisite: transition student with instructor approval.

504 Introduction to Chemical Thermodynamics. (3) F, S

Energy relations and equilibrium conversions based on chemical potentials and phase equilibria. Prerequisite: transition student with instructor approval.

505 Introduction to Chemical Reactor Design. (3) F, S

Application of kinetics to chemical reactor design. Prerequisite: transition student with instructor approval.

515 Biomedical Transport Processes. (3) N

Analysis of heat, mass, momentum and electrical energy transfer in mammals, derivation of both microscopic and macroscopic models based on current research. Cross-listed as BME 515.

517 Prosthetic and Diagnostic Engineering. (3) N

Criteria for mechanical replacement or assistance of organ functions; diagnostic methods, equipment and usage; existing methodology and future requirements, including detailed designs. Cross-listed as BME 517.

518 Introduction to Biomaterials. (3) F

Topics include structure property relationships for synthetic and natural biomaterials, biocompatibility and uses of materials to replace body parts. Cross-listed as BME 518.

527 Advanced Applied Mathematical Analysis in Chemical Engineering. (3) F

Formulation and solution of complex mathematical relationships resulting from the description of physical problems in mass, energy and momentum transfer and chemical kinetics.

528 Process Optimization Techniques. (3) S

Method for optimizing engineering processes. Experimental design and analysis; linear and non-linear regression methods; classical, search and dynamic programming algorithms.

533 Transport Processes I. (3) F

Unified treatment of momentum, heat and mass transfer from molecular theory and continuum points of view. Continuum equations of microscopic and macroscopic systems, multicomponent and multiphase systems.

534 Transport Processes II. (3) S

Continuation of CHE 533 emphasizing mass transfer. Prerequisite: CHE 533.

535 Turbulent Mixing. (3) N

Turbulence and mixing in multicomponent systems with/without chemical reactions. Computational models applied to chemical processes. Prerequisite: CHE 533.

536 Convective Mass Transfer. (3) N

Turbulent flow for multicomponent systems including chemical reactions with applications in separations and air pollution. Prerequisite: CHE 533 or MAE 571.

543 Thermodynamics of Chemical Systems. (3) F

Classical and statistical thermodynamics of non-ideal physicochemical systems and processes; prediction of optimum operating conditions.

544 Chemical Reactor Engineering. (3) S

Reaction rates, thermodynamics and transport principles applied to the design and operation of chemical reactors. Prerequisite: CHE 543.

548 Topics in Catalysis. (3) N

Engineering catalysis emphasizes: adsorption, kinetics, characterization, diffusional considerations and reactor design. Other topics: mechanisms, surface analyses and electronic structure.

553 Air and Water Quality Control. (3) N

Origins of pollutants; environmental interactions and concerns. Physical and chemical processes including dispersion, particle mechanics, filtration, sampling, sedimentation, coagulation, flotation, absorption. Control technology.

554 New Energy Technology. (3) N

Gasification, liquefaction pyrolysis and combustion processes for coal, wastes and other raw materials. In-situ processes for coal, oil, shale and geothermal energy. Environmental quality issues.

556 Separation Processes. (3) N

Topics in binary/multicomponent separation, rate governed and equilibration processes, mass transfer criteria, energy requirements, separating agents and devices, staged operations.

558 Electronic Materials. (3) N

Processing and characterization of electronic materials for semiconductor type uses. Thermodynamics and transport phenomena, phase equilibria and structure, mass transfer, diffusion and thermal properties.

561 Advanced Process Control. (3) S

Dynamic process representation, linear optimal control, optimal state reconstruction, parameter and state estimation techniques for continuous and discrete time systems.

562 Chemical Systems Engineering. (3) N

Process dynamics, systems analysis, computer applications, process control.

563 Chemical Engineering Design. (3) N

Computational methods; the design of chemical plants and processes.

Special Courses: CHE 484, 494, 498, 499, 580, 584, 590, 591, 592, 593, 594, 598, 599, 792, 799. (See pages 36-37.)

MATERIALS SCIENCE

MSE 355 Introduction to Metallurgy. (3) S

Elements of the structure of metals and alloys, measurement of mechanical properties and optical metallography. Field trips. Lecture, lab. Prerequisite: CHM 114 or 116.

420 Physical Metallurgy. (4) F

Crystal structure and defects. Phase diagrams, metallography, solidification and casting, deformation and annealing. 3 lectures, 3 hours lab. Prerequisite: ECE 350.

430 Thermodynamics of Materials. (3) N

Principles of statistical mechanics, statistical thermodynamics of single crystals, solutions, phase equilibrium, free

energy of reactions, free electron theory, thermodynamics of defects. Prerequisite: CHE 312 or ECE 340.

431 Corrosion and Corrosion Control. (3) S

Introduction to corrosion mechanisms and methods of preventing corrosion. Topics: electrochemistry, polarization, corrosion rates, oxidation, coatings, cathodic protection. Prerequisite: ECE 350.

440 Mechanical Properties of Solids. (3) S

Effects of environmental and microstructural variables of mechanical properties; plastic deformation, fatigue, creep, brittle fracture, internal friction. Prerequisite: ECE 350.

441 Analysis of Material Failures. (3) S

Identification of types of failures. Analytical techniques. Fractography, SEM, nondestructive inspection, metallography. Mechanical and electronic components. Prerequisite: ECE 350.

450 X-Ray and Electron Diffraction. (3) F

Fundamentals of X-ray diffraction, transmission electron microscopy and scanning electron microscopy. Techniques for studying surfaces internal microstructures and fluorescence. Lecture, demonstrations. Prerequisite: ECE 350.

470 Polymers and Composites. (3) F

Relationship between chemistry, structure and properties of engineering polymers. Design, properties and behavior of fiber-polymer composite systems. Prerequisite: ECE 350.

472 Integrated Circuit Materials Science. (3) N

Principles of materials science applied to semiconductor processing and fabrication in metals, ceramics, polymers and semiconductors.

480 Manufacturing Engineering. (3) F

Analysis and optimization of manufacturing processes. Prerequisite: ECE 350.

492 Capstone Design Project. (1-3) F, S

For small groups in fundamental or applied aspects of engineering materials; emphasis on experimental problems and design. Prerequisites: MSE 430, 440, 450.

496 Professional Seminar. (0) F, S

Professional and ethical aspects with a discussion of employment opportunities and responsibilities. Lectures, field trips.

510 X-Ray and Electron Diffraction. (3) F

Fundamentals of X-ray diffraction, transmission electron microscopy and scanning electron microscopy. Techniques for studying surfaces, internal microstructures and fluorescence. Lecture, demonstrations. Open only to transition student with instructor approval.

511 Corrosion and Corrosion Control. (3) S

Introduction to corrosion mechanisms and methods of preventing corrosion. Topics: electrochemistry, polarization, corrosion rates, oxidation, coatings, cathodic protection. Open only to transition students with instructor approval.

512 Analysis of Material Failures. (3) S

Identification of types of failures. Analytical techniques. Fractography, SEM, nondestructive inspection, metallography. Mechanical and electronic components. Open only to transition student with instructor approval.

513 Polymers and Composites. (3) F

Relationship between chemistry, structure and properties of engineering polymers. Design, properties and behavior of fiber polymer composite systems. Open only to transition students with instructor approval.

514 Physical Metallurgy. (4) F

Crystal structure and defects. Phase diagrams, metallography, solidification and casting, deformation and annealing. 3 lectures, 3 hours lab. Open only to transition student with instructor approval.

515 Thermodynamics of Materials. (3) N

Principles of statistical mechanics, statistical thermodynamics of single crystals, solutions, phase equilibrium, free energy of reactions, free electron theory, thermodynamics of defects. Open only to transition student with instructor approval.

520 Theory of Crystalline Solids. (3) F

Anisotropic properties of crystals; tensor treatment of elastic, magnetic, electric and thermal properties, crystallography of Martensitic transformations.

521 Defects In Crystalline Solids. (3) S

Introduction to the geometry, interaction and equilibrium between dislocations and point defects. Relations between defects and properties will be discussed. Prerequisite: ECE 350 or instructor approval.

530 Metallurgical Thermodynamics and Kinetics. (3) S

Thermodynamics of alloy systems, diffusion in solids, kinetics of precipitation and phase transformations in solids. Prerequisites: CHE 312 or ECE 340; ECE 350.

531 Statistical Thermodynamics. (3) N

Continuation of MAE 581, including statistical and irreversible thermodynamics. Cross-listed as MAE 582. Prerequisite: MAE 581 or equivalent.

533 Direct Energy Conversion/Irreversible Thermodynamics. (3) N

Advanced selected topics in direct energy conversion, theory, design and applications. Cross-listed as MAE 583. Prerequisite: MAE 581 or equivalent.

540 Fracture, Fatigue and Creep. (3) F

Relationship between microstructure and fracture; fatigue and creep properties of materials. Environmental effects, recent developments. Current theories and experimental results. Prerequisite: MSE 440 or equivalent.

550 Advanced Materials Characterization. (3) N

Analytical instrumentation for characterization of materials; SEM, SIMS, Auger, analytical TEM and other advanced research techniques.

556 Electron Microscopy Laboratory. (3) F

Laboratory to support MSE 558.

557 Electron Microscopy Laboratory. (3) S

Laboratory support for MSE 559.

558 Electron Microscopy I. (3) F

Microanalysis of the structure and composition of metals, semiconductors and ceramics using images, diffraction and X-ray and energy dispersive loss spectroscopy.

559 Electron Microscopy II. (3) S

Microanalysis of the structure and composition of metals, semiconductors and ceramics using images, diffraction and X-ray and energy loss spectroscopy.

560 Strengthening Mechanisms. (3) S

Deformation of crystalline materials. Properties of dislocations. Theories of strain hardening, solid solution, precipitation and transformation strengthening. Prerequisite: ECE 350 or equivalent.

561 Phase Transformation in Solids. (3) N

Heterogeneous and homogeneous precipitation reactions, shear displacive reactions, order-disorder transformation.

562 Ion Implantation. (3) S

Includes defect production and annealing. Generalized treatment including ion implantation, neutron irradiation damage and the interaction of other incident beams. Prerequisite: MSE 450.

570 Polymer Structure and Properties. (3) F

Relationships between structure and properties of synthetic polymers: glass transition, molecular relaxations, crystalline state viscoelasticity, morphological characterization, processing.

571 Ceramics. (3) A

Includes ceramic processing, casting, molding, firing, sintering, crystal defects, mechanical, electronic and physical properties will be included. Prerequisites: MSE 521, 561.

572 Semiconductor Phase Diagrams. (3) A

Analysis of binary and ternary phase diagrams and application to semiconductor growth and vapor and liquid phase epitaxy. Prerequisite: MSE 521.

573 Magnetic Materials. (3) A

Emphasis on ferromagnetic and ferrimagnetic phenomena. Domains, magnetic anisotropy, magnetostriction. Study of commercial magnetic materials. Prerequisite: MSE 520 or equivalent.

580 Manufacturing Analysis. (3) S

Analysis and optimization of manufacturing processes. Prerequisite: MSE 480.

Special Courses: MSE 484, 494, 498, 499, 500, 584, 590, 591, 592, 593, 594, 598, 599, 600, 690, 691, 692, 693, 791, 792, 799. (See pages 36-37.)

Civil Engineering

PROFESSORS:

O'BANNON (EC G-136A), BETZ, BLACKBURN, W. HOUSTON, KLOCK, LUNDGREN, MATTHIAS, RUFF, SINGHAL, TUMA

ASSOCIATE PROFESSORS:

DUFFY, HINKS, MAMLOUK, RADWAN, UPCHURCH

ASSISTANT PROFESSORS:

FAFITIS, S. HOUSTON, KREAMER, RAJAN, ZANIEWSKI

PROFESSORS EMERITI:

BORGO, HILL, PIAN

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, water and waste treatment plants and various multipurpose systems. Education in this field is established on scientific fundamentals with extensive training and practice in one or more areas of emphasis.

Civil Engineering—B.S.E.

Entrance Requirements. 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 113/116 in lieu of CHM 114 and PHY 111/113 is required as a prerequisite to PHY 121/122. For international

students, an official TOEFL score of 550 is required.

Degree Requirements

Requirements for the bachelor's degree include the completion of the civil engineering core courses and 18 semester 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. 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 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. MAT 290, 291, or MAT 270, 271, 272, and MAT 274; ECE 210, 312 and 313 have all been completed with minimum grades of "C."

Civil Engineering Core

The following courses are required as a part of the engineering core (only ECE 333 Electrical Instrumentation may be deleted):

		<i>Semester Hours</i>
CEE 400	Microcomputer Applications in Civil Engineering	3
ECE 351	Engineering Materials	3

The additional requirements for science, engineering sciences and design specified in the engineering core are satisfied within the civil engineering core.

		<i>Semester Hours</i>
CEE 296	Introduction to Civil Engineering	1
CEE 321	Structural Analysis	3
CEE 322	Steel Structures	3
CEE 323	Concrete Structures	3
CEE 351	Soil Mechanics	4
CEE 361, 362	Environmental Engineering	6
CEE 372	Transportation Engineering	4
CEE 381	Hydraulic Engineering	4
CEE 496	Topics in Civil Engineering Practice ..	1
IEE 300	Economic Analysis for Engineers	2
MAE 371	Fluid Mechanics	3
Total		34

Civil Engineering Designated Design

		<i>Semester Hours</i>
Electives (minimum of 2 required)		
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 12 hours required)

A maximum 6 hours 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

Construction engineering. CON 344, 383, 395, 496. Only one course may be selected.

Environmental engineering. Water treatment, industrial and domestic waste treatment and disposal, public health engineering, industrial hygiene. CEE 466, 563; CHM 231; MIC 210 (or 201 and 202).

Geotechnic engineering. Assessment of engineering properties and design utilizing soils and rocks as engineering materials. CEE 452, 550, 552, 555, 556.

Structural engineering. Analysis and design of structures for buildings, bridges, space frames, structural mechanics. CEE 423, 432, 521, 531.

Transportation engineering. Analysis and design of transportation facilities, transportation planning and economics, transportation in the urban environment. CEE 412, 471, 475, 512, 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.

**Civil Engineering Program of Study
Typical Four-Year Sequence**

Freshman Year

	<i>Semester Hours</i>
First Semester	
CEE 296 Introduction to Civil Engineering	1
CHM 114 General Chemistry	4
ECE 105 Introduction to Languages of Engineering	3
MAT 290 Calculus I	5
PHY 121 University Physics I	3
PHY 122 University Physics Lab I	1
Total	17

Second Semester

ECE 106 Introduction to Computer-Aided Engineering	3
ENG 101 First-Year Composition	3
MAT 291 Calculus II	5
PHY 131 University Physics II	3
PHY 132 University Physics Lab II	1
Social and Behavioral Sciences Elective ¹	3
Total	18

Sophomore Year

First Semester

ECE 210 Engineering Mechanics I: Statics	3
ECE 301 Electrical Networks I	4
ECN 111 Macroeconomic Principles	3
ENG 102 First-Year Composition	3
IEE 300 Economic Analysis for Engineers	2
MAT 274 Elementary Differential Equations	3
Total	18

Second Semester

ECE 312 Engineering Mechanics II: Dynamics	3
ECE 313 Introduction to Deformable Solids	3
ECE 340 Thermodynamics	3
ECE 383 Probability and Statistics for Engineers	2
Basic Science Elective	3
Humanities and Fine Arts Elective ¹	3
Total	17

Junior Year

First Semester

CEE 321 Structural Analysis	3
ECE 351 Engineering Materials	3
ECE 384 Numerical Analysis for Engineers	2
MAE 371 Fluid Mechanics	3
Literacy and Critical Inquiry Elective ¹	3
Humanities and Fine Arts Elective ¹	3
Total	17

Second Semester

CEE 322 Steel Structures	3
CEE 351 Soil Mechanics	4
CEE 361 Environmental Engineering	3
CEE 372 Transportation Engineering	4
CEE 381 Hydraulic Engineering	4
Total	18

Senior Year

First Semester

CEE 323 Concrete Structures	3
CEE 362 Environmental Engineering	3
CEE 400 Microcomputer Applications in Civil Engineering	3
CEE 496 Topics in Civil Engineering Practice ..	1
Design Elective	3
Technical Elective	3
Total	16

Second Semester

ECE 400 Engineering Communications	3
Design Elective	3
Technical Elective	9
Social and Behavioral Science Elective ¹	3
Total	18

¹ See pages 42-55 for requirements and approved list.

Concurrent Studies in Architecture and Civil Engineering

Undergraduate. Qualified lower-division students interested in combining studies in architecture and civil engineering may prepare for upper-division and graduate courses in both programs by taking courses listed in option "B" of the School of Architecture (page 177).

Graduate. Qualified students may develop a program of study that leads to the concurrent degrees Master of Architecture and MSE with a focus in Civil Engineering. The student's program of study is developed in conjunction with advisors in both departments. For specific details consult with advisors in both departments.

CIVIL ENGINEERING

CEE 296 Introduction to Civil Engineering. (1) F, S
Introduction to the profession. Description of areas of specialization. Degree requirements, academic standing and advising procedures. Introduction to lab facilities. Prerequisite: freshman standing.

310 Testing of Materials for Construction. (3) F, S
Structural and behavioral characteristics, engineering properties, measurements and application of construction materials. Lecture, lab. Not open to engineering students. Prerequisite: CON 323 or equivalent.

321 Structural Analysis. (3) F, S
Statically determinate and indeterminate structures by classical and matrix methods: trusses, beams and frames. 2 lectures, 2 hours recitation. Prerequisite: same as CEE 322 except ECE 351 and MAE 371.

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. 2 lectures, 2 hours recitation. Prerequisite: CEE 321; completion of the engineering core (except electrical and communications courses) with an average grade of "C" or better; at least a "C" in ECE 210, 312, 313 and MAT 274, 290, 291.

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. 2 lectures, 2 hours recitation. Prerequisite: same as CEE 322.

351 Soil Mechanics. (4) F, S
Index properties and engineering characteristics of soils. Compaction, permeability and seepage, compressibility and settlement and shear strength. 3 lectures, 3 hours lab. Prerequisite: same as CEE 322.

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. Cross-listed as PUP 301.

372 Transportation Engineering. (4) 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. 2 lectures, 3 hours lab. Prerequisite: CON 221.

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. 3 lectures, 3 hours lab. Prerequisite: MAE 371.

400 Microcomputer Applications in Civil Engineering. (3) F, S
Development of microcomputer literacy in civil engineering applications. Prerequisites: 3 of the following CEE courses: 321, 351, 361, 372, 381; ECE 106. [Satisfies General Studies Requirement: N3]

412 Pavement Analysis and Design. (3) F
Design of flexible and rigid pavements for highways and airports. Surface, base, subgrade courses. Cost analysis and pavement selection. Prerequisites: CEE 351; ECE 351.

423 Structural Design. (3) F
Analysis and design of structural systems. 2 lectures, 3 hours lab. Prerequisites: CEE 322, 323.

432 Matrix and Computer Applications in Structural Engineering. (3) S
Matrix and computer applications to structural engineering and structural mechanics. Stiffness and flexibility methods, finite elements, differences. Prerequisite: CEE 321.

450 Soil Mechanics in Construction. (3) 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. Lecture, lab. Prerequisite: CON 323.

452 Foundations. (3) F, S
Applications of soil mechanics to foundation systems, bearing capacity, lateral earth pressure, slope stability. Prerequisite: CEE 351.

466 Sanitary Systems Design. (3) F
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
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. 2 lectures, 3 hours lab. Prerequisite: senior standing.

475 Highway Geometric Design. (3) S
Design of the visible elements of the roadway. Fundamental design controls with application to rural roads, at-grade intersections, freeways and interchanges. 2 lectures, 2 hours recitation. Prerequisite: CEE 372.

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) F, S
Professional engineering practice. Interviewing and resume writing, professional registration requirements, continuing education, graduate study, financial planning and employment. Prerequisite: senior standing.

512 Pavement Performance and Management. (3) S
Pavement management systems including data collection, evaluation, optimization, economic analysis and computer applications for highway and airport design. Prerequisite: CEE 412.

514 Bituminous Materials and Mixture. (3) F
Types of bituminous materials used in pavement mixtures. Chemical composition and physical properties, desirable aggregate characteristics, optimum asphalt contents. 2 hours lecture, 3 hours lab. Prerequisite: ECE 351.

515 Design and Behavior of Portland Cement Concrete Mixtures. (3) S
Properties of cements and aggregates. Mix design for strength and durability requirements. Failures caused by chemical reaction, weathering and loading. Prerequisite: ECE 351.

521 Stress Analysis. (3) F
Advanced topics in the analytical determination of stress and strain. Prerequisite: CEE 321.

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. Prerequisite: CEE 322.

526 Finite Element Methods in Civil Engineering. (3) F
Finite element formulation for solutions of structural, geotechnical and hydraulic problems. Prerequisite: CEE 432.

527 Advanced Concrete Structures. (3) F
Elastic, ultimate strength and yield line theory. Deflection, torsion, shrinkage and plastic flow. Prestressed concrete; special systems. Prerequisite: CEE 323.

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. Prerequisites: CEE 322; instructor approval.

529 Complex Structures. (3) S
Classical and numerical investigations of linear and non-linear structures composed of flat and curved surfaces and linear or curvilinear elements. Prerequisite: CEE 323.

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. Prerequisites: CEE 322, 323.

533 Applied Optimal Design. (3) S
Linear and nonlinear programming. Problem formulation. Design sensitivity analysis. FEM-based optimal design of structural and mechanical systems. Prerequisite: graduate standing or instructor approval.

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. 2 lectures, 2 hours recitation. Prerequisites: CEE 322, 323; instructor approval.

537 Topics in Structural Engineering. (1-3) F, S
Advanced topics including wind engineering, earthquake engineering, probabilistic concepts, optimization and behavior of structural systems. Prerequisites: CEE 322, 323; instructor approval.

550 Soil Behavior. (3) S
Physico-chemical aspects of soil behavior, stabilization of soils, engineering properties of soils. 3 hours lecture. Prerequisite: CEE 351.

551 Advanced Soil Mechanics Laboratory. (3) F
Oedometer, triaxial (static and cyclic) back pressure saturated and unsaturated samples, pore pressure measurements, resonant column, automatic data acquisition, in-situ testing. 1 hour lecture, two 3-hour labs. Prerequisite: CEE 351.

552 Geological Engineering. (3) S
Geological investigations for engineering purposes, case histories, geologic structure, weathering, remote sensing, geophysics, air photo interpretation for engineering site locations. 3 hours lecture, field trips required. Prerequisite: CEE 351.

553 Advanced Soil Mechanics. (3) S
Application of theories of elasticity and plasticity to soils, theories of consolidation, failure theories, response to static and dynamic loading. 3 hours lecture. Prerequisite: CEE 551. Corequisite: CEE 452.

554 Shear Strength and Slope Stability. (3) F
Shear strength of saturated and unsaturated soils strength-deformation relationships, time-dependent strength parameters, effects of sampling, advanced slope stability. 3 hours lecture. Corequisites: CEE 452, 551.

555 Applied Soil Mechanics. (3) S
Deep foundations, braced excavations, anchored bulkheads, reinforced earth, underpinning and dewatering. 3 hours lecture. Corequisite: CEE 452.

556 Seepage and Earth Dams. (3) F
Transient and steady state fluid flow through soil, confined and unconfined flow, pore water pressures and application to earth dams. 3 hours lecture. Prerequisite: CEE 351. Corequisite: CEE 554.

557 Topics in Geotechnical Engineering. (3) F, S
New and developing technology in geotechnical engineering. 3 hours lecture. Prerequisites: graduate standing; instructor approval.

558 Numerical Methods. (3) F '90
Constitutive relations for soils, numerical techniques applied to geotechnical engineering, including computer applications. 3 hours lecture. Prerequisites: CEE 351; computer programming; graduate standing.

559 Earthquake Engineering. (3) F '89
Characteristics of earthquake motions, selection of design earthquakes, site response analyses, seismic slope stability, liquefaction. 3 hours lecture. Prerequisites: CEE 351; graduate standing.

561 Physical-Chemical Treatment of Water and Waste. (3) 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) 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. 1 lecture, 5 hours lab. Prerequisite: CEE 361 or 362.

564 Industrial Hygiene. (3) 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.

573 Computer Applications in Transportation (3) S
Use of available computer application software to solve traffic engineering, transportation planning and highway design problems. Prerequisite: graduate standing or instructor approval.

574, 575 Traffic Engineering. (3) F, S
Operator and vehicle characteristics, street capacity, signals, signs and markings, etc. All phases of traffic engineering as applied to urban areas. Prerequisite: CEE 372.

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 '90
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. Prerequisite: CEE 372.

578 Highway Engineering, Planning and Economics. (3) S '89
Highway transportation including design, operation, planning, environmental impact, economic feasibility and financing. Highways as a regional system. Prerequisite: CEE 372.

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

581 Surface Water Hydrology. (3) S '89
Hydrologic cycle and mechanisms, including precipitation, evaporation and transpiration; hydrograph analysis; flood routing; statistical methods in hydrology, hydrologic design. Prerequisite: CEE 381 or instructor approval.

582 Free Surface Hydraulics. (2) S '89
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 '89
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: instructor approval.

584 Foundations of Hydraulic Engineering. (2) F '88
Review of incompressible fluid dynamics. Flow in pipes and channels; unsteady and varied flows; wave motion. Prerequisite: CEE 381.

585 Principles of River Engineering. (2) F '89
Uses of rivers, study of watershed and channel processes. Sediment sources, yield and control; hydrologic analysis. Case studies. Prerequisite: CEE 381 or instructor approval.

586 Water Resources Systems I. (3) S '90
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 instructor approval.

587 Water Resources Systems II. (3) F '88
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 '90
Introduction to the transportation of granular sedimentary materials by moving fluids. Degradation, aggregation and local scour in alluvial channels. Mathematical and physical models. Prerequisite: CEE 585 or instructor approval.

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 8 semester hours is to enroll for at least 1 semester 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 semester hour of CEE 580; such credit does not apply toward graduation.

Special Courses: CEE 484, 494, 498, 499, 580, 584, 590, 591, 592, 594, 598, 599, 792, 799. (See pages 36-37.)

Computer Science

PROFESSORS:

BARNHILL (EC G-252), BLACKLEDGE,
FINDLER, LEWIS, NIELSON, WOODFILL

ASSOCIATE PROFESSORS:

COLLOFELLO, FALTZ, FARIN, HUEY,
LINDQUIST, MILLER, O'GRADY, OZKARAHAN,
PAI, PHEANIS, ROBBINS

ASSISTANT PROFESSORS:

DATTA, FAINTER, FAUSTINI, FOLEY,
GOLSHANI, JORGENSON, MELLON, MUTCH,
SEBAN, SEN, YEH

Computers have a significant impact on our daily life. This impact may be even 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 two undergraduate degrees: a B.S. in Computer Science and a B.S.E. in Computer Systems Engineering.

Degree Requirements

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" in all CSC courses used for degree credit.

Computer Science—B.S.

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 B.S. degree will complete the general studies requirements described below, an English proficiency requirement, the computer science core courses, a senior-level breadth requirement in the major and a set of technical electives. It should be noted that the B.S. degree requirements consistently exceed the university minimum requirements.

English Proficiency		<i>Semester Hours</i>
† ENG 101, 102	First-Year Composition	6
	or ENG 105 Advanced First-Year Composition (3) (See page 246 for English exemption.)	

General Studies

*Humanities and Fine Arts/
Social and Behavioral Sciences**
(18 semester hours)

At least one upper-division course must be included, two of the courses must be from the same department, and two departments or more must be represented in the total selection.

Humanities and Fine Arts	6-12
Social and Behavioral Sciences	12-6

*Literacy and Critical Inquiry**
(6 semester hours)

One course chosen from the university approved list. In general this course will be sophomore-level and will include a series of formal, graded, written or spoken assignments in composing critical discourse

† ECE 400	Engineering Communications	3
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Numeracy
(7 semester hours)

† MAT 270	Calculus with Analytic Geometry I	4
	or MAT 290 Calculus I (5)	
† CSC 355	Introduction to Theoretical Computer Science	3

Natural Science

(8 semester hours)		
† PHY 121	University Physics I	3
† PHY 122	University Physics Lab I	1
† PHY 131	University Physics II	3
† PHY 132	University Physics Lab II	1

Total General Studies

NOTE: One course in the area of global awareness* and one course in historical awareness* *must* appear in the final list of courses offered in the student's graduation program of study. These can be included in the humanities and fine arts/social and behavioral sciences course selections.

* See pages 42-55 and 57-66 for requirements and approved list..

† Graduation requirement for the baccalaureate degree.

Computer Science Core		<i>Semester Hours</i>
CSC 100	Introduction to Computer Science I	3
CSC 101	Introduction to Computer Science II	3
CSC 201	Application Languages Programming Laboratory	1-2
CSC 202	Functional Languages Programming Laboratory	2-1
CSC 220	Computer Organization and Assembly Language Programming	4
CSC 310	Data Structures	3
CSC 320	Computer Architecture and Organization	4
CSC 321	Computer Systems Architecture	4
CSC 340	Structure of Programming Languages	3
ECE 383	Probability and Statistics for Engineers	2
	or STP 326 Intermediate Probability (3)	
MAT 271, 272	Calculus with Analytic Geometry II, III	8
	or MAT 291 Calculus II (5)	
MAT 243	Discrete Mathematical Structures	3
MAT 342	Linear Algebra	3
Total Computer Science Core		43
Computer Science Breadth Requirement		15
Each student will complete 15 hours of CSC 400-level courses (CSC 483 excluded) that have no other CSC 400-level course as prerequisite. Each such course serves as a foundation course in an area of specialization.		
Technical Electives		14
Each computer science student must complete 14 hours of courses chosen from the computer science technical elective list and approved by the student's advisor.		
Unrestricted Electives		11
Total Degree Requirements		128

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

	<i>Semester Hours</i>
First Semester	
CSC 100 Introduction to Computer Science I	3
ENG 101 First-Year Composition	3
MAT 270 Calculus with Analytic Geometry I	4
General Studies Elective (HU or SB) ¹	3
Unrestricted Elective	3
Total	16

Second Semester	
CSC 101 Introduction to Computer Science II	3
ENG 102 First-Year Composition	3
MAT 243 Discrete Mathematical Structures	3
MAT 271 Calculus with Analytic Geometry II	4
General Studies Elective (HU or SB) ¹	3
Total	16

Sophomore Year

First Semester	
CSC 201 Application Language Programming Laboratory	1
CSC 220 Computer Organization and Assembly Language Programming	4
MAT 272 Calculus with Analytic Geometry III	4
PHY 121 University Physics I	3
PHY 122 University Physics Laboratory I	1
General Studies Elective (HU or SB) ¹	3
Total	16

Second Semester	
CSC 202 Functional Languages Programming Laboratory	1
CSC 310 Data Structures	3
PHY 131 University Physics II	3
PHY 132 University Physics Laboratory II	1
General Studies Elective (HU or SB) ¹	3
Literacy and Critical Inquiry Elective ¹	3
Unrestricted Elective	3
Total	17

Junior Year

First Semester	
CSC 201 Application Languages Programming Laboratory	1
CSC 320 Computer Architecture and Organization	4
CSC 340 Structure of Programming Languages	3
MAT 342 Linear Algebra	3
ECE 383 Probability and Statistics for Engineers	2
General Studies Elective (HU or SB) ¹	3
Total	16

Second Semester

CSC 321 Computer Systems Architecture	4
CSC 355 Introduction to Theoretical Computer Science	3
General Studies Elective (HU or SB) ¹	3
Unrestricted Elective	3
Technical Elective	3
Total	16

Senior Year

First Semester	
CSC 400-level Computer Science Breadth Electives	6
ECE 400 Engineering Communications	3
Technical Electives	5
Unrestricted Elective	2
Total	16

Second Semester	
CSC 400-level Computer Science Breadth Electives	9
Technical Electives	6
Total	15

¹ See pages 42-55 for requirements and approved list.

Computer Systems Engineering—B.S.E.

The Department of Computer Science offers a B.S.E. degree that prepares the student for a career in computer systems engineering. The requirements for English proficiency and General Studies are shown on page 301.

The following courses must be selected in the engineering core (only ECE 313 Introduction to Deformable Solids may be deleted):

	<i>Semester Hours</i>
CSC 220 Computer Organization and Assembly Language Programming	4
ECE 210 Engineering Mechanics I: Statics	3
ECE 312 Engineering Mechanics II: Dynamics	3
ECE 333 Electrical Instrumentation	3
ECE 340 Thermodynamics	3
ECE 352 Semiconductors and Devices	3
ECE 383 Probability and Statistics for Engineers	2
MAT 342 Linear Algebra	3
PHY 361 Introductory Modern Physics (Basic Science Elective)	3

In addition, the following courses are required:

CSC 100 Introduction to Computer Science I	3
CSC 101 Introduction to Computer Science II	3
CSC 310 Data Structures	3
CSC 320 Computer Architecture and Organization	4
CSC 321 Computer Systems Architecture	4

CSC 340	Structure of Programming Languages	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)		13
Total		50

The student selects technical electives from an approved list with approval of an advisor.

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

		<i>Semester Hours</i>
First Semester		
CSC 100	Introduction to Computer Science I	3
CHM 114	General Chemistry for Engineers	4
ECE 105	Introduction to Languages of Engineering	3
ENG 101	First-Year Composition	3
MAT 290	Calculus I	5
Total		18

Second Semester		
CSC 101	Introduction to Computer Science II	3
ENG 102	First-Year Composition	3
ECE 106	Introduction to Computer-Aided Engineering	3
MAT 243	Discrete Mathematical Structures	3
MAT 291	Calculus II	5
Total		17

Sophomore Year

First Semester		
CSC 220	Computer Organization and Assembly Language Programming	4
CSC 310	Data Structures	3
ECN 111	Macroeconomic Principles	3
MAT 274	Elementary Differential Equations	3
PHY 121	University Physics I	3
PHY 122	University Physics Laboratory I	1
Total		17

Second Semester		
CSC 320	Computer Architecture and Organization	4
ECE 210	Engineering Mechanics: Statics	3
PHY 131	University Physics II	3
PHY 132	University Physics Laboratory II	1
General Studies Elective (HU or SB) ¹		3
Literacy and Critical Inquiry Elective ¹		3
Total		17

Junior Year

First Semester

CSC 340	Structure of Programming Languages	3
ECE 301	Electrical Networks I	4
ECE 312	Engineering Mechanics II: Dynamics	3
ECE 383	Probability and Statistics for Engineers	2
PHY 361	Introductory Modern Physics	3
General Studies Elective (HU or SB) ¹		3
Total		18

Second Semester

CSC 321	Computer Systems Architecture	4
CSC 421	Microcomputer Fundamentals	4
ECE 333	Electrical Instrumentation	3
MAT 342	Linear Algebra	3
Technical Elective		3
Total		17

Senior Year

First Semester

CSC 422	Microcomputer Systems Design I	4
ECE 340	Thermodynamics	3
ECE 400	Engineering Communications	3
General Studies Elective (HU or SB) ¹		3
Technical Elective		4
Total		17

Second Semester

CSC 423	Microcomputer Systems Design II	3
CSC 430	Elementary Concepts of Operating Systems	3
ECE 352	Semiconductors and Devices	3
General Studies Elective (HU or SB) ¹		3
Technical Electives		6
Total		18

¹ See pages 42-55 for requirements and 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
Advanced programming techniques; file processing; implementation of arrays, stacks, queues, linked lists, binary search trees; large program development; team programming. Prerequisite: CSC 100. [Satisfies General Studies Requirement: N3]

180 Computer Literacy. (3) F, S
Introduction to general problem solving approaches using widely available software tools such as database packages, word processors, spreadsheets and report generators. Non-majors only. [Satisfies General Studies Requirement: N3]

181 Applied Problem Solving with BASIC. (3) F, S
Introduction to systematic definition of problems, solution formulation, method validation. Computer solution using

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BASIC required for projects. Lecture, lab. Non-majors only. Prerequisite: MAT 117. [Satisfies General Studies Requirement: N3]

183 Applied Problem Solving with 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. [Satisfies General Studies Requirement: N3]

201 Application Languages Programming Laboratory. (1) F, S, SS
Each module introduces a programming language such as C, FORTRAN, PL/1, or COBOL. Includes programming exercises. May be repeated for different languages. Prerequisite: CSC 101 or CSC 300.

202 Functional Languages Programming Laboratory. (1) F, S, SS
Each module introduces a programming language such as APL, Lisp, or PROLOG. Includes programming exercises. May be repeated for different languages. Prerequisite: CSC 101 or CSC 300.

220 Computer Organization and Assembly Language Programming. (4) F, S, SS
Computer organization, assembly language programming, data representation, data structure and addressing modes, assemblers, linkers. 3 lectures, 3 hours lab. Prerequisite: CSC 100 or ECE 105.

300 Concepts of Computer Science. (4) A
Accelerated coverage of fundamental concepts of computer science using Pascal for students with a strong background in at least one other high level programming language. [Satisfies General Studies Requirement: N3]

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.

310 Data Structures. (3) F, S
Data representation; advanced treatment of arrays, stacks, queues, lists, dynamic storage allocation, n-ary trees, strings, graphs, AVL trees, data abstraction. Prerequisites: CSC 101; MAT 243.

320 Computer Architecture and Organization. (4) F, S, SS
Combinational and sequential logic design, register/ bus level CPU design, instruction interpretation and microprogramming, I/O devices, interfaces and programming. 3 lectures, 3 hours lab. Prerequisites: CSC 220; MAT 243.

321 Computer Systems Architecture. (4) F, S
Integration of DMA, I/O and other processing elements into a single system architecture. Memory hierarchy and subsystems. Processor, context, memory management. 3 lectures, 3 hours lab. Prerequisite: CSC 320.

340 Structure of Programming Languages. (3) F, S
Formal specifications for language syntax and dynamic runtime environments, introduction to language translation. Prerequisites: at least one unit of CSC 201 or 202, 220, 310.

355 Introduction to Theoretical Computer Science. (3) F, S
The theory of computation. Introduction to formal languages, recursive functions, complexity. Prerequisites: CSC 310; MAT 243. [Satisfies General Studies Requirement: N3]

383 Applied Fortran Programming. (3) F, S
Advanced Fortran: character handling, machine dependency, sorting and merging, plotting, tapes, disks, time-shar-

ing terminals, library programs. Lecture, lab. Non-majors only. Prerequisite: CSC 183.

400 Advanced Assembly Language Programming. (3) F
Assembly language treatment of recursion, coroutines, interpretive routines, multiple buffering of I/O, dynamic storage allocation, various data structures. Prerequisites: CSC 220, 310.

408 Introduction to Scene Analysis. (3) A
Image analysis and formation; low-level processing, object segmentation, texture analysis, stereo vision, motion; higher-level interpretation active sensing. Prerequisite: CSC 310 or instructor approval.

410 Information Processing. (3) A
Primary, secondary file access organizations. Multi-attribute indexing. File processing. Introduction to database management and document retrieval. Prerequisite: CSC 310. [Satisfies General Studies Requirement: N3]

412 Database Management. (3) S
Introduction to DBMS concepts. Data models and languages. Relational database theory. Database security/integrity and concurrency. Prerequisite: CSC 310. [Satisfies General Studies Requirement: N3]

420 Comparison of Computer Architectures. (3) A
Evolution of mainline architectures, instruction sets, addressing modes, control structures. Characterization of computer architectures. Performance evaluation. Prerequisite: CSC 321 or 423. [Satisfies General Studies Requirement: N3]

421 Microcomputer Fundamentals. (4) F, S
Hardware, software and assembly-language programming of a microcomputer system are used as vehicles to teach fundamentals of digital system design. Lecture, lab. Prerequisite: CSC 320.

422 Microcomputer Systems Design I. (4) F, S
Design of microcomputer systems using contemporary logic and microcomputer system components. Requires assembly language programming. Corequisite: CSC 421.

423 Microcomputer Systems Design II. (3) S
Information and techniques presented in CSC 422 are used to develop the hardware design of a multi-processor, multi-programming microprocessor-based system. Prerequisite: CSC 422.

428 Computer-Aided Processes. (3) A
Hardware and software considerations for computerized manufacturing systems. Specific concentration on automatic inspection, numerical control, robotics, integrated manufacturing systems. Prerequisite: CSC 321 [Satisfies General Studies Requirement: N3]

430 Elementary Concepts of Operating Systems. (3) F, S
Design and implementation of supervisory system components. Input/output methods, process management, multi-programming and multiprocessing systems, storage management, file systems. Prerequisites: CSC 321 or 340.

438 Systems Programming. (3) A
Design and implementation of systems programs: text editors, file utilities, monitors, assemblers, relocating linking loaders, I/O handlers, schedulers, etc. Prerequisite: CSC 421 or instructor approval.

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

450 Analysis of Algorithms. (3) F

Design and analysis of computer algorithms using analytical and empirical methods; complexity measures, design methodologies, survey of important algorithms. Prerequisite: CSC 310. [Satisfies General Studies Requirement: N3]

451 Switching Theory. (3) N

Combinational logic, functional decomposition, NAND (NOR) circuit analysis and synthesis, logic arrays, iterative networks, fault diagnosis, sequential circuit representation, memory devices. Prerequisite: CSC 320.

457 Theory of Formal Languages. (3) A

Theory of grammar, methods of syntactic analysis and specification, types of artificial languages, relationship between formal languages and automata. Prerequisite: MAT 243. Cross-listed as MAT 401. [Satisfies General Studies Requirement: N3]

459 Logic for Computing Scientists I. (3) F

Propositional logic, symbolic processing, principles of logic programming; resolution, pattern matching. Prolog; various applications of predicate logic in computer science; extensions to predicate logic. Prerequisite: CSC 355.

460 Software Project Management and Development I. (3) F, S

Software life cycle analysis; programming teams; project documentation and milestones; requirements and specifications; design, testing and maintenance tools and techniques. Prerequisite: senior standing.

470 Computer Graphics. (3) S

Display devices, data structures, transformations, interactive graphics, 3-dimensional graphics, hidden line problem. Prerequisites: CSC 310; MAT 342. [Satisfies General Studies Requirement: N3]

471 Survey of Artificial Intelligence. (3) F, S

Introduction to heuristic search, games, knowledge representation techniques, formal and fuzzy logics, natural language understanding, expert systems, computer vision. Prerequisite: CSC 310

473 Non-Procedural Programming Languages. (3) S

Functional and logic programming using languages like Lucid and Prolog. (Typical applications would be a Screen Editor and an Expert System.) Prerequisite: CSC 355. [Satisfies General Studies Requirement: N3]

474 Modeling for Computer Simulation. (3) A

Mathematical description of general dynamic systems (discrete event, discrete time, continuous) in forms suitable for computer implementation. Prerequisites: CSC 310; ECE 383. [Satisfies General Studies Requirement: N3]

475 Simulation Theory and Languages. (3) A

Statistical background for simulation. Model construction and validation, analysis of results. Languages that support simulation. Prerequisite: CSC 474. [Satisfies General Studies Requirement: N3]

476 Introduction to Natural Language Processing. (3) F

Principles of computational linguistics, formal syntax, semantics, as applied to the design of software with natural (human) language I/O. Prerequisite: CSC 310 or instructor approval.

483 Fortran Programming for Graduate Research. (3) F, S

Introductory course for graduate research computing. Subroutines, program libraries, mathematical and statistical applications, batch and time-sharing environments, data files, plotting. 2 lectures, 2 hours lab. Non-majors only.

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 or instructor approval.

509 Digital Image Processing II. (3) S

Advanced analytical techniques applied to digital image processing, computer vision, applications including robotics. Prerequisite: CSC 508.

512 Database Systems Design. (3) F

Multi-level, generalized DBMS architectures and design. Distributed databases: transparent functionalities, query processing, update synchronization, concurrency control. Prerequisites: CSC 410, 412.

513 Database Machines. (3) N

Nonnumeric processing. Von-Neumann bottlenecks. Parallel and associative processors. Database machines: survey, theory, software, performance. Advanced topics in database architectures. Prerequisites: CSC 321; 410 or 412.

515 Information Storage and Retrieval. (3) N

Concepts of information storage and retrieval: theory, applications, case studies. Prerequisite: CSC 410.

516 Digital Testing and Reliability. (3) A

Fault modeling, test generation and simulation for combinational and sequential circuits; memory testing, self-checking logic, fault-tolerant logic, reliability analysis. Prerequisites: CSC 321 or 423; 451 or 355.

517 Digital Design Automation. (3) N

Typical computer-aided design system. Simulation techniques, test generation, microprogrammed control design aids, specification sheet analysis. Applications. Prerequisite: CSC 520 or 524.

518 Hardware Design Languages. (3) N

Introduction to hardware design languages (HDL's). HDL description of integrated circuit components and systems. HDL description of computer organizations. Prerequisite: CSC 321.

519 Minicomputers. (4) N

Organization of minicomputers, with "hands-on" emphasis of one particular design. 3 lectures, 3 hours lab. Prerequisite: CSC 321 or 423.

520 Computer Architecture II. (3) A

Theoretical structure of computer and computations, performance tradeoffs, control units, memory hierarchies, input/output, interconnection networks, operating system support. Prerequisite: CSC 430.

521 Microprocessor Applications. (4) S

Microprocessor technology and its application to the design of practical digital systems. Hardware, assembly-language programming, interfacing of microprocessor-based systems. Lecture, lab. Prerequisite: CSC 421.

522 Microprogramming. (3) A

Theory, practice and application of microprogramming. Prerequisite: CSC 321.

523 Microcomputer Systems Software. (3) F

Developing system software for a multi-processor, multi-programming microprocessor-based system using information and techniques presented in CSC 421, 422. Prerequisite: CSC 422.

524 Multiprogramming Architectures. (3) N

Main-line computer architectures; multiprogramming, timesharing, multiprocessing, hardware/software tradeoffs, memory hierarchies, input/output structures, communications. Prerequisite: CSC 321 or 423.

526 Parallel Processing. (3) N

Real and apparent concurrency. Hardware organization of multiprocessors, multiple computer systems, scientific attached processors and other parallel systems. Prerequisite: CSC 321 or 423.

527 High-Level-Language Machines. (3) N
Advantages and disadvantages of high-level-language machines. Languages suitability. Microprogramming and interpretive execution. I/O operations. Examples. Prerequisite: CSC 520 or 524.

529 Bit-Slice Processor Design. (4) N
Hardware and software design of a bit-slice computer with writable control store. 3 lectures, 3 hours lab. Prerequisite: CSC 321 or 423.

530 Operating System Case Study. (3) F
Study of the design and implementation of a timeshared multiprogramming operating system with emphasis on the UNIX operating system. Prerequisite: CSC 430; knowledge of C language.

531 Distributed Operating Systems. (3) N
Interprocess communications, concurrency control, file system design, programming language constructs, architecture and network considerations in distributed operating systems. Case studies. Prerequisite: CSC 530 or instructor approval.

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

533 Distributed Computer Systems. (3) N
Topics in distributed computer systems. Topology, communication, synchronization and recovery, concurrency control, deadlock, task allocation, file systems, case studies. Prerequisites: CSC 410, 430.

534 Computer Networks. (3) N
Computer network protocols, hardware elements and software algorithms. Error handling, routing, flow control, host-to-host communication, local area networks. Prerequisite: CSC 320

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

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

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

554 Advanced Switching Theory. (3) S
Lattices, Boolean algebras, post algebras, Boolean differential calculus, multivalued logic, fuzzy logic, finite state machines. Prerequisite: CSC 451.

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.

560 Software Project Management and Development II. (3) F, S

Software project management, cost estimation, configuration management, quality assurance. Advanced software engineering life cycle topics. Prerequisite: CSC 460

563 Software Requirements and Specification. (3) F
Examination of the definitional stage of software development; analysis of specification representations and techniques emphasizing important application issues. Prerequisite: CSC 460.

564 Software Design. (3) S
Examination of software design issues and techniques. Includes a survey of design representations and a comparison of design methods. Prerequisite: CSC 460.

565 Software Validation. (3) F
Software reliability models and measures, program testing theory, fault tolerant software, program verification, reliable software design and development, regression testing. Prerequisite: CSC 460.

566 Software Maintenance. (3) S
Survey of software maintenance problems, tools, metrics, management approaches. Implications of software maintenance on software development. Prerequisite: CSC 460.

570 Advanced Computer Graphics I. (3) A
Hidden surface algorithms, lighting models and shading techniques. User interface design. Animation techniques. Fractals and stochastic models. Raster algorithms. Prerequisite: CSC 470.

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: ECE 383 or STP 326.

573 Advanced Computer Graphics II. (3) A
Computer-aided geometric design. Interactive and surface representation and design. Scattered data techniques. CAD/CAM. Constructive solid geometry and modelling. Prerequisite: CSC 470.

Special Courses: CSC 294, 484, 492, 493, 494, 498, 499, 580, 590, 591, 592, 598, 599, 790, 791, 792, 799. (See pages 36-37.)



Electrical and Computer Engineering

PROFESSORS:

SAEKS (EC G-127), AKERS, BACKUS, BALANIS, BOSE, BYRNES, CADZOW, DeMASSA, FERRY, HADEN, HIGGINS, KARADY, KAUFMAN, KELLY, McKLVEEN, PALAIS, ROEDEL, RUSSELL, SCHRODER, SCHWUTTKE, SIRKIS, SMITH (ASU WEST CAMPUS), TICE, WANG

ASSOCIATE PROFESSORS:

CROUCH, DAVIS, GREENEICH, GRONDIN, KEARFOTT, MARACAS, SHEN, WILSON (ASU WEST CAMPUS), ZIMMER

ASSISTANT PROFESSORS:

GORUR, KOZICKI, SOHIE, TYLAVSKY, VARHUE

PROFESSORS EMERITI:

AX, BARKSON, DONNELLY, STEINMANN, THOMPSON, WELCH

The professional activities of electrical engineers directly affect the lives of most of the world's population every day. They are responsible for the design and development of radio and television transmitters and receivers, telephone networks and switching systems, computer systems, and electric power generation and distribution. 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 semiconductor 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 monitoring systems for hospitals. The development of the microprocessor has expanded the opportunities for electrical engineers to improve the design of familiar products since these devices are now incorporated in automobiles, consumer and office products, entertainment systems, and a vast variety of test and measurement instruments and machine tools.

A student who earns a B.S.E. degree majoring in Electrical Engineering will be involved in a variety of electrical and electronic problems in the course of their careers. To insure the necessary breadth of knowledge, the electrical engineering curriculum includes basic (core) engineering courses as well as courses in networks and electronic circuits, electromagnetic fields and waves, microprocessors, com-

munication and control systems, solid state electronics, electrical power systems and other specialty courses.

Electrical Engineering—B.S.E.

The curriculum in Electrical Engineering builds upon the base provided by the engineering core. Beyond the engineering core, the curriculum includes a number of required electrical engineering and technical elective courses. Approved technical elective courses serve to provide students with an opportunity to either broaden their background in electrical 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 engineering or to pursue advanced education in graduate school.

Degree Requirements

Electrical Engineering Core

Students in Electrical Engineering will fulfill the requirements of the engineering core by taking ECE 334, 352 and EEE 221. No credit will be given for ECE 333. Students may replace ECE 210 and 312 with PHY 321 and 322. Only ECE 313 may be deleted. The mathematics and basic science electives will be met by taking the following courses:

	<i>Semester Hours</i>
MAT 342 Linear Algebra	3
MAT 362 Advanced Mathematics for Engineers and Scientists I	3
PHY 361 Introductory Modern Physics	3

In addition, the following courses are required to fulfill the electrical engineering core:

	<i>Semester Hours</i>
EEE 302 Electrical Networks II	3
EEE 303 Signals and Filters	3
EEE 322 Microprocessor Applications	4
EEE 340 Electromagnetic Engineering I	3
EEE 360 Energy Conversion and Transport	3
EEE 396 Professional Seminar	0
EEE 432 Senior Design Laboratory	3
Total	19

Technical Electives in Electrical Engineering

The program in Electrical Engineering requires a total of 29 hours of technical electives. To insure breadth of knowledge students *must* select the courses indicated, from not less than four of the following six areas:

Area	Course
Electromagnetics	EEE 440
Solid State Electronics	EEE 436
Communications	EEE 455
Control	EEE 480
Electronics Circuits	EEE 425 or 433
Power Systems	EEE 470 or 471

Of the remaining technical electives, at least half must be electrical engineering (EEE) 400-level courses. With approval of the faculty advisor, computer science (CSC) 400-level courses may be used as an alternative to meet this requirement.

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. Students must have not less than a 3.00 grade point average and approval of the instructor to enroll in EEE graduate-level courses. In addition up to six semester hours of technical electives may be chosen from the approved list of courses from the College of Business.

**Electrical Engineering Program of Study
Typical Four-Year Sequence
Freshman Year**

	<i>Semester Hours</i>
First Semester	
CHM 114 General Chemistry for Engineers 4 or CHM 116 General Chemistry (4)	4
ECE 105 Introduction to Languages of Engineering 3	3
ENG 101 First-Year Composition 3	3
MAT 290 Calculus I 5	5
General Studies Elective (HU or SB) ¹ 3	3
Total	18
Second Semester	
ECE 106 Introduction to Computer-Aided Engineering 3	3
ENG 102 First-Year Composition 3	3
MAT 291 Calculus II 5	5
PHY 121 University Physics I 3	3
PHY 122 University Physics Lab I 1	1
General Studies Elective (HU or SB) ¹ 3	3
Total	18

Sophomore Year

First Semester	
EEE 221 Digital Computer Fundamentals 4	4
ECE 210 Engineering Mechanics I: Statics 3	3
MAT 274 Elementary Differential Equations 3	3
MAT 342 Linear Algebra 3	3
PHY 131 University Physics II 3	3
PHY 132 University Physics Lab II 1	1
Total	17

Second Semester

ECE 301 Electrical Networks I 4	4
ECE 312 Engineering Mechanics II: Dynamics 3	3
ECN 111 Macroeconomic Principles 3	3
EEE 322 Microprocessor Applications 4	4
MAT 362 Advanced Mathematics for Engineers and Scientists I 3	3
Total	17

Junior Year

First Semester

ECE 334 Electronic Devices and Instrumentation 4	4
ECE 340 Thermodynamics 3	3
EEE 302 Electrical Networks II 3	3
EEE 340 Electromagnetic Engineering I 3	3
EEE 396 Professional Seminar 0	0
PHY 361 Introductory Modern Physics 3	3
Literacy and Critical Inquiry Elective ¹ 3	3
Total	19

Second Semester

EEE 303 Signals and Filters 3	3
EEE 360 Energy Conversion and Transport 3	3
ECE 352 Semiconductors and Devices 3	3
Technical Electives 4	4
General Studies Elective (HU or SB) ¹ 3	3
Total	16

Senior Year

First Semester

EEE 432 Senior Design Laboratory 3	3
Technical Electives 14	14
Total	17

Second Semester

ECE 400 Engineering Communications 3	3
Technical Electives 11	11
General Studies Elective (HU or SB) ¹ 3	3
Total	17

¹ See pages 42-55 for requirements and approved list.

Graduation Requirements

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 program of study. The student must also have an overall grade point average of at least 2.00 for the following group of courses: ECE 301, 334, 352; all courses with an EEE prefix; and all other courses used as technical electives.

Special Program

For those students interested in Microelectronics Manufacturing Engineering, an option in this area of emphasis is available under the special engineering studies. See page 331 for details and course requirements.

ELECTRICAL AND COMPUTER ENGINEERING

EEE 221 Digital Computer Fundamentals. (4) F, S, SS
Combinational and sequential logic network design. Data representations and arithmetic unit operations. Introduction to microcomputer programming and operation. 3 lectures, 3 hours lab. Prerequisite: ECE 105 or CSC 100. [Satisfies General Studies Requirement: N3]

302 Electrical Networks II. (3) F, S, SS
Analysis of linear and nonlinear networks. Analytical and numerical methods. Prerequisite: ECE 301.

303 Signals and Filters. (3) F, S, SS
Filtering and spectral analysis in continuous and discrete systems. Prerequisite: ECE 301.

322 Microprocessor Applications. (4) F, S
Continuation of EEE 221. Microcomputer system organization and operation, I/O device operation, I/O programming and interfacing. Memory systems, microcomputer applications. 3 lectures, 3 hours lab. Prerequisite: EEE 221.

340 Electromagnetic Engineering I. (3) F, S, SS
Static and time varying vector fields; boundary value problems; dielectric and magnetic materials. Maxwell's equations; boundary conditions; uniform plane waves. Prerequisites: MAT 362; PHY 131.

360 Energy Conversion and Transport. (3) F, S
Three phase circuits. Energy supply systems. Magnetic circuit analysis, synchronous generators, transformers, induction machines, dc circuits. Load flow and short circuit calculations. Prerequisite: ECE 301.

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

405 Filter Design. (3) N
Design of active and passive filter design. Time and frequency domain approximations. Prerequisite: EEE 303 or equivalent.

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

425 Digital Systems and Circuits. (4) F
Digital logic gate analysis, propagation delay times, figures of merit, noise margins. Application of MOS and bipolar logic families, including NMOS, CMOS, standard and advanced TTL and ECL, regenerative logic circuits, memories, VLSI circuits; computer simulations using PSPICE. 3 hours lecture, 3 hours lab. Prerequisites: ECE 334, 352.

432 Senior Design Laboratory. (3) F, S
Project oriented laboratory. Each student will complete several design projects during the semester. 1 lecture, 6 hours lab. Prerequisites: ECE 334, EEE 303; senior status or instructor approval.

433 Analog Integrated Circuits. (3) S
Analysis, design and applications of modern analog circuits using integrated bipolar and field effect transistor technologies. Prerequisite: ECE 334.

434 Quantum Mechanics for Engineers. (3) F
Probability, Schrodinger equation, eigenfunctions, harmonic oscillator, periodic potential, superposition, angular momentum, scattering, tunneling, perturbation theory. Prerequisite: EEE 340.

435 Microelectronics. (3) S
Practice of solid state device fabrication techniques including thin film and integrated circuit fabrication principles. 2 lectures, 3 hours lab. Prerequisite: EEE 436 or equivalent.

436 Fundamentals of Solid State Devices. (3) F, S
Metal-semiconductor contacts, P-N junctions, light interacting devices, Schottky diodes, bipolar and field effect transistors, planar and thin film integrated circuit (I-C) devices. Prerequisite: ECE 352.

439 Semiconductor Facilities and Cleanroom Practices. (3) F
Microcontamination, cleanroom concepts, operational considerations, ultrapure water, process materials, safety practices, introduction to industrial hygiene, emergency response. Mandatory for users of CEAS cleanroom.

440 Electromagnetic Engineering II. (4) F, S
Coaxial and waveguide transmission lines; matching techniques; plane waves in lossy media; polarization; reflection and refraction; electromagnetic system concepts; radiation. 3 lectures, 3 hours lab. Prerequisites: ECE 105, 301; EEE 340; or equivalents.

443 Antennas. (3) S
Fundamental parameters; engineering principles, radiation integrals; linear wire antennas; loops, arrays; numerical computations; measurements. Prerequisite: EEE 440 or equivalent.

445 Microwaves. (4) F
Waveguides; circuit theory for waveguiding systems; microwave devices, systems and energy sources; striplines and microstrips; impedance matching transformers; measurements. 3 lectures, 3 hours lab. Prerequisite: EEE 440 or equivalent.

448 Fiber Optics. (4) F
Principles of fiber-optic communications. 3 lectures, 3 hours lab. Prerequisites: EEE 303, 340.

451 Error-Correcting Codes. (3) N
Application of modern algebra to the analysis and synthesis of random error-detecting and error-correcting block codes. Prerequisite: EEE 221.

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

455 Communication Systems. (4) F, S
Signal analysis. Linear, exponential and pulse modulation. Comparative analysis of circuits and systems. 3 lectures, 3 hours lab. Prerequisite: EEE 303.

459 Data Communication Systems. (3) N
System characteristics. Communications media. Communication codes. Data validity checking. Line protocols, terminals, system configurations. Examples. Prerequisites: EEE 303, 322.

460 Introduction to Nuclear Engineering. (3) F
Neutron interactions with matter. Principles of neutron chain reacting systems. Neutron diffusion and moderation. Heat removal from nuclear reactors. Point reactor kinetics. Cross-listed as MAE 430 and NUC 460. Prerequisite: PHY 361.

461 Health Physics Principles and Radiation Measurements. (3) S
Sources, characteristics, dosimetry, shielding and measurement techniques for natural and man-made radiation. Phi-

310 ELECTRICAL AND COMPUTER ENGINEERING

osophy of radiation protection. Emphasis on instrumentation, detectors and environmental monitoring. 2 lectures, 3 hours lab. Cross-listed as BME 461 and NUC 461. Prerequisite: ECE 301.

462 Reactor Safety Analysis. (3) S

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. Cross-listed as NUC 462. Prerequisite: EEE or NUC 460.

463 Electric Power Plant. (3) F

Nuclear, fossil and solar energy sources. Analysis and design of steam supply systems, electrical generating systems and auxiliary systems. Power plant efficiency, operation and costs and analyses. Cross-listed as NUC 463. Prerequisites: ECE 301; EEE 340.

464 Nuclear Engineering Experiments. (3) F

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. 2 lectures, 3 hours lab. Cross-listed as NUC 464. Corequisite: EEE or NUC 460.

465 Clinical Nuclear Engineering I. (3) N

Fundamentals of clinical nuclear engineering and medical health physics practice. Radiation biology, dosimetry and shielding for radiotherapy and diagnostic procedures. Cross-listed as BME 465 and NUC 465. Prerequisite: instructor approval.

470 Electric Power Devices. (3) S

Analysis of devices used for short circuit protection including circuit breakers, relays, current and voltage transducers, etc. Protection against switching and lightning over voltages. Insulation coordination. 3 lectures. Prerequisite: EEE 360.

471 Power System Analysis. (3) F

Review of transmission line parameter calculation. Zero sequence impedance, symmetrical components for fault analysis, short circuit calculation, review of power flow analysis, power system stability, power system control concepts. Distribution system analysis, feeder design, voltage drop, capacitor placement, substation location. Prerequisite: EEE 360.

473 Electrical Machinery. (3) S

Analysis and design of transformers and rotating machines: dc, induction and synchronous machines. Principals of motor drives, thyristor microprocessor control. Prerequisite: EEE 360.

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. 3 lectures, 3 hours lab. Prerequisite: EEE 303.

482 Introduction to State Space Methods. (3) S

Discrete and continuous systems in state space form: linear systems and A.R.M.A. models. Elements of realization, observer and stabilization theory. Non linear systems, stability phase plane and Liapunov methods. Applications to digital (computer) simulation. Prerequisite: EEE 303.

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. Corequisite: EEE 454. 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.

525 VLSI Design. (3) F

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

531 Semiconductor Device Theory I. (3) F

Transport and recombination theory, pn and Schottky barrier diodes, bipolar and junction field-effect transistors, MOS capacitors and transistors. Prerequisite: EEE 436 or equivalent.

532 Semiconductor Device Theory II. (3) S

Advanced MOSFETs, charge-coupled devices, solar cells, photodetectors, light-emitting diodes, microwave devices, modulation-doped structures. 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 Semiconductor Transport. (3) F

Carrier transport in semiconductors. Hall effect, high electric field, Boltzmann equation, correlation functions, carrier-carrier interactions. Prerequisite: EEE 436 or equivalent.

535 Solar Cells. (3) F

Photovoltaic devices including homojunctions and heterojunctions. Photogeneration of carriers, spectral response, electrical characteristics, efficiency. Prerequisite: EEE 436 or equivalent.

536 Semiconductor Characterization. (3) N

Measurement techniques for semiconductor materials and devices. Electrical, optical, physical and chemical characterization methods. Prerequisite: EEE 436 or equivalent.

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.

539 Introduction to Solid State Electronics. (3) F

Crystal lattices, reciprocal lattices, quantum statistics, lattice dynamics, equilibrium and nonequilibrium processes in semiconductors. Prerequisite: EEE 434.

541 Electromagnetic Fields and Guided Waves. (3) S

Polarization and magnetization; dielectric, conducting, anisotropic and semiconducting media; duality, uniqueness and image theory; plane wave functions, waveguides, resonators and surface guided waves. Prerequisite: EEE 440 or equivalent.

542 Selected Microwave Devices. (3) N

Use of ferrite, semiconductor and piezoelectric materials in microwave systems. Prerequisites: ECE 352 and EEE 445 or equivalents.

543 Antenna Analysis and Design. (3) F

Impedances, broadband antennas, frequency independent antennas, miniaturization, aperture antennas, horns, reflectors, lens antennas, continuous sources design techniques. Prerequisite: EEE 443 or equivalent.

544 High Resolution Radar. (3) F

Fundamentals; wideband coherent design, waveforms and processing; stepped frequency; synthetic aperture radar (SAR); inverse synthetic aperture radar (ISAR); imaging. Prerequisites: EEE 303, 340; or equivalent.

545 Microwave Circuit Design. (3) S

Analysis and design of microwave attenuators, in-phase and quadrature-phase power dividers, magic tee's, directional couplers, phase shifters, DC blocks, equalizers, etc. Prerequisite: EEE 445 or instructor approval.

546 Advanced Fiber Optics. (3) N

Theory of propagation in fibers, frequency modulation of light, fiber-optic heterodyne receivers, fiber-optic sensors, birefringence in fibers. Prerequisite: EEE 448 or instructor approval.

547 Microwave Solid State Circuit Design I. (3) F

Application of semiconductor characteristics to practical design of microwave mixers, detectors, limiters, switches, attenuators, multipliers, phase shifters and amplifiers. Prerequisite: EEE 545 or instructor approval.

548 Coherent Optics. (3) N

Diffraction, lenses, optical processing, holography, electro-optics, lasers. Prerequisite: EEE 440.

549 Lasers. (3) N

Theory and design of gas, solid and semiconductor lasers. Prerequisite: EEE 448 or instructor approval.

550 Transform Theory and Applications. (3) F

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, 454.

552 Coherent Communications. (3) N

Systems analysis and design of telecommunication systems using phase-locked loops. Prerequisite: EEE 454.

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 454.

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 454, 455.

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 454, 455.

559 Computer Communication Networks. (3) N

Introduction to computer networks. Hardware elements. Data link protocols. Packet and message switching software elements. Network control. Examples. Prerequisite: EEE 459.

566 Advanced Medical Instrumentation. (3) N

Design and analysis of imaging systems and nuclear devices for medical diagnosis, therapy and research. Cross-listed as BME 566 and NUC 566. Prerequisite: instructor approval.

571 Power System Transients. (3) F

Analysis of transient currents and voltages generated by disturbances in power networks. EMTP method. Travelling waves. Transients in transformers and generators. Protection against transients. Prerequisite: EEE 471.

572 Power Electronics. (3) F

Analysis of device operation: thyristors, gate-turn-off thyristors, transistors. Design of rectifier and inverter circuits. Applications: variable speed drives, HVDC, motor control, uninterruptable power supplies. Prerequisite: EEE 471.

573 Power System Control. (3) S

Concepts of economic and secure operation of power systems; load frequency control, economic dispatch, unit commitment, state estimation, contingency analysis. Prerequisite: EEE 471.

574 Computer Solution of Power Systems. (3) S

Algorithms for digital computation for power flow, fault and stability analysis. Sparse matrix and vector programming methods, optimization, stochastic methods. Prerequisite: EEE 471.

575 Power System Stability Modeling. (3) N

Mathematical modeling of synchronous machines, excitation systems, governors, power plants and loads for dynamic analysis. Simulation of small systems. Prerequisite: EEE 480.

576 Power System Reliability. (3) N

Reliability functions, distributions, Markov processes, recursive techniques, generation capacity evaluation, spinning capacity, frequency and duration method, transmission reliability, composite systems. Prerequisite: EEE 471 or equivalent.

577 Power System Planning. (3) F

Power flow and transient stability analysis, load forecasting methods, reliability concepts. Transmission planning, loss of load probability and production cost analysis, optimal network and generation expansion. Prerequisite: EEE 470.

579 Power Transmission and Distribution. (3) S

High voltage transmission line design: conductors, corona, RI and TV noise etc. dc transmission. Distribution system analysis: load characteristics, feeder voltage drop, capacitor applications. Prerequisite: EEE 471.

580 Digital Control Systems. (3) S

Analysis and design of digital and sampled data control systems including: sampling theory, z-transforms, the state transition method, stability, design and synthesis. Prerequisites: EEE 550, 582.

581 Random Processes in Control Systems. (3) N

Statistical filtering, estimation and control with emphasis on the Kalman filter and its applications and computational problems. Prerequisites: EEE 454, 550, 582.

582 Linear System Theory. (3) F

Controllability, observability and realization theory for multi-variable continuous time systems. Stabilization and asymptotic state estimation. Disturbance decoupling, non interacting control and banded input/banded output stability. Prerequisite: EEE 482.

586 Nonlinear Control Systems. (3) N

Stability theory including phase-plane, describing function, Liapunov's method and frequency domain criteria for continuous and discrete, nonlinear and time-varying systems. Prerequisite: EEE 582.

587 Optimal Control Systems. (3) N

Application of calculus of variations, Pontryagin's principle and dynamic programming to control problems. Computational techniques for solving optimal control problems. Prerequisite: EEE 582.

641 Advanced Electromagnetic Field Theory. (3) S

Cylindrical wave functions, wave guides and resonators; spherical wave functions and resonators; integral equations; scattering and radiation; perturbational and variational methods. Prerequisite: EEE 541 or equivalent.

643 Advanced Topics in Electromagnetic Radiation. (3) S
High-frequency asymptotic techniques, geometrical and physical theories of diffraction (GTD and PTD), moment method (MM), radar cross section (RCS) prediction, Fourier transforms in radiation, synthesis methods. Prerequisite: EEE 543.

645 Microwave Filter Design. (3) S
Analysis and design of microwave low-pass, high-pass, band-pass and band-stop filters and microwave duplexers/multiplexers. Prerequisite: EEE 545 or instructor approval.

647 Microwave Solid State Circuit Design II. (3) S
Practical design of microwave free-running and voltage-controlled oscillators using Gunn and Impatt diodes and transistors; analysis of noise characteristics of the oscillator. Prerequisites: EEE 545, 547.

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

732 Advanced Bipolar Devices and Circuits. (3) F
Critical examination of new bipolar device and circuit technologies. Performance tradeoffs, scaling effects and modeling techniques. Prerequisite: EEE 531.

770 Advanced Topics in Power Systems. (3) N
Power system problems of current interest, approached at an advanced technical level, for mature students. Prerequisites: EEE 577, 579 or equivalents; instructor approval.

Special Courses: EEE 484, 494, 498, 499, 590, 591, 592, 594, 598, 599, 680, 690, 691, 692, 790, 791, 792, 799. (See pages 36-37.)

Industrial and Management Systems Engineering

PROFESSORS:

BEDWORTH, SMITH

ASSOCIATE PROFESSORS:

KEATS (EC G-120B), ANDERSON, BAILEY,
DEAN, KNIGHT, MACKULAK, MOOR,
ROLLIER, SHUNK

ASSISTANT PROFESSORS:

COCHRAN, HUBELE, RUCKER

PROFESSORS EMERITI:

HOYT, YOUNG

The industrial engineer (IE) provides leadership for American organizations in productivity improvement and in reestablishing competitiveness in the domestic and international marketplaces. This gives IE's a wide range of interests and responsibilities. In a manufacturing enterprise, for example, the common goal of American industry (and the IE) is to both modernize and migrate the organization towards the concept of the factory-of-the-future (FOF).

Information technologies are of major interest to the industrial engineer. Information technology makes it possible to integrate people, material, machines, money and other resources into productive enterprises. Information systems, including networks, data base models, computer hardware and software, that tie people and resources together symbolize the essence of "integration" from a systems perspective.

Technology integration includes the integration of mechanical, electrical, chemical, structural and biological systems to create synergistic higher-level systems and subsystems. Other disciplines tend to take vertical cuts deep into their areas of specialty, while IE's take horizontal cuts across multiple areas of technology.

A distinguishing feature of industrial engineering is the emphasis on people. In fact, IE is often referred to as the "people-oriented profession." It is a primary function of the IE to integrate people and technology oriented systems. IE's are active in the fields of human factors and ergonomics. With the development of the field of artificial intelligence and expert systems, the IE is being called upon to lead the movement from muscle-based work to knowledge-based work. Industrial engineering is the only engineering discipline offering course work in quality assurance, so critical in today's competitive environment.

The IE is not only the developer of people and technology integrated systems but also is a prime candidate for all levels of management, especially those in high tech organizations, because of their background in technology integration, organizational theory, management practice and engineering economics. This is evidenced by the fact that over half of all practicing IE's are in some level of management.

The demand for IE's is growing in direct proportion to the exponential increase in integration, modernization and automation activities. It has been predicted that the greatest shortfall in an individual engineering discipline by 1990 will be in industrial engineering.

Industrial Engineering-B.S.E.

Degree Requirements

The following courses are required as a part of the engineering core mathematics requirement and the microcomputer elective (only ECE 312 Engineering Mechanics: Dynamics or ECE 340 Thermodynamics may be deleted from the engineering core, with the approval of the student's advisor):

		<i>Semester Hours</i>
ECE 383	Probability and Statistics for Engineers	2
IEE 463	Computer-Aided Manufacturing and Control	3

In addition, the following courses are required for the Industrial Engineering major:

		<i>Semester Hours</i>
ASE 485	Engineering Statistics	3
IEE 300	Economic Analysis for Engineers	2
IEE 330	Microcomputer Applications in Industrial Engineering	3
IEE 367	Methods Engineering and Facilities Design	4
IEE 374	Quality Control	3
IEE 422	Information Systems Design	3
IEE 431	Engineering Administration	3
IEE 461	Integrated Production Control	3
IEE 475	Introduction to Simulation	3
IEE 476	Operations Research Techniques	4
IEE 488	Industrial Engineering Analysis	3
IEE 492	Project in Design and Development ...	3
MAE 351	Manufacturing Processes Survey	3
	Area of Emphasis (technical electives)	12
	Total	52

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. A maximum of two courses are allowed outside the School of Engineering. The graduate courses listed under these areas may, with appropriate approvals, be taken for undergraduate credit provided the student has a GPA greater than or equal to 3.00.

Production systems: IEE 464, 561, 570; OPM 331.

Computer-aided manufacturing: CHE 461; IEE 464; MET 346, 443.

Engineering management: FIN 300; GNB 306; IEE 411, 510, 531.

Information systems: CSC 304, 410, 412; IEE 464, 577.

Quality controll/reliability: AET 409; ASE 483; MAE 441, 442; IEE 549, 570.

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. A minimum of six hours of technical electives must be taken from this department.

**Industrial Engineering Program of Study
Typical Four-Year Sequence
Freshman Year**

		<i>Semester Hours</i>
First Semester		
CHM 114	General Chemistry ¹	4
ECE 105	Introduction to Languages of Engineering	3
ENG 101	First-Year Composition	3
MAT 270	Calculus I	4
	General Studies Elective (HU or SB) ²	3
	Total	17

Second Semester		
ECE 106	Introduction to Computer-Aided Engineering	3
ENG 102	First-Year Composition	3
MAT 271	Calculus II	4
PHY 121	University Physics I	3
PHY 122	University Physics Lab I	1
	Literacy and Critical Inquiry Elective ²	3
	Total	17

Sophomore Year

First Semester		
ECN 111	Macroeconomic Principles	3
	or ECN 112 Microeconomic Principles (3)	
IEE 300	Economic Analysis for Engineers	2
MAT 242	Elementary Linear Algebra	2
MAT 272	Calculus III	4
PHY 131	University Physics II	3
PHY 132	University Physics Lab II	1
	Total	15

Second Semester		
ECE 211	Engineering Mechanics I: Statics	3
ECE 383	Probability and Statistics for Engineers	2
IEE 330	Microcomputer Applications in Industrial Engineering	3
MAT 274	Elementary Differential Equations	3
	Basic Science Elective ³	3
	General Studies Elective (HU or SB) ²	3
	Total	17

Junior Year

First Semester		
ASE 485	Engineering Statistics	3
ECE 301	Electrical Networks I	4
ECE 312	Engineering Mechanics II: Dynamics	3
	or ECE 340 Thermodynamics (3)	
ECE 350	Structure and Property of Materials	3
	Technical Elective	3
	General Studies Elective (HU or SB) ²	3
	Total	19

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Second Semester

ECE 313	Introduction to Deformable Solids 3
ECE 333	Electrical Instrumentation 3
IEE 367	Methods Engineering and Facilities Design	..... 4
MAE 351	Production Processes	..... 3
	Technical Elective	..... 3
	General Studies Elective (HU or SB) ²	..... 3
	Total	..... 19

Senior Year

First Semester

IEE 374	Quality Control	..... 3
IEE 422	Information Systems Design	..... 3
IEE 431	Engineering Administration	..... 3
IEE 461	Integrated Production Control	..... 3
IEE 463	Computer-Aided Manufacturing and Control	..... 3
IEE 475	Introduction to Simulation	..... 3
	Total	..... 18

Second Semester

ECE 400	Engineering Communications	..... 3
IEE 476	Operations Research Techniques/Applications	..... 4
IEE 488	Industrial Engineering Analysis	..... 3
IEE 492	Project in Design and Development	..... 3
	Technical Electives	..... 6
	Total	..... 19

Graduation requirements: 133 semester hours minimum (excluding English requirement).

¹ No high school chemistry, take CHM 113 and 116.

² See pages 42-55 for requirements and approved list.

³ Select from BIO 181, CHM 331, GLG 100, PHY 361 or ZOL 201.

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 of 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/CIM and factory automation technology to industry.

The following courses are required as part of the engineering core mathematics requirement and the microcomputer elective (only ECE 312 Engineering Mechanics: Dynamics or ECE 340 Thermody-

namics may be deleted from the engineering core, with the approval of the student's advisor):

		<i>Semester Hours</i>
ECE 350	Structure and Properties of Materials	3
ECE 383	Probability and Statistics for Engineers	2
IEE 463	Computer-Aided Manufacturing and Control	3

The basic science elective may be selected from BIO 181, PHY 361, CHM 331, GLG 100 or ZOL 201.

In addition, the following courses are required:

		<i>Semester Hours</i>
IEE 300	Economic Analysis for Engineers	2
IEE 330	Microcomputer Applications in Industrial Engineering	3
IEE 374	Quality Control	3
IEE 422	Information System Design	3
IEE 431	Engineering Administration	3
IEE 464	Computer-Integrated Design	3
IEE 492	Project in Design and Development	3
MAE 317	Dynamic Systems and Control	4
MAE 351	Manufacturing Processes Survey	3
MAE 422	Mechanics of Materials	4
MAE 441	Design Theory and Techniques	3
MAE 447	Robotics and Its Influence on Design	3
MET 443	N/C Computer Programming	3
MSE 480	Manufacturing Engineering	3
	Technical Electives	9
	Total	52

INDUSTRIAL AND MANAGEMENT SYSTEMS ENGINEERING

IEE 300 Economic Analysis for Engineers. (2) F, S
Economic evaluation of alternatives for engineering decisions emphasizing the time value of money. Prerequisites: ECE 106; MAT 260 or 270.

330 Microcomputer Applications in Industrial Engineering. (3) F, S
Concepts related to development of operational capability in the use of microcomputer hardware, software and networking as related to industrial engineering applications. Prerequisites: ECE 106. [Satisfies General Studies Requirement: N3]

367 Methods Engineering and Facilities Design. (4) F, S
Analysis and design of work systems; productivity; motion and time study techniques; human factors. Analysis and design of facilities for automated and man-machine systems; emphasis on process design, material handling, layout design and facilities location. 3 lectures, 2 hours lab. Prerequisites: IEE 300.

374 Quality Control. (3) F
In-depth analysis of control chart and other statistical process control techniques. Organization and managerial aspects of quality assurance. Attribute and variable acceptance sampling plans. Prerequisite: ECE 383.

411 Engineering Economy. (3) S

Equipment replacement analysis, treatment of inflation in cash flow studies and consideration of risk and uncertainty. Prerequisite: IEE 300.

422 Information Systems Design. (3) F, S

Emphasis on the application of system analysis and design to information systems. Microprocessor MIS project required.

431 Engineering Administration. (3) F, S

Engineering organization and administration; introduction to decision making, quantitative and qualitative approaches to management and engineering administration.

437 Human Factors Engineering. (3) F

Study of people at work; designing for human performance effectiveness and productivity. Considerations of human physiological and psychological factors. Prerequisite: IEE 367.

461 Integrated Production Control. (3) F, S

Production control techniques for the planning, analysis, control and evaluation of operating systems. Time series forecasting, network planning, scheduling and control. Prerequisite: ECE 383.

463 Computer-Aided Manufacturing and Control. (3) F, S

Emphasis on computer control in manufacturing; real time concepts. CIM, NC, group technology and process planning, robotics. Prerequisite: ECE 105. [Satisfies General Studies Requirement: N3]

464 Computer-Integrated Design. (3) F, S

Use of CAD tools to create geometric objects and layout designs. Design interfacing through database structure with manufacturing planning control functions. Includes open-shop design laboratory assignments in addition to classroom work. Prerequisite: ECE 105. [Satisfies General Studies Requirement: N3]

475 Introduction to Simulation. (3) F, S

Use of simulation in the analysis and design of network and discrete systems. Methods for using a simulation language. Introduction to statistical aspects to simulation. Prerequisites: ECE 105, 383. [Satisfies General Studies Requirement: N3]

476 Operations Research Techniques/Applications. (4) F, S

Topics include linear programming, network optimization, dynamic programming, Markov processes and queueing models. Emphasis on the design and development of models for solving decision problems in industrial systems. Prerequisites: ECE 383; MAT 242. [Satisfies General Studies Requirement: N2]

488 Industrial Engineering Analysis. (3) S

Labor material and overhead cost analysis, parametric cost estimating, risk analysis involving budget limitations, assurance of estimates, quality cost systems, life-cycle cost analysis including effects on engineering design, reliability, maintainability, serviceability, testability and availability. Prerequisites: ECE 383; IEE 300.

492 Project in Design and Development. (3) F, S

Individual project in creative design and synthesis.

501 Foundations of Industrial Engineering I. (3) F

Techniques for the analysis and design of man-machine systems. Emphasis on work planning, methods, measurements, material handling and facility design. Not available for I.E. graduate credit.

502 Foundations of Industrial Engineering II. (3) S

Introduction to quantitative production control techniques: planning, forecasting, inventory control and MRP, scheduling. Influence of CAD/CAM and automation on production control process. Not available for I.E. graduate credit. Prerequisite: ECE 383 or 500.

503 Economic Analysis for Engineers. (2) F, S

Economic evaluation of alternatives for engineering decisions, emphasizing the time value of money. Not available for I.E. graduate credit. Prerequisites: ECE 106; MAT 260 or 270.

510 Measurement of Productivity. (3) F

The engineering economic audit and its use with applications to break-even analysis, variable budget control cost analysis and product pricing. Prerequisite: ECE 383 or 500.

511 Analysis of Decision Processes. (3) F, S

Methods of making decisions in complex environments, statistical decision theory; effects of risk, uncertainty and strategy on engineering and managerial decisions. Prerequisite: ECE 383 or 500.

520 Ergonomics Design. (3) S

Human physiological and psychological factors in the design of work environments and in the employment of people in man-machine systems. Open-shop lab assignments in addition to class work. Prerequisite: IEE 501.

531 Topics in Engineering Administration. (3) S

Consideration given to philosophical, psychological, political and social implications of administrative decisions.

533 Scheduling and Network Analysis Models. (3) S

Application of scheduling and sequencing algorithms, deterministic and stochastic network analysis and flow algorithms. Prerequisites: ECE 383 or 500; IEE 475 or 545.

540 Engineering Economy. (3) S

Equipment replacement analysis, treatment of inflation in cash flow studies and consideration of risk and uncertainty. Open only to students without previous credit for IEE 411. Prerequisite: IEE 503.

541 Engineering Administration. (3) F, S

Engineering organization and administration; introduction to decision making; quantitative and qualitative approaches to management and engineering administration. Open only to students without previous credit for IEE 431.

542 Information System Design. (3) F, S

Emphasis on the application of system analysis and design to information systems. Microprocessor MIS project required. Open only to students without previous credit for IEE 422.

543 Computer-Aided Manufacturing and Control. (3) F, S

Emphasis on computer control in manufacturing real-time concepts. CIM, NC, group technology and process planning, robotics. Open only to students without previous credit for IEE 463. Prerequisite: ECE 105.

544 Computer-Integrated Design. (3) F, S

Use of CAD tools to create geometric objects and layout designs. Design interfacing through database structure with manufacturing planning control functions. Includes open-shop design lab assignments in addition to classroom work. Open only to students without previous credit for IEE 464. Prerequisite: ECE 105 or equivalent.

545 Introduction to Simulation. (3) F, S

Use of simulation in the analysis and design of network and discrete systems. Methods for using a simulation language. Introduction to statistical aspects of simulation. Open only to students without previous credit for IEE 475. Prerequisites: ECE 105; ECE 383 or 500.

546 Operations Research Techniques/Applications. (4) F, S

Topics include linear programming network optimization, dynamic programming, Markov processes and queueing models. Emphasis on the design and development of models for solving decision problems in industrial systems. Open only to students without previous credit for IEE 476. Prerequisites: ECE 383 or 500; MAT 242.

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547 Human Factors Engineering. (3) F

Study of people at work; designing for human performance effectiveness and productivity. Considerations of human physiological and psychological factors. Open only to students without previous credit for IEE 437. Prerequisite: IEE 501.

548 Industrial Engineering Analysis. (3) S

Labor material and overhead cost analysis, parametric cost estimating, risk analysis involving budget limitations, assurance of estimates, quality cost systems, life-cycle analysis including effects on engineering design, reliability, maintainability, serviceability, testability and availability. Open only to students without previous credit for IEE 488. Prerequisites: ECE 383 or 500; IEE 300 or 503.

573 Reliability Evaluation Techniques. (3) S

Topics include the nature of reliability, time to failure densities, especially the exponential and Weibull, series/parallel/standby systems, complex system reliability, Bayesian reliability analysis and sequential reliability tests. Prerequisite: ECE 383 or 500.

560 Data Base Concepts for Industrial Management Systems. (3) F, S

Application of data base concepts to industrial systems problems. Topics include conceptual modeling, data structures, database software and perspectives from expert and knowledge base systems. Prerequisites: ASE 485 or 500; IEE 330; IEE 422 or 542; MAT 242

561 Production Control Information Systems. (3) F, S

Development of information system designs for production control. Topics include MRP I, MRP II, scheduling, sequencing and inventory control. On-line design concepts are covered. Prerequisites: ASE 485 or 500; IEE 330; IEE 422 or 542; MAT 242.

563 Systems Analysis for Distributed Systems. (3) S

Analysis and design of distributed systems for computer integrated manufacturing and information processing. Concepts of host driven microprocessors to collect, store and communicate data.

564 Planning for Computer-Integrated Manufacturing. (3) F, S

Theory and use of IDEF methodology in planning for flexible manufacturing, robotics and real-time control. Simulation concepts applied to computer-integrated manufacturing planning. Prerequisites: IEE 501, 502.

565 Computer-Integrated Manufacturing Research. (3) N

Determination and evaluation of research areas in computer-integrated manufacturing including real-time software, manufacturing information systems, flexible and integrated manufacturing systems, robotics, computer graphics. Prerequisite: IEE 463 or 543 or instructor approval.

566 Simulation in Computer-Integrated Manufacturing Planning. (3) N

Use of simulation in the planning of computer-integrated manufacturing planning related to robotics, flexible and integrated manufacturing systems. Use of computer graphics combined with simulation analysis for CIM decision support. Prerequisite: IEE 475 or 545 or instructor approval.

567 System Simulation. (3) S

Use of simulation in the analysis and design of systems involving continuous and discrete processes; simulation languages; statistical aspects of simulation. Prerequisite: IEE 475 or 545.

569 Nonparametric Statistical Inference. (3) S

Application of statistical inference procedures, based on ranks, to engineering problems. Efficient alternatives to classical statistical inference constrained by normality assumptions. Prerequisite: ASE 485 or 500.

570 Advanced Quality Control. (3) F

Economic-based acceptance sampling, multiattribute acceptance sampling, narrow limit gauging in inspector error and attributes acceptance sampling, principles of quality management, selected topics from current literature. Prerequisite: IEE 374 or instructor approval.

572 Engineering Statistics. (3) F

Analysis of variance and experimental design. Topics include general design methodology, incomplete blocks, confounding, fractional replication, response surface methodology. Prerequisite: ASE 485 or 500.

574 Applied Deterministic Operations Research Models. (3) F

Formulation, solution, analysis and application of deterministic models in operations research, including those of linear programming, integer programming and non-linear programming. Prerequisite: 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 or 500.

576 Applications of Operations Research. (3) F

Case studies of application of linear and non-linear models and general types of search techniques. Prerequisite: IEE 574 or instructor approval.

577 Information Systems Methodology. (3) S

Systems approach to the analysis, design and implementation of decision support systems. Emphasis on development of databases, model bases dialogs and systems architecture as well as systems effectiveness. Introduction to expert systems as decision aid included. Term project required. Prerequisite: IEE 542.

578 Advanced Decision Theory. (3) S

Advanced decision theory techniques for industrial systems. Topics include conjugate families of distributions, value theory, decisions with multiple objectives and goal programming. Prerequisite: IEE 511.

579 Time Series Analysis and Forecasting. (3) F

Forecasting time series by the Box-Jenkins and exponential smoothing techniques; existing digital computer programs are utilized to augment the theory. Prerequisite: ASE 485 or 500.

581 Reliability, Availability and Serviceability. (3) F

Includes organizing for RAS, hardware and software RAS, integrity and fault-tolerant design, maintenance design and maintenance strategy. Markov models for RAS, fault-free analysis and military standards for RAS. Prerequisite: ECE 383 or 500.

Special Courses: IEE 484, 494, 498, 498, 499, 580, 590, 591, 592, 598, 599, 784, 790, 792, 799. (See pages 36-37.)



Mechanical and Aerospace Engineering

PROFESSORS:

EVANS (EC G-346E), BEAKLEY, BICKFORD,
CHEN, DAVIDSON, DITSWORTH,
FLORSCHUETZ, JACOBSON, JANKOWSKI,
LOGAN, METZGER, NELSON, RICE, ROY,
SARIC, SO, WALLACE, WOOD, YAO

ASSOCIATE PROFESSORS:

HIRLEMAN, LAANANEN, LIU, NEITZEL, PECK,
RANKIN, REED, TONG

ASSISTANT PROFESSORS:

BILIMORIA, BLECHSCHMIDT, CASTELAZO,
FERNANDO, HENDERSON, KOURIS, KUO,
McNEILL, MIGNOLET, MURTHY, NATSIAVAS,
RAJAN, SHAH, WELLS

VISITING PROFESSOR:

ISLAM

PROFESSORS EMERITI:

ALLEN, AVERY, FRY, KAUFMAN, PRICE,
SHAW, STAFFORD, THOMPSON, TURNBOW,
WILCOX, WOOLDRIDGE

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

Aerospace Engineering
Energy Systems Engineering
Engineering Science
Mechanical Engineering

All four 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 education for the aerospace industries and government agencies. The *Energy Systems Engineering* major provides education 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 who prefer more emphasis in the science and analysis side of engineering than is generally available in more traditional engineering programs. The *Mechanical Engineering* major is, perhaps, one of the most broadly applicable programs in engineering, providing education 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 knowledge 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 or special programs which emphasize primarily current applications or specific industries.

Degree 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 287 as part of the engineering core requirements, students in the Department of Mechanical and Aerospace Engineering are required to select the following:

	<i>Semester Hours</i>
ECE 210 Engineering Mechanics: Statics	3
ECE 312 Engineering Mechanics: Dynamics	3
ECE 313 Introduction to Deformable Solids	3
ECE 340 Thermodynamics	3
ECE 350 Structure and Properties of Materials	3

The microcomputer/microprocessor elective, when required by a degree requirement, must be selected from one of the following:

	<i>Semester Hours</i>
CSC 220 Computer Organization and Assembly Language Programming	4
EEE 221 Digital Computer Fundamentals	4
IEE 463 Computer-Aided Manufacturing and Control	3
MAE 405 Microcomputer-Aided Processes for MAE	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:

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Program of Study

Typical First and Second-Year Sequence

Freshman Year

	<i>Semester Hours</i>
First Semester	
CHM 114 General Chemistry for Engineers 4 or CHM 116 General Chemistry (4)	4
ECE 105 Introduction to Languages of Engineering	3
ENG 101 First-Year Composition	3
MAT 290 Calculus I	5
General Studies Elective (HU or SB) ¹	3
Total	18

Second Semester

ECE 106 Introduction to Computer-Aided Engineering	3
ENG 102 First-Year Composition	3
MAT 291 Calculus II	5
PHY 121 University Physics I	3
PHY 122 University Physics Lab II	1
General Studies Elective (HU or SB) ¹	3
Total	18

Sophomore Year

First Semester

ECE 210 Engineering Mechanics I: Statics	3
MAT 274 Elementary Differential Equations	3
PHY 131 University Physics II	3
PHY 132 University Physics Lab II	1
MAT 242 Elementary Linear Algebra ²	2
Literacy and Critical Inquiry Elective ¹	3
General Studies Elective (HU or SB) ¹	3
Total	18

Second Semester

ECE 301 Electrical Networks I	4
ECE 312 Engineering Mechanics II: Dynamics	3
ECE 313 Introduction to Deformable Solids	3
ECE 340 Thermodynamics	3
ECE 350 Structure and Properties of Materials	3
ECE 386 Partial Differential Equations for Engineers	2
Total	18

¹ See pages 42-55 for specific requirements and approved list.

² Engineering Science majors substitute MAT 342 (3).

Aerospace Engineering—B.S.E.

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 efficiency transport aircraft, the development of the next generation of space trans-

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

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

Aerospace Engineering Major

Aerospace Engineering students are required to select the following courses in the engineering core:

	<i>Semester Hours</i>
ECE 333 Electrical Instrumentation	3
or Microcomputer/Microprocessor Elective (3)	
ECE 386 Partial Differential Equations for Engineers	2
MAT 242 Elementary Linear Algebra	2
PHY 361 Introductory Modern Physics	3

The Aerospace Engineering major consists of:

	<i>Semester Hours</i>
MAE 317 Dynamic Systems and Control	3
MAE 361 Aerodynamics I	3
MAE 413 Spacecraft Dynamics and Control	3
MAE 416 Aerospace Vibrations	4
MAE 425 Aerospace Structures I	3
MAE 426 Aerospace Structures II	4
MAE 441 Design Theory and Techniques	3
MAE 460 Gas Dynamics	3
MAE 461 Aerodynamics II	3
MAE 462 Dynamics of Flight	3
MAE 463 Propulsion	3
MAE 464 Aerospace Laboratory	2
MAE 467 Aircraft Performance	3
MAE 468 Aerospace Systems Design	3
Area of Emphasis (Technical) Electives	8 or 9
Total	51 or 52

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 382, 402, 466, 471, 489, 492.

Aerospace materials. MSE 420, 440, 441, 470.
Aerospace structures. MAE 404, 410, 492; MSE 447.
Design. MAE 403, 404, 406, 435, 492; MSE 470.
Propulsion. MAE 382, 436, 465, 489, 492.
Stability and control. MAE 341, 417, 447, 492.

**Aerospace Engineering
 Program of Study
 Typical Last Two-Year Sequence
 Junior Year**

First Semester		<i>Semester Hours</i>
ECE 333	Electrical Instrumentation	3
	or Microcomputer/Microprocessor Elective (3)	
MAE 317	Dynamic Systems and Control	3
MAE 361	Aerodynamics I	3
MAE 413	Spacecraft Dynamics and Control	3
MAE 425	Aerospace Structures I	3
PHY 361	Introductory Modern Physics	3
Total		18

Second Semester		
MAE 426	Aerospace Structures II	4
MAE 441	Design Theory and Techniques	3
MAE 460	Gas Dynamics	3
MAE 462	Dynamics of Flight	3
	General Studies Elective (HU or SB) ¹	3
Total		16

Senior Year

First Semester		
MAE 416	Aerospace Vibrations	4
MAE 461	Aerodynamics II	3
MAE 463	Propulsion	3
MAE 467	Aircraft Performance	3
	General Studies Elective (HU or SB) ¹	3
Total		16

Second Semester		
ECE 400	Engineering Communications	3
MAE 464	Aerospace Laboratory	2
MAE 468	Aerospace Systems Design	3
	Technical Electives	9
Total		17

¹ See pages 42-45 and 48-55 for requirements and approved list.

Energy Systems Engineering—B.S.E.

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 made 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 mechanics, thermodynamics, heat transfer, design and controls with student-selected courses in the following areas of emphasis: alternative energy sources and conversion (including solar energy); conventional sources and conversion; electrical power and distribution; environmental aspects; 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

Energy Systems students are required to select the following in the engineering core:

	<i>Semester Hours</i>	
ECE 333	Electrical Instrumentation	3
ECE 384	Numerical Analysis for Engineers I ...	2
ECE 386	Partial Differential Equations for Engineers	2
PHY 361	Introductory Modern Physics	3
	Microcomputer/Microprocessor Elective	3

The Energy Systems Engineering major consists of:

	<i>Semester Hours</i>	
EEE 360	Energy Conversion and Transport	3
MAE 317	Dynamic Systems and Control	3
MAE 318	Dynamic Systems and Control Laboratory	1
MAE 371	Fluid Mechanics	3
MAE 372	Fluid Mechanics	4
MAE 382	Thermodynamics	3
MAE 422	Mechanics of Materials	4
MAE 430	Introduction to Nuclear Engineering ..	3
MAE 441	Design Theory and Techniques	3
MAE 488	Heat Transfer	3
MAE 491	Experimental Mechanical Engineering	3
MAE 492	Projects in Design and Development	2
	or MAE 443 Engineering Design (3)	
MAE 498	PS: Energy Systems Engineering	3
	Area of Emphasis (Technical) Electives	9-11
Total		47-49

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; GLG 301; IEE 300; MAE 336, 436, 437, 438, 446.

Conventional sources and conversion. IEE 300; MAE 415, 417, 422, 435, 436, 446.

Electrical power and distribution. EEE 302, 470, 471, 473; IEE 300; MAE 415, 417, 422, 435, 437, 442.

Environmental. BIO 320, 330; CEE 361, 362, EEE 461; GLG 302; IEE 300; MAE 336, 417.

Nuclear. EEE 461; GLG 321; IEE 300; MAE 415, 417, 422, 431, 433, 435, 437, 442.

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

First Semester	<i>Semester Hours</i>
ECE 333 Electrical Instrumentation	3
or ECE 334 Electronic Devices and Instrumentation (4)	
MAE 371 Fluid Mechanics	3
MAE 382 Thermodynamics	3
MAE 422 Mechanics of Materials	4
PHY 361 Modern Physics	3
Total	16

Second Semester	
EEE 360 Energy Conversion and Transport	3
MAE 372 Fluid Mechanics	4
MAE 430 Introduction to Nuclear Engineering	3
MAE 488 Heat Transfer	3
MAE 317 Dynamic Systems and Control	3
MAE 318 Dynamic Systems and Control Laboratory	1
Total	17

Senior Year

First Semester	
MAE 441 Design Theory and Techniques	3
MAE 491 Experimental Mechanical Engineering	3
Microcomputer Elective	3
Technical Electives	6
General Studies Elective (HU or SB) ¹	3
Total	18

Second Semester

ECE 400 Engineering Communications	3
MAE 492 Projects in Design and Development ..2 or MAE 443 Engineering Design (3)	
MAE 498 PS: Energy Systems Engineering	3
Technical Electives	5
General Studies Elective (HU or SB) ¹	3
Total	16

¹ See pages 42-45 and 48-55 for requirements and approved list.

Engineering Science—B.S.E.

The Engineering Science curriculum is intended for individuals who are interested in pursuing a more basic and theoretical education than is provided by typical curricula in aerospace, civil or mechanical engineering. This curriculum is particularly suited for individuals whose goals are an increased depth of understanding in the fundamentals of mechanics and the pursuit of an advanced engineering degree, with the ultimate career goal of an academic or research position. Thus, it is strongly recommended that a GPA of at least 3.00 be maintained by all Engineering Science majors. Students who include courses beyond the B.S.E. requirements during their senior year, may apply 6 semester hours of approved courses toward a master's degree program in Engineering Science or Mechanical Engineering.

The Engineering Science program is based on increased course work in mathematics and the broad field of engineering science, the latter of which includes three interrelated areas: dynamics, fluid mechanics and solid mechanics. Each of these areas is related to a variety of important and challenging technological problems. Examples include vibration control in space vehicles at launch, optimal design of composite structures, crystal growing in a microgravity environment, fluid transition to turbulence on swept wings and computer-aided modeling of structures ranging from surgical implants to space satellites. The fundamental emphasis of the Engineering Science program provides the flexibility and understanding which is required to cope with rapidly occurring changes in technology and the needs of society.

Engineering Science Major

Engineering Science students are required to select the following in the engineering core:

	<i>Semester Hours</i>
ECE 333 Electrical Instrumentation	3
or ECE 334 Electronic Devices and Instrumentation	
ECE 384 Numerical Analysis for Engineers I ...	3
ECE 386 Partial Differential Equations for Engineers	2
PHY 361 Introductory Modern Physics	3
Microcomputer/Microprocessor Elective	3

The Engineering Science major consists of:

	<i>Semester Hours</i>
MAE 371 Fluid Mechanics	3
MAE 372 Fluid Mechanics	4
MAE 402 Introduction to Continuum Mechanics	3
MAE 404 Finite Elements in Engineering	3
MAE 413 Spacecraft Dynamics and Control	3
MAE 415 Vibration Analysis	4
MAE 422 Mechanics of Materials	4
or MAE 425 Aerospace Structures I (3)	
MAE 441 Design Theory and Techniques	3
MAE 488 Heat Transfer	3
MAE 492 Projects in Design and Development	2
MAT 342 Linear Algebra	3
MAT 371 Advanced Calculus I	3
or MAT 460 Applied Real Analysis (3)	
MSE 440 Mechanical Properties of Solids	3
Area of Emphasis (Technical) Electives	6-8
Total	47-49

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 (undergraduates must obtain instructor and department approval before enrolling in 500-level courses).

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

Dynamics. MAE 317, 318, 410, 417, 462, 506, 513, 515.

Engineering mathematics. ASE 483, 485, 582, 586; ECE 383, 385; MAT 371, 460, 461, 462.

Fluid mechanics. MAE 410, 435, 460, 463, 471, 571.

Solid mechanics. MAE 461, 520, 522, 523, 524, 526, 529.

Engineering Science Program of Study

Typical Last Two-Year Sequence

Junior Year

First Semester		<i>Semester Hours</i>
ECE 333 Electrical Instrumentation		3
or ECE 334 Electronic Devices and Instrumentation (4)		
MAE 371 Fluid Mechanics		3
MAT 371 Advanced Calculus I		3
or MAT 460 Applied Real Analysis (3)		
MSE 440 Mechanical Properties of Solids		3
PHY 361 Introductory Modern Physics		3
General Studies Elective (HU or SB) ¹		3
Total		18

Second Semester

ECE 384 Numerical Analysis for Engineers I ...	2
MAE 372 Fluid Mechanics	4
MAE 404 Finite Elements in Engineering	3
MAE 413 Spacecraft Dynamics and Control	3
MAE 422 Mechanics of Materials	4
Total	16

Senior Year

First Semester

MAE 402 Introduction to Continuum Mechanics	3
MAE 415 Vibration Analysis	4
MAE 441 Design Theory and Techniques	3
MAE 488 Heat Transfer	3
Microcomputer Elective	3
Total	16

Second Semester

ECE 400 Engineering Communications	3
MAE 492 Projects in Design and Development	2
General Studies Elective (HU or SB) ¹	3
Technical Electives	8
Total	16

¹ See pages 42-45 and 48-55 for requirements and approved list.

Mechanical Engineering—B.S.E.

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

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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 integrity and materials selection of almost every product on the market.

Mechanical engineers are employed in virtually every kind of industry. They are involved with seeking new knowledge through research, with doing creative design and development, and with the construction, control, management and sales of the devices and systems needed by man. Therefore, a major strength of a mechanical engineering education is the flexibility it provides in future employment opportunities for its graduates.

The undergraduate curriculum includes the study of principles governing the use of energy; principles of design, instruments and control devices; and the application of these studies to the creative solution of practical, modern problems.

Mechanical Engineering Major

Mechanical Engineering students are required to select the following in the engineering core:

	<i>Semester Hours</i>
MAT 242 Linear Algebra	2
ECE 333 Electrical Instrumentation	3
ECE 386 Partial Differential Equations for Engineers	2
PHY 361 Introductory Modern Physics	3
Microcomputer/Microprocessor Elective	3

The Mechanical Engineering major consists of:

	<i>Semester Hours</i>
ECE 384 Numerical Analysis for Engineers I ...	2
MAE 317 Dynamic Systems and Control	3
MAE 318 Dynamic Systems and Control Laboratory	1
MAE 371 Fluid Mechanics	3
MAE 372 Fluid Mechanics	4
MAE 382 Thermodynamics	3
MAE 415 Vibration Analysis	4
MAE 422 Mechanics of Materials	4
MAE 441 Design Theory and Techniques	3
MAE 442 Mechanical Systems Design	3
or MAE 446 Thermal System Design (3)	3
MAE 443 Engineering Design	3
MAE 488 Heat Transfer	3
MAE 491 Experimental Mechanical Engineering	3
MAE 492 Projects in Design and Development	2
Area of Emphasis (Technical) Electives	7-8
Total	48-49

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, 460, 461, 462, 463, 466, 467, 471, 489.

Biomechanical. BME 411, 412, 517 (recommended); EEE 302, 434; MAE 526.

Computer methods. ASE 483, 485; CSC 310, 320, 422, 428; ECE 383; IEE 463, 464, 475; MAE 403, 404, 405, 406, 471, 541; MAT 464, 465.

Control and dynamic systems. CSC 320; ECE 383; EEE 360; IEE 463; MAE 413, 416, 417, 462.

Design. MAE 333, 341, 351, 403, 404, 406, 417, 433, 434, 435, 438, 442, 446, 447.

Engineering mechanics. MAT 464, 466; MAE 341, 402, 404, 410, 413, 416, 426, 442, 460, 461, 471.

Manufacturing. IBE 300, 374, 411, 461, 463; MAE 341, 351, 403, 404, 442, 447; MSE 355, 420, 431, 440.

Stress analysis, failure prevention and materials. ECE 383; MAE 341, 404, 426, 447; MSE 355, 420, 431, 440, 450.

Thermosciences. MAE 336, 430, 434, 435, 436, 437, 446, 460, 471.

Mechanical Engineering

Program of Study

Typical Last Two-Year Sequence

Junior Year

	<i>Semester Hours</i>
First Semester	
ECE 333 Electrical Instrumentation	3
ECE 384 Numerical Analysis for Engineers I ...	2
MAE 371 Fluid Mechanics	3
MAE 382 Thermodynamics	3
MAE 422 Mechanics of Materials	4
PHY 361 Introductory Modern Physics	3
Total	18
Second Semester	
MAE 317 Dynamic Systems and Control	3
MAE 318 Dynamic Systems and Control Laboratory	1
MAE 372 Fluid Mechanics	4
MAE 441 Design Theory and Techniques	3
MAE 488 Heat Transfer	3
Microcomputer Elective	3
Total	17

Senior Year

First Semester

MAE 415	Vibration Analysis	4
MAE 442	Mechanical Systems Design	3
	or 446 Thermal System Design (3)	
MAE 491	Experimental Mechanical Engineering	3
	Technical Electives	4
	General Studies Elective (HU or SB) ¹	3

Total 17

Second Semester

ECE 400	Engineering Communications	3
MAE 443	Engineering Design	3
MAE 492	Projects in Design and Development	2
	Technical Electives	4
	General Studies Elective (HU or SB) ¹	3

Total 15

¹ See pages 42-45 and 48-55 for requirements and approved list.

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MAE 317 Dynamic Systems and Control. (3) F, S
Modeling and representations of dynamic physical systems: transfer functions, block diagrams, state equations. Transient response. Principles of feedback control and linear system analysis including root locus and frequency response. Prerequisites: ECE 301, 312. Corequisite (mechanical engineering majors only): MAE 318.

318 Dynamic Systems and Control Laboratory. (1) F, S
Corequisite: MAE 317 or instructor approval.

336 Air Conditioning and Refrigeration. (3) F
Refrigeration cycles, refrigerant properties, heating, cooling loads; psychrometry, purification; temperature and humidity control. Prerequisite: MET 381 or MAE 382 or instructor approval.

341 Mechanism Analysis and Design. (3) F
Positions, velocities and accelerations of machine parts; cams, gears, flexible connectors, rolling contact; introduction to synthesis. Prerequisite: ECE 312.

351 Manufacturing Processes Survey. (3) F, S
Survey of processes and equipment for casting, forming, machining, joining and assembly. Process selection, manufacturability and economics. System and process automation. Prerequisite: ECE 350.

361 Aerodynamics I. (3) F, S
Fluid statics, conservation principles, stream function, velocity potential, vorticity, inviscid flow, Kutta-Joukowski, thin-airfoil theory, panel methods. Prerequisites: ECE 312, 340.

371 Fluid Mechanics. (3) F, S
Introductory concepts of fluid motions; fluid statics; control volume forms of basic principles; introduction to local principles. Prerequisites: ECE 312, 340.

372 Fluid Mechanics. (4) F, S
Application of basic principles of fluid mechanics to problems in viscous and compressible flow. Lab experimentation, demonstrations. Prerequisites: ECE 384, 386; MAE 371.

382 Thermodynamics. (3) F, S
Applied thermodynamics; gas mixtures, power cycles and reactive systems. Lab experimentation, demonstrations. Prerequisite: ECE 340.

402 Introduction to Continuum Mechanics. (3) S
Application of the principles of continuum mechanics to such fields as flow in porous media, biomechanics, electromagnetic continua, magneto-fluid mechanics. Prerequisites: ECE 313; MAE 361 or 371; MAT 242.

403 CAD Systems Development. (3) S
Design and implementation of CAD System, user interface design, computer graphics, data structures, extensive code development. Prerequisites: ECE 105 or equivalent; CSC 220 or EEE 221, junior standing in program.

404 Finite Elements in Engineering. (3) S
Introduction to ideas and methodology of finite element analysis. Applications to solid mechanics, heat transfer, fluid mechanics, vibrations. Prerequisites: ECE 313; MAT 242.

405 Microcomputer-Aided Processes for MAE. (3) F, S
Microcomputer and microprocessor fundamentals. Overview of programming languages, input/output, interfacing and analog/digital conversion, data acquisition, control, applications. Prerequisite: CSC 100 or ECE 106. [Satisfies General Studies Requirement: N3]

406 CAD/CAM Applications in Mechanical Engineering. (3) F
Solution of engineering problems with the aid of state-of-the-art software tools in solid modeling, engineering analysis and manufacturing; selection of modeling parameters; reliability tests on software.

410 Acoustics and Noise Control. (2) S
Acoustic analysis and design. Acoustic fatigue of aerospace structures. Aircraft, traffic and industrial noise control. Environmental noise standards. Architectural acoustics. Prerequisite: PHY 131.

413 Spacecraft Dynamics and Control. (3) F, S
Kinematics of particles and rigid bodies, Euler's moment equations, satellite orbits and maneuvers, spacecraft attitude dynamics and control. Prerequisite: ECE 312.

415 Vibration Analysis. (4) F, S
Free vibration and forced response of single and multiple degree of freedom systems, normal modes, random vibrations. Lecture, lab. Prerequisite: ECE 312; MAE 422.

416 Aerospace Vibrations. (4) F, S
Finite degree of freedom systems; self excited systems; one-dimensional continuous system vibrations; two-dimensional flutter theory; flutter analyses using normal modes. Prerequisites: MAE 361, 425; MAT 242.

417 Control System Design. (3) S
Tools and methods of control system design and compensation: simulation, response optimization, frequency domain techniques, state variable feedback, sensitivity analysis. Introduction to nonlinear and discrete time systems. Prerequisite: MAE 317.

422 Mechanics of Materials. (4) F, S
Failure theories, energy methods, finite element methods, plates, torsion of non-circular members, unsymmetrical bending, shear center, beam column. Lecture, recitation, lab. Prerequisites: ECE 313; MAT 242.

425 Aerospace Structures I. (3) F, S
Stability, loads, energy methods, torsion, curved bars, finite elements, plates, shells of revolution. Prerequisites: ECE 313; MAT 242.

426 Aerospace Structures II. (4) F, S
Joints and connections, torsion, stability, unsymmetrical bending, shear lag, stringer-skin analyses, multi-cell construction, finite element applications, composite materials. Lecture, lab. Prerequisite: MAE 425.

430 Introduction to Nuclear Engineering. (3) F
Neutron interactions with matter. Principles of neutron chain reacting systems. Neutron diffusion and moderation. Heat removal from nuclear reactors. Point reactor kinetics. Cross-listed as EEE 460 and NUC 460. Prerequisite: PHY 361.

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431 Nuclear Reactor Theory I. (3) N

Neutron transport theory, diffusion theory, applications. Reactor kinetics, applications. Reactivity, interdependence between neutronics and thermal-hydraulics. Prerequisite: MAE 430.

433 Nuclear Plant Systems Design. (3) F

Relevant thermodynamic cycles. Conceptual design of commercial fission-reactor systems (light water reactors, gas-cooled reactors, fast breeder reactors) and fusion-reactor systems. Emphasis on thermal-hydraulic aspects. Prerequisites: ECE 340; MAE 430.

434 Internal Combustion Engines. (3) S

Performance characteristics, combustion, carburetion and fuel-injection, cooling and control of internal combustion engines. Computer modeling. Lab demonstrations. Prerequisite: MAE 382.

435 Turbomachinery. (3) S

Design and performance of turbomachines including steam, gas and hydraulic turbines, centrifugal pumps, compressors, fans and blowers. Corequisites: MAE 372, 382.

436 Combustion. (3) N

Thermodynamics and chemical kinetics of combustion. Structure, propagation and stability of flames. Ignition theories; droplet and solid particle combustion. Pollutant formation. Prerequisite: MAE 382.

437 Direct Energy Conversion. (3) F

Unconventional methods of energy conversion; fuel cells, thermoelectrics, thermionics, photovoltaics and magnetohydrodynamics. Prerequisites: ECE 340, 350.

438 Solar Energy. (3) S

Solar radiation and instrumentation, design and testing of collectors, performance analyses of systems, thermal storage, photovoltaics, materials and economic analysis. Prerequisites: MAE 382, 488.

441 Design Theory and Techniques. (3) F, S

The design process: problem definition, conceptual design, form and function, decision-making, material selection, manufacturability, modes of failure, fatigue, professionalism and ethics. Prerequisites: ECE 106, 350; MAE 422 or 425.

442 Mechanical Systems Design. (3) F, S

Application of engineering principles and techniques to the modeling and analysis of mechanical systems and components. Optimization techniques presented and use demonstrated. Prerequisite: MAE 441.

443 Engineering Design. (3) F, S

Group projects to design engineering components and systems. Problem definition ideation, modeling and analysis, decision making and documentation activities emphasized. 6 hours lab. Prerequisite: MAE 442 or 446.

446 Thermal Systems Design. (3) F

Application of engineering principles and techniques to the modeling and analysis of thermal systems and components. Optimization techniques are presented and their use demonstrated. Prerequisite: MAE 441.

447 Robotics and Its Influence on Design. (3) S

Robot applications, configurations, singular positions and work space; modes of control; vision; programming exercises; design of parts for assembly. Prerequisite: MAE 317.

460 Gas Dynamics. (3) F, S

Compressible flow at subsonic and supersonic speeds; duct flow; normal and oblique shocks, perturbation theory, wind tunnel design. Prerequisite: MAE 361 or 371.

461 Aerodynamics II. (3) F, S

Transonic/hypersonic flows, wing theory, Navier-Stokes, laminar/turbulent shear flows, pressure drop in tubes, separation, drag, viscous/inviscid interaction, wing design. Prerequisite: MAE 460.

462 Dynamics of Flight. (3) F, S

Aerodynamic forces and moments, static stability and control, equations of motion, stability derivatives, lateral and longitudinal motion and control. Prerequisite: MAE 413.

463 Propulsion. (3) F, S

Application of gas dynamics and thermodynamics to air breathing engines and rockets; emphasis on turbojet, turbofan and turboprop engines. Corequisite: MAE 460.

464 Aerospace Laboratory. (2) F, S

Measurements of aerodynamic parameters in both subsonic and supersonic flows; flow over airfoils, wedges and cones. Gas turbine engine performance. Solid rocket, heat pipe, radiation. Lecture, lab. Prerequisite: MAE 460. Corequisite: MAE 461.

465 Rocket Propulsion. (3) S

Rocket flight performance; nozzle design; combustion of liquid and solid propellants; component design; advanced propulsion systems; interplanetary missions; testing. Prerequisite: MAE 460.

466 Rotary Wing Aerodynamics and Performance. (3) S

Introduction to helicopter and propeller analysis techniques. Momentum, blade-element, vortex methods. Hover and forward flight. Ground effect, autorotation, compressibility effects. Prerequisites: ECE 386; MAE 361 or instructor approval.

467 Aircraft Performance. (3) F, S

Technical aspects of flight, integrating aerodynamic principles relating to lift, drag and thrust with power operating characteristics; performance of an airplane analyzed as a system. Prerequisite: MAE 361. Corequisites: MAE 441, 463.

468 Aerospace Systems Design. (3) F, S

Group projects related to aerospace vehicle design, working from mission definition and continuing through preliminary design; decision making and communication activities emphasized. Prerequisites: MAE 426, 441, 467.

471 Computational Fluid Mechanics. (3) F

Numerical solutions for selected problems in fluid mechanics. Prerequisite: MAE 372.

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. Lab experimentation, demonstrations. Prerequisite: MAE 371.

489 Thermophysics. (3) F

Basic principles of heat transfer and their application to propulsion devices, thermal control, heat rejection and cryogenic 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. 1 hour lecture, 3 hours lab. Prerequisites: ECE 334; MAE 382. Corequisite: MAE 488.

492 Projects in Design and Development. (2) F, S

Capstone projects in fundamental or applied aspects of engineering. Prerequisites: mechanical engineering and energy systems majors: MAE 441, 491; engineering science majors: MAE 422.

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: instructor approval.

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 instructor approval.

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.

508 Digital Control. (3) S

Introduction to discrete-time systems difference equations, Z-transforms and digital filters. Hybrid analog/digital systems modeling. Control design methods. Lectures, demonstrations, lab. Prerequisite: MAE 317.

510 Dynamics and Vibrations. (3) F

Lagrange's and Hamilton's equations, rigid body dynamics, gyroscopic motion, small oscillation theory, modal analysis.

511 Acoustics. (3) F

Principles underlying the generation, transmission and reception of acoustic waves. Applications to noise control, architectural acoustics, random vibrations, acoustic fatigue.

512 Random Vibrations. (3) S

Review of probability theory, random processes, stationarity, power spectrum, white noise process, random response of single and multiple dof systems, Markov processes simulation. Prerequisites: MAE 510 or instructor approval.

515 Structural Dynamics. (3) S

Free vibration and forced response of discrete and continuous systems, exact and approximate methods of solution, finite element modeling, computational techniques.. Prerequisite: MAE 510 or instructor approval.

517 Nonlinear Oscillations. (3) F

Phase plane, singular points and limit cycles, bifurcation theory, approximate analysis methods, stability analysis, Liapunov's theorem. Prerequisite: MAE 510 or instructor approval.

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 Solid Mechanics. (3) F

Introduction to tensors: kinematics, kinetics and constitutive assumptions leading to elastic, plastic and visco elastic behavior. Applications.

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. Prerequisite: MAE 520 or equivalent.

523 Theory of Plates and Shells. (3) F

Linear and non-linear theories of plates. Membrane and bending theories of shells. Shells of revolution. Prerequisite: MAE 520 or equivalent.

524 Theory of Elasticity. (3) S

Formulation and solution of two and three dimensional boundary value problems. Prerequisite: MAE 520 or equivalent.

526 Biomechanics. (3) S

Mechanics of the human body. Mechanical and physical properties of tissues. Application to fields of interest including joint replacement and 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.

529 Theory of Elastic Stability. (3) S

Stability of discrete and continuous mechanical systems. Dynamic instability. Prerequisite: MAE 523 or equivalent.

534 Reactor Design. (3) N

Heterogeneous reactor systems, perturbation theory, fuel burn-up. Introduction to transport theory. Kinetics, controls and feedback methodology. Prerequisite: MAE 532.

536 Combustion. (3) N

Kinetic theory and chemical kinetics of combustion. Explosion and ignition theories. Reactive gas dynamics; detonations. Structure, propagation and stability of flames. Combustion of condensed-phase fuels. Experimental methods. Prerequisite: MAE 436 or instructor approval.

541 CAD Tools for Engineers. (3) F

Elements of computer techniques required to develop CAD software. Data structures including lists, trees and graphs. Computer graphics including 2-D and 3-D algorithms and user interface techniques.

542 Geometric Modeling in CAD/CAM. (3) S

Geometric and solid modeling, curve and surface design, CAD database architectures, integration of solid modeling into engineering processes. Prerequisite: MAE 541.

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.

546 CAD/CAM Applications in Mechanical Engineering.

(3) F

Solution of engineering problems with the aid of state-of-the-art software tools in solid modeling, engineering analysis and manufacturing; selection of modeling parameters; reliability tests on software. Open only to students without previous credit for MAE 406.

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.

557 Mechanics of Composite Materials. (3) S

Analysis of composite materials and applications. Micromechanical and macromechanical behavior. Classical lamination theory developed with investigation of bending – extension coupling.

560 Propulsion Systems. (3) N

Principles of gas dynamics with application to propulsion-system components. Air-breathing and chemical rocket engines.

561 Computational Aerodynamics. (3) S

Finite-difference and finite-volume techniques for solving the subsonic, transonic and supersonic flow equations. The method of characteristics. Numerical grid generation techniques. Prerequisite: MAE 571 or instructor approval.

562 Transonic Flow. (3) F

Transonic flow, nonlinear small disturbance equations, mixed flow with shock waves. Analytical and numerical treatments for airfoils. Applications to wings, bodies and turbomachinery. Prerequisite: MAE 460 or 461.

563 Unsteady Aerodynamics. (3) S

Unsteady incompressible and compressible flow. Wings and bodies in oscillatory and transient motions. Kernel function approach and panel methods. Aeroelastic applications. Prerequisites: MAE 460 or 461, 562.

564 Advanced Aerodynamics. (3) F

Perturbation method. Linearized subsonic and supersonic flows. Thin wing/slender body theories. Lifting surface theory. Panel method computation. Prerequisite: MAE 460 or 461.

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 basic fluid models.

572 Inviscid Fluid Flow. (3) S

Mechanics of fluids for flows in which the effects of viscosity may be ignored. Potential flow theory, waves, inviscid compressible flows. Prerequisite: MAE 571.

573 Viscous Fluid Flow. (3) F

Mechanics of fluids for flows in which the effects of viscosity are significant. Exact and approximate solutions of the Navier-Stokes system, laminar flow at low and high Reynolds number. Prerequisite: MAE 571.

574 Viscous, Compressible Fluid Flow. (3) N

Mechanics of fluids for flows in which the effects of compressibility and viscosity are significant. Compressible boundary layers, free shear layers, shock waves, internal flows. Prerequisite: MAE 572.

575 Turbulent Shear Flows. (3) F

Homogeneous and isotropic turbulence, wall turbulence. Experimental results. Introduction to turbulent-flow calculations. Prerequisite: MAE 571.

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) N

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.

584 Heat Transfer. (3) F

Basic concepts; physical and mathematical models for heat transfer. Applications to conductive, convective, radiative and combined mode heat transfer. Prerequisite: MAE 488 or equivalent.

585 Conduction Heat Transfer. (3) F

Basic equations and concepts of conduction heat transfer. Mathematical formulation and solution (analytical and numerical) of steady and unsteady, one and multi-dimensional heat conduction problems. Prerequisites: ECE 386; MAE 488.

586 Convection Heat Transfer. (3) S

Basic concepts and governing equations. Analysis of laminar and turbulent heat transfer for internal and external flows. Natural and mixed convection. Prerequisite: MAE 488.

587 Radiation Heat Transfer. (3) F

Advanced concepts and solution methodologies for radiation heat transfer, including exchange of thermal radiation between surfaces, radiation in absorbing, emitting and scattering media and radiation combined with conduction and convection. Prerequisite: MAE 488.

588 Two-Phase Flows and Boiling Heat Transfer. (3) S

Pool and flow boiling heat transfer, condensation heat transfer, various models of vapor-liquid mixture flows, gas-solid mixture flows, experimental measurement techniques.

594 Graduate Research Conference. (1) F, S

Topics in contemporary research. Required every semester of all departmental 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) CAD/CAM Tools
- (f) Aeroelasticity

Special Courses: MAE 484, 494, 498, 499, 500, 590, 591, 592, 598, 599, 790, 792, 799. (See pages 36-37.)

Programs in Engineering Special and Interdisciplinary Studies

C.E. Wallace, Ph.D., Director

The following degree programs are administered by the Dean's Office of the College of Engineering and Applied Sciences:

- B.S.E. Bioengineering
- B.S.E. Engineering Special Studies
 - Manufacturing Engineering (see page 313)
 - Microelectronics Manufacturing Engineering (see page 331)
 - Nuclear Sciences (see page 331)
 - Systems Engineering (see page 332)
- B.S. Engineering Interdisciplinary Studies
 - Engineering Business & Prelaw (see page 333)
 - Geological Engineering (see page 333)
 - Premedical Engineering (see page 334)

Descriptions of these programs and options, with their respective program requirements, can be found on the pages indicated.

Bioengineering—B.S.E.

FACULTY:

CHEN, DORSON, GUILBEAU, KEARFOTT,
TOWE, WINTERS

Bioengineering is a separate major under the School of Engineering and is administered by the same office as the special and interdisciplinary engineering studies.

Bioengineering (synonyms: biomedical engineering, medical engineering) is that discipline of engineering that applies principles and methods from engineering, the physical sciences, the life sciences and the medical sciences to understand, define and solve problems in medicine, physiology and biology. Bioengineering bridges the engineering, physical, life and medical sciences. More specifically, the Bioengineering program at ASU educates engineering students to use engineering principles and technology to develop instrumentation, materials, diagnostic and therapeutic devices, artificial organs and other equipment needed in medicine and biology, and to discover new fundamental principles regarding the functioning and structure of living systems. The multidisciplinary approach to solving problems in medicine and biology has evolved from exchanges of information between specialists in the concerned areas.

Because a depth of knowledge from at least two diverse disciplines is required in the practice of bioengineering, students desiring a career in bioengineering should plan for advanced study beyond the bachelor's degree. The Bioengineering major at ASU is especially designed for students desiring advanced study in bioengineering in graduate programs, a career in the medical device industry, a career in biomedical research, a career in biotechnology research or entry into a medical college.

Academic Requirements

In addition to the General Studies requirement, CHM 116 Chemistry and BIO 181 General Biology (basic science elective) must be selected in the engineering core. Other engineering core requirements are outlined in the area of emphasis descriptions. The following courses are required in the undergraduate Bioengineering major which have been selected to meet all university requirements and ABET accreditation requirements:

	<i>Semester Hours</i>
BIO 182 General Biology	4
BME 331 Transport Phenomena I: Fluids	3
BME 334 Heat and Mass Transfer	3
BME 411 Biomedical Engineering I	3

BME 412 Biomedical Engineering II	3
or CHM 331 General Organic Chemistry (3)	
BME 413 Physiological Instrumentation	3
BME 417 Biomedical Engineering Design	3
BME 418 Biomaterials	3
BME/AGB 435 Animal Physiology I	4
BME 492 Biomedical Engineering Projects	2
BME 496 Professional Seminar	0
CHM 113 General Chemistry	4
Technical Electives	16
Total	51

Areas of Emphasis

Students interested in a career in bioengineering may elect to emphasize either biochemical, bioelectrical, biomechanical, bionuclear, biosystems or premedical engineering. Although organic chemistry and biochemistry are not required in the bioelectrical, biomechanical, bionuclear and biosystems engineering areas of emphasis, students selecting these areas are encouraged to include organic and biochemistry in their advanced degree programs of study.

Biochemical engineering: Designed to strengthen the student's knowledge of chemistry and transport phenomena and is particularly well suited for students interested in biotechnology. The following courses are required in the engineering core: ECE 333, 340, 350 and CHE 461. Technical electives must include: CHM 331, 332, 361 (or 461 or 462). ECE 312 is not required in the engineering core. The remaining technical electives must be upper-division engineering courses of suitable engineering science and design content.

Bioelectrical engineering: Designed to strengthen the student's knowledge of electrical systems, signal processing and medical imaging. It emphasizes bioelectric phenomena, medical instrumentation, non-invasive imaging and electrophysiology. The following courses are required in the engineering core: ECE 333, 340, 352 and EEE 221. ECE 312 is not required in the engineering core. Technical electives must include: BME 414; ECE 334; EEE 302 and 303. Remaining technical electives will be selected from BME 412, 419, 420 or any 400-level EEE course with acceptable engineering science and design content.

Biomechanical engineering: Designed to strengthen the student's knowledge of mechanics, materials science, control theory and mechanical design. It emphasizes the design of orthopedic load bearing joint replacement devices, orthotic devices and other mechanical devices important in the practice of medicine. It also provides the fundamentals for the study of neuro-muscular control and the study of human motion. The following courses are

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required in the engineering core: ECE 340, 350, 384 and MAE 405. ECE 333 (or 334) is not required in the engineering core. Technical electives may be selected from one of the following two groups:

Biomechanics: BME 416; MAE 404 (or MSE 440), 422 and 441.

Biocontrols: BME 416, 419; MAE 317 and 417 (or 447).

Bionuclear engineering: Designed to strengthen the student's knowledge of radiation interactions and shielding, health physics, radiation biology and nuclear instrumentation. It emphasizes radiological imaging, medical physics, nuclear medicine, radiotherapy and radiation protection. The following courses are required in the engineering core: ECE 334, 340, 352 and EEE 221. ECE 312 is not required in the engineering core. Technical electives will include: BME/EEE 461, 465 and PHY 361. Remaining technical electives will be selected from EEE 464 and BME 414 (or any 400-level BME, MAE [nuclear] or EEE courses with acceptable engineering science and design content).

Biosystems engineering: Designed to strengthen the background of students interested in physiological systems analysis and design of artificial organs and medical devices that are based on chemical reactions and include momentum, heat or mass transfer phenomena. Analyzing or designing flowing and reacting systems requires a background in transport phenomena, thermodynamics and reaction engineering. Whether the system involves the microcirculation and physiological events or an artificial organ and extracorporeal circulation, there is a core of bioengineering sciences and design common to both applications. The following courses are required in the engineering core: ECE 313, 333; CHM 441, 442 and 461. Technical electives must include CHE 311, 312, 342; ECE 312 and BME 419.

Premedical engineering: Designed to meet the needs of students desiring entry into a medical or dental school. The course sequence provides an excellent background for advanced study leading to a career in research in the medical or life sciences. The following courses are required in the engineering core: ECE 333, 340, 350. ECE 312 is not required in the engineering core. Technical electives must include CHM 331, 332, 335 and 336. Remaining technical electives must consist of BME prefix courses plus biology or biochemistry courses which must meet engineering science and design content requirements.

Bioengineering Program of Study Typical Four-Year Sequence

First Year

	<i>Semester Hours</i>
First Semester	
BME 496 Professional Seminar	0
CHM 113 General Chemistry	4
ECE 105 Introduction to Languages of Engineering	3
ECN 111 Macroeconomic Principles	3
ENG 101 First-Year Composition	3
MAT 290 Calculus I	5
Total	18

Second Semester

BME 496 Professional Seminar	0
CHM 116 General Chemistry	4
ECE 106 Introduction to Computer-Aided Engineering	3
MAT 291 Calculus II	5
PHY 121 University Physics I	3
PHY 122 University Physics Lab I	1
Total	16

Second Year

First Semester

BIO 181 General Biology	4
BME 496 Professional Seminar	0
ENG 102 First-Year Composition	3
MAT 274 Elementary Differential Equations	3
PHY 131 University Physics II	3
PHY 132 University Physics Lab II	1
General Studies Elective (HU or SB) ¹	3
Total	17

Second Semester

BIO 182 General Biology	4
BME 496 Professional Seminar	0
ECE 210 Engineering Mechanics I: Statics	3
ECE 301 Electrical Networks I	4
Literacy and Critical Inquiry Elective ¹	3
General Studies Elective (HU or SB) ¹	3
Total	17

Third Year

First Semester

BME 331 Transport Phenomena I: Fluids	3
BME 435 Animal Physiology I	4
BME 496 Professional Seminar	0
ECE 312 Engineering Mechanics II: Dynamics	3
or Technical Elective ²	
ECE 313 Introduction to Deformable Solids	3
ECE 340 Thermodynamics	3
or CHM 441 General Physical Chemistry (3)	
ECE 384 Numerical Analysis for Engineers I ... or ECE 386 Partial Differential Equations for Engineers (2) or MAT 242 Elementary Linear Algebra (2)	3
Total	18

Second Semester

BME 334	Heat and Mass Transfer	3
BME 413	Physiological Instrumentation	3
BME 496	Professional Seminar	0
ECE 333	Electrical Instrumentation	3
	or ECE 334 Electronic Devices (4) or Technical Elective ³	
ECE 350	Structure and Properties of Materials	3
	or ECE 351 Engineering Materials (3) or ECE 352 Semiconductors and Devices (3) or CHM 442 General Physical Chemistry (3)	
	Technical Elective	3
	General Studies Elective (HU or SB) ¹	3
	Total	18

Fourth Year

First Semester

BME 411	Biomedical Engineering I	3
BME 418	Biomaterials	3
BME 492	Biomedical Engineering Project	2
BME 496	Professional Seminar	0
MAE 405	Microcomputer-Aided Processes for Mechanical Engineers	3
	or CHE 461 Process Control (3) or CSC 220 Computer Organization and Assembly Language Programming (4) or EEE 221 Digital Computer Fundamentals (4) or IEE 463 Computer-Aided Manufacturing and Control (3)	
	Technical Electives	6
	Total	17

Second Semester

BME 412	Biomedical Engineering II	3
	or CHM 331 General Organic Chemistry (3)	
BME 417	Biomedical Engineering Design	3
BME 496	Professional Seminar	0
ECE 383	Probability and Statistics	2
ECE 400	Engineering Communications	3
	General Studies Elective (HU or SB) ¹	3
	Technical Elective	4
	Total	18

Graduation requirements: 133 semester hours plus English proficiency.

- ¹ See pages 42-55 for requirements and approved list of courses.
- ² Except biosystems and biomechanics areas of emphasis.
- ³ For biomechanics area of emphasis only.

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BME 331 Transport Phenomena I: Fluids. (3) F, S
Transport phenomena with emphasis on fluid systems. Cross-listed as CHE 331. Prerequisites: MAT 274; PHY 131.

334 Heat and Mass Transfer. (3) A
Application of the principles of heat and mass transfer phenomena to solution of problems in medicine and medical device design. Cross-listed as CHE 334. Prerequisites: MAT 274; PHY 131.

411 Biomedical Engineering I. (3) F
Review of diagnostic and prosthetic methods using engineering methodology. Introduction to transport, metabolic and autoregulatory processes in the human body. Cross-listed as CHE 411. Prerequisite: instructor approval.

412 Biomedical Engineering II. (3) S
Review of electrophysiology and nerve pacing applications, introduction to biomechanics and joint/limb replacement technology, cardiovascular and pulmonary fluid mechanics, application of mathematical modeling. Cross-listed as CHE 412. Prerequisite: instructor approval.

413 Physiological Instrumentation. (3) S
Problems, concepts and techniques of biomedical instrumentation in static and dynamic environments. Cross-listed as CHE 413. Prerequisites: BME 435 or AGB 435; ECE 334. *[Satisfies General Studies Requirement: L2]*

414 Biomedical Instrumentation. (3) F
Electrical, physical and mechanical principles governing the operation of modern biomedical instrumentation including biosensors, EEG-ECG recorders, ultrasonic imaging, diagnostic devices. Prerequisites: ECE 334; MAT 274.

415 Biomedical Transport Processes. (4) A
Principles of momentum, heat and mass transfer with applications to medical and biological systems and medical device design. Prerequisites: MAT 274; PHY 131.

416 Biomechanics. (3) S
Mechanical properties of bone, muscle and soft tissues. Static and dynamic analysis of human movement tasks such as locomotion. Prerequisite: ECE 313. Corequisite: ECE 312.

417 Biomedical Engineering Design. (3) A
Technical, regulatory, economic, legal, social and ethical aspects of medical device systems engineering design. Prerequisite: senior standing in Bioengineering or instructor approval.

418 Biomaterials. (3) A
Material properties of natural and artificial biomaterials. Tissue and blood biocompatibility. Uses of materials to replace body parts. Prerequisite: ECE 313.

419 Biocontrol Systems. (3) F
Application of linear and non-linear control systems techniques toward analysis of neuromusculoskeletal, cardiovascular, thermal and mass transfer systems of body. Prerequisites: ECE 301; MAT 274.

435 Animal Physiology I. (4) F
Control and function of the nervous, muscular, cardiovascular, respiratory and renal systems of domestic animals. 3 hours lecture, 3 hours lab. Cross-listed as AGB 435. Prerequisites: BIO 181; CHM 113.

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

437 Animal Physiology Laboratory. (1) N
Selected physiological experiments to accompany BME 436. 3 hours lab. Cross-listed as AGB 437. Corequisite: BME 436.

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461 Health Physics Principles and Radiation Measurements. (3) S

Sources, characteristics, dosimetry, shielding and measurement techniques for natural and man-made radiation. Philosophy of radiation protection. Emphasis on instrumentation, detectors and environmental monitoring. 2 lectures, 3 hours lab. Cross-listed as EEE 461; NUC 461. Prerequisite: ECE 301.

465 Clinical Nuclear Engineering I. (3) N

Fundamentals of clinical nuclear engineering and medical health physics practice. Radiation biology, dosimetry and shielding for radiotherapy and diagnostic procedures. Cross-listed as EEE 465; NUC 465. Prerequisite: instructor approval.

492 Biomedical Engineering Projects. (1-5) F, S, SS
Individual projects in medical systems or medical device design and development.

496 Professional Seminar. (0) F, S

Professional and ethical aspects with a discussion of employment opportunities and responsibilities. Lecture, field trips.

511 Biomedical Engineering. (3) A

Diagnostic and prosthetic methods using engineering methodology. Transport, metabolic and autoregulatory processes in the body.

512 Biomedical Engineering II. (3) A

Electrophysiology and nerve pacing applications, introduction to biomechanics and joint/limb replacement, technology, cardiovascular and pulmonary fluid mechanics, mathematical modeling.

513 Physiological Instrumentation I. (3) A

Problems, concepts and techniques of biomedical instrumentation in static and dynamic environments.

514 Biomedical Instrumentation. (3) F

Electrical, physical and mechanical principles governing the operation of modern biomedical instrumentation. Prerequisites: ECE 334; MAT 274.

515 Biomedical Transport Processes. (3) N

Principles of momentum heat and mass transport with applications to medical and biological systems and medical device design. Cross-listed as CHE 515. Prerequisite: instructor approval.

516 Topics in Biomechanics. (3) S

Mechanical properties of bone, muscle and soft tissues. Static and dynamic analysis of human movement tasks, including in-depth project. Prerequisites: ECE 312, 313; or instructor approval.

517 Prosthetic and Diagnostic Engineering. (3) N

Criteria for mechanical replacement or assistance of organ functions; diagnostic methods, equipment and usage; existing methodology and future requirements, including detailed designs. Cross-listed as CHE 517. Prerequisite: instructor approval.

518 Introduction to Biomaterials. (3) F

Topics include structure property relationships for synthetic and natural biomaterials, biocompatibility and uses of materials to replace body parts. Cross-listed as CHE 518. Prerequisite: ECE 313 or instructor approval.

519 Topics in Biocontrol Systems. (3) F

Linear and non-linear control systems analysis of neuromusculoskeletal, cardiovascular, thermal and mass transfer systems of body including in-depth project. Prerequisite: MAT 274.

520 Bioelectric Phenomena. (3) N

Study of the origin, propagation and interactions of bioelectricity in living things; volume conductor problem, mathemati-

cal analysis of bioelectric interactions, uses in medical diagnostics.

521 Neuromuscular Control Systems. (3) S

Overview of sensorimotor brain structures. Application of non-linear, adaptive, optimal and supervisory control theory to eye-head-hand coordination, locomotion.

566 Advanced Medical Instrumentation. (3) N

Design and analysis of imaging systems and nuclear devices for medical diagnosis, therapy and research. Cross-listed as EEE 566 and NUC 566. Prerequisite: instructor approval.

Special Courses: BME 294, 394, 484, 494, 498, 499, 584, 590, 591, 592, 593, 594, 598, 599, 792, 799. (See pages 36-37.)

Engineering Special Studies—B.S.E.

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 in traditional 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).

Manufacturing Engineering. This program is administered by the Department of Industrial and Management Systems Engineering (see page 314).

Microelectronics Manufacturing Engineering. The successful demonstration of the first integrated circuit in 1958 inspired the creation of a new industry to manufacture these truly amazing devices. This dynamic growth industry, which is based on concepts developed in American laboratories, is vital to the economic well-being and security of the United States. Today, integrated or microelectronic circuits are essential components in products that range from inexpensive, mass-produced consumer goods to extremely sophisticated electronic systems.

Microelectronics manufacturing engineers play crucial roles in the realization of commercially viable microelectronic products from design prototypes. Their involvement begins with the product design and does not end until the completed microelectronic circuit or system is delivered to the purchaser. A microelectronics manufacturing engineer needs diverse knowledge and abilities in order to participate effectively in the identification and implementation of cost-effective solutions to significant manufacturing problems.

This Engineering Special Studies curriculum has been established to prepare students for challenging and rewarding careers in microelectronics manufacturing engineering.

This option is administered by the Department of Electrical and Computer Engineering. The following courses are required as part of the engineering core and mathematics electives (only ECE 313 Introduction to Deformable Solids may be deleted):

	<i>Semester Hours</i>
CHM 441 General Physical Chemistry	3
ECE 334 Electronic Devices and Instruments ...	4
ECE 352 Semiconductors and Devices	3
ECE 383 Probability and Statistics	2
EEE 221 Digital Computer Fundamentals	4
MAT 342 Linear Algebra	3

In addition, the following courses are required:

	<i>Semester Hours</i>
CHE 461 Process Control	3
EEE 302 Electrical Networks II	3
EEE 322 Microprocessor Applications	4
EEE 435 Microelectronics	3
or UET 418 Hybrid Integrated Circuit Technology (4)	
EEE 436 Solid State Devices	3
EEE 439 Semiconductor Facilities and Cleanroom Practices	3
IEE 300 Economic Analysis for Engineers	2

IEE 463 Computer-Aided Manufacturing and Control	3
or MET 416 Applied Computer Integrated Manufacturing (3)	
MET 401 Statistical Process Control	3
or IEE 374 Quality Control (3)	
MSE 472 Integrated Circuit Materials Science	3
UET 432 Semiconductor Packaging and Heat Transfer	3
UET 437 Integrated Circuit Testing	3
One of the following Senior Design Projects	3
ASE 492 Project in Design and Development (3)	
CHE 492 Chemical Engineering Projects (3)	
EEE 432 Senior Design Laboratory (3)	
IEE 492 Project in Design and Development (3)	
MSE 492 Capstone Design Project (3)	
UET 415 Electronics Fabrication Principles (3)	
Technical Electives	9-10
Total	48-49

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, medical physics, radiological imaging, 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, biomedical applications, 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 labo-

332 PROGRAMS IN ENGINEERING

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 courses are required as a part of the engineering core (only ECE 333 Electrical Instrumentation may be deleted):

	<i>Semester Hours</i>
CSC 220 Computer Organization and Assembly Language Programming	4
or EEE 221 Digital Computer Fundamentals (4) or MAE 405 Microcomputer-Aided Processes for MAE (3)	
ECE 210 Engineering Mechanics: Statics	3
ECE 312 Engineering Mechanics: Dynamics	3
ECE 350 Structure and Properties of Materials	3
or ECE 352 Semiconductors and Devices (3)	
PHY 361 Introductory Modern Physics	3
(Basic Science Elective)	

In addition, the following courses are required:

	<i>Semester Hours</i>
EEE/NUC 460 Nuclear Engineering	3
or MAE 430 Introduction to Nuclear Engineering (3)	
EEE/NUC 461 Health Physics Principles and Radiation Measurements	3
EEE/NUC 462 Reactor Safety Analysis	3
EEE/NUC 463 Electric Power Plant Systems	3
or MAE 433 Nuclear Plant Systems Design (3)	
EEE/NUC 464 Nuclear Engineering Experiments	3
EEE/NUC 465 Clinical Nuclear Engineering I	3
MAE 415 Vibration Analysis	4
or EEE 480 Feedback Systems (4)	
MAE 371 Fluid Mechanics	3
or EEE 302 Electrical Networks II (3)	
MAE 382 Thermodynamics	3
or EEE 303 Signals and Filters (3) or EEE 322 Microprocessor Applications (4)	
MAE 422 Mechanics of Materials	4
Technical Electives	20
Total	52

NUCLEAR ENGINEERING

NUC 460 Introduction to Nuclear Engineering. (3) F Neutron interactions with matter. Principles of neutron chain reacting systems. Neutron diffusion and moderation. Heat removal from nuclear reactors. Point reactor kinetics. Cross-listed as MAE 430 and EEE 460. Prerequisite: PHY 361.

461 Health Physics Principles and Radiation Measurements. (3) S

Sources, characteristics, dosimetry, shielding and measurement techniques for natural and man-made radiation. Philosophy of radiation protection. Emphasis on instrumentation, detectors and environmental monitoring. 2 lectures, 3 hours lab. Cross-listed as BME 461 and EEE 461. Prerequisite: ECE 301.

462 Reactor Safety Analysis. (3) S

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. Cross-listed as EEE 462. Prerequisite: EEE or NUC 460.

463 Electrical Power Plant. (3) F

Nuclear, fossil and solar energy sources. Analysis and design of steam supply systems, electrical generating systems and auxiliary systems. Power plant efficiency, operation and costs and analyses. 3 lectures. Cross-listed as EEE 463. Prerequisites: ECE 301; EEE 340.

464 Nuclear Engineering Experiments. (3) F

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. 2 lectures, 3 hours lab. Cross-listed as EEE 464. Corequisite: EEE or NUC 460.

465 Clinical Nuclear Engineering I. (3) N

Fundamentals of clinical nuclear engineering and medical health physics practice. Radiation biology, dosimetry and shielding for radiotherapy and diagnostic procedures. Cross-listed as BME 465 and EEE 465. Prerequisite: instructor approval.

566 Advanced Medical Instrumentation. (3) N

Design and analysis of imaging systems and nuclear devices for medical diagnosis, therapy and research. Cross-listed as BME 566 and EEE 566. Prerequisite: instructor approval.

Special Courses: NUC 484, 494, 498, 499, 584, 590, 591, 592, 593, 594, 598, 599, 792, 799. (See pages 36-37.)

Systems Engineering. Systems Engineering deals with the integration of diverse components into a functioning whole. This curriculum combines the more traditional studies of electrical and industrial engineering with contemporary analytical and computer-based problem-solving skills. The program also has a strong computer science component. Graduates are prepared for a broad variety of industrial, manufacturing and design engineering career opportunities.

After completing a basic core of fundamental courses in mathematics, physical sciences and engineering sciences, each Systems Engineering student undertakes a major which includes courses in computer science, electronic circuits, operations research, computer simulation, microprocessors, engineering economics, digital system design, microcomputer fundamentals and integrated production control. Technical electives may be selected to allow the student to acquire concentrated knowledge in electrical engineering, industrial engineering or computer science.

The following courses are required as a part of the engineering core and mathematics electives (only ECE 313 Introduction to Deformable Solids may be deleted):

	<i>Semester Hours</i>
ECE 210 Engineering Mechanics: Statics	3
ECE 312 Engineering Mechanics: Dynamics	3
ECE 334 Electronic Devices and Instrumentation	4
ECE 352 Semiconductors and Devices	3
or ECE 350 Structure and Properties of Materials (3)	
ECE 383 Probability and Statistics for Engineers	2
EEE 221 Digital Computer Fundamentals	4
MAT 242 Elementary Linear Algebra	2
PHY 361 Introductory Modern Physics	3
(Basic Science Elective)	

In addition, the following courses are required:

	<i>Semester Hours</i>
ASE 492 Project in Design and Development ...	3
CSC 220 Computer Organization and Assembly Language Programming	4
CSC 320 Computer Architecture and Organization	4
CSC 422 Microcomputer System Design	4
EEE 302 Electrical Networks II	3
EEE 303 Signals and Filters	3
EEE 455 Communication Systems	4
EEE 480 Feedback Systems	4
IEE 300 Economic Analysis for Engineers	2
IEE 461 Integrated Production Control	3
IEE 475 Introduction to Simulation	3
IEE 476 Operations Research Techniques/ Applications	4
Technical Electives	11
Total	52

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.

In addition to ECN 111, the following course is required as a part of the social and behavioral sciences requirement:

	<i>Semester Hours</i>
ECN 112 Microeconomic Principles	3

The following courses are required as a part of the engineering core and mathematics electives:

	<i>Semester Hours</i>
ECE 383 Probability and Statistics for Engineers	2
IEE 463 Computer-Aided Manufacturing and Control	3
MAT 242 Elementary Linear Algebra	2

The course to be deleted depends on the student's chosen engineering electives (area of emphasis) and is subject to approval of the advisor.

In addition, the following courses are required:

	<i>Semester Hours</i>
ACC 211 Elementary Accounting	3
ACC 212 Elementary Accounting	3
ASE 485 Engineering Statistics	3
FIN 300 Fundamentals of Finance	3
GNB 305 Legal Environments of Business	3
IEE 300 Economic Analysis for Engineers	2
IEE 367 Methods Engineering and Facilities Design	4
or IEE 422 Information Systems Design (3)	
IEE 461 Integrated Production Control	3
IEE 476 Operations Research Techniques/ Applications	4
IEE 492 Project in Design and Development ...	3
MGT 301 Principles of Management	3
MKT 300 Principles of Marketing	3
Engineering Technical Electives	15
(Including three courses of engineering science and one of engineering design type content)	
Total	51

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 development of water, petroleum and mineral deposits are encompassed within the program.

The following courses are required as a part of the engineering core (only ECE 333 Electronic Instrumentation may be deleted):

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	<i>Semester Hours</i>
CEE 400 Microcomputer Applications in Civil Engineering	3
ECE 210 Engineering Mechanics: Statics	3
ECE 312 Engineering Mechanics: Dynamics	3
ECE 351 Engineering Materials	3
GLG 101 General Geology	3
(Basic Science Elective)	

In addition, the following courses are required:

	<i>Semester Hours</i>
ASE 492 Project in Design and Development ...	3
CEE 451 Soil Mechanics	4
CEE 452 Foundations	3
CEE 552 Geological Engineering	3
GLG 103 Introduction to Geology Lab	1
GLG 310 Structural Geology	3
GLG 321 Mineralogy	4
GLG 323 Optical and X-Ray Techniques	3
GLG 424 Petrology-Petrography	4
MAE 371 Fluid Mechanics	3
Engineering Technical Electives	21
(Includes two courses of engineering science and two courses of engineering design type content. An approved summer engineering-geology field course is also highly recommended.)	

Total 52

Premedical Engineering. 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, transport phenomena, biomechanics, bioelectric phenomena, operations research 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, biomedical engineering 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.

Academic Requirements. In addition to the General Studies requirement, CHM 116 Chemistry and BIO 181 General Biology (basic science elective) must be selected in the engineering core. Other engineering core requirements are outlined in the area of emphasis descriptions. The following courses are required in the undergraduate Premedical Engineering Program which have been selected to meet all university requirements and ABET accreditation requirements:

	<i>Semester Hours</i>
BIO 182 General Biology	4
BME 331 Transport Phenomena I: Fluids	3
BME 334 Heat and Mass Transfer	3
BME 411 Biomedical Engineering I	3
BME 412 Biomedical Engineering II	3
BME 413 Physiological Instrumentation	3
BME 417 Biomedical Engineering Design	3
BME/AGB 435 Animal Physiology I	4
BME 492 Biomedical Engineering Projects	2
BME 496 Professional Seminar ¹	0
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
Engineering Technical Electives (to be selected from an area of emphasis)	8
Total	48

¹ Students must register for BME 496 each semester.

Students interested in Premedical Engineering may elect to emphasize either general bioengineering or computer science:

General bioengineering: Designed to strengthen the student's knowledge of bioengineering. It emphasizes biomedical research. The following courses are required in the engineering core: ECE 333, 340, 350 and MAE 405. ECE 312 is not required in the engineering core. The 8 hours of technical electives may be selected from engineering, biology or chemistry upper-division courses but these courses must include adequate engineering science and design content.

Computer science: Designed for students interested in the application of modern computer technology for medical information processing, medical scientific computation and for the recognition, storage, retrieval and processing of medical data. The following courses are required in the engineering core: CSC 220, ECE 334, 340, 352 and MAT 242 (ECE 312 is not required in the engineering core). Technical electives must include CSC 310, one advanced computer programming course selected from CSC 383, 400 or 470, and upper-division engineering courses of engineering science and design content.

**Premedical Engineering Program of Study
Typical Four-Year Sequence**

First Year

	<i>Semester Hours</i>
First Semester	
BME 496 Professional Seminar	0
CHM 113 General Chemistry	4
ECE 105 Introduction to Languages of Engineering	3
ECN 111 Macroeconomic Principles	3
ENG 101 First-Year Composition	3
MAT 290 Calculus I	5
Total	18

Second Semester

BME 496 Professional Seminar	0
ECE 106 Introduction to Computer-Aided Engineering	3
CHM 116 General Chemistry	4
MAT 291 Calculus II	5
PHY 121 University Physics I	3
PHY 122 University Physics Lab I	1
Total	16

Second Year

First Semester

BIO 181 General Biology	4
BME 496 Professional Seminar	0
ENG 102 First-Year Composition	3
MAT 274 Elementary Differential Equations	3
PHY 131 University Physics II	3
PHY 132 University Physics Lab II	1
General Studies Elective (HU or SB) ¹	3
Total	17

Second Semester

BIO 182 General Biology	4
BME 496 Professional Seminar	0
CHM 331 General Organic Chemistry	3
CHM 335 General Organic Chemistry Lab	1
ECE 210 Engineering Mechanics I: Statics	3
ECE 301 Electrical Networks I	4
Literacy and Critical Inquiry Elective ¹	3
Total	18

Third Year

First Semester

BME 331 Transport Phenomena I: Fluids	3
BME 435 Animal Physiology I	4
BME 496 Professional Seminar	0
CHM 332 General Organic Chemistry	3
ECE 312 Engineering Mechanics II: Dynamics	3
or Technical Elective	
ECE 313 Introduction to Deformable Solids	3
ECE 340 Thermodynamics	3
or CHM 441 General Physical Chemistry (3)	
Total	19

Second Semester

BME 334 Heat and Mass Transfer	3
BME 413 Physiological Instrumentation	3
BME 496 Professional Seminar	0
CHM 336 General Organic Chemistry Laboratory	1
ECE 333 Electrical Instrumentation	3
or ECE 334 Electronic Devices (4)	
ECE 350 Structure and Properties of Materials	3
or ECE 351 Engineering Materials (3) or ECE 352 Semiconductors and Devices (3) or CHM 442 General Physical Chemistry (3)	
ECE 384 Numerical Analysis	2
or ECE 386 Partial Differential Equations for Engineers (2) or MAT 242 Elementary Linear Algebra (2)	
General Studies Elective (HU or SB) ¹	3
Total	18

Fourth Year

First Semester

BME 411 Biomedical Engineering I	3
BME 496 Professional Seminar	0
BME 492 Senior Design Project	2
MAE 405 Microcomputer-Aided Processes	3
or CHE 461 Process Control (3) or CSC 220 Computer Organization and Assembly Language Programming (4) or EEE 221 Digital Computer Fundamentals (4) or IEE 463 Computer-Aided Manufacturing and Control (3)	
General Studies Elective (HU or SB) ¹	3
Technical Electives	6
Total	17

Second Semester

BME 412 Biomedical Engineering II	3
BME 417 Biomedical Engineering Design	3
BME 496 Professional Seminar	0
ECE 383 Probability and Statistics for Engineers	2
ECE 400 Engineering Communications	3
General Studies Elective (HU or SB) ¹	3
Technical Elective	2
Total	16

Graduation requirements: 133 semester hours plus English proficiency.

¹ See pages 42-55 for requirements and approved list of courses.

College of Fine Arts

Seymour L. Rosen, B.A.

Dean

Purpose

The College of Fine Arts provides for pre-professional and professional education in the several arts disciplines and also an opportunity for nonmajors 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. 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, myriad concerts, art exhibitions, music and dance concerts, dramatic productions, opera, lectures and seminars.

Organization

The college is one of 11 schools and colleges on campus. It houses the School of Art, the Department of Dance, the School of Music, the Department of Theatre and the University Art Museum. An average of 2,000 students per semester enroll as majors in various degree programs offered through these units.

Degrees

Baccalaureate Degrees

Bachelor of Arts (B.A.)

Art

Emphasis in Studio, Art History or Photographic Studies

Dance

Music

Theatre

Bachelor of Fine Arts (B.F.A.)

Art

Concentrations in Art Education, Ceramics, Drawing, Fibers, Graphic Design, Intermedia, Metals, Painting, Photography, Printmaking, Sculpture, Wood

Dance

Concentrations in Performance and Choreography, Dance Education

Theatre

Concentrations in Theatre Education, Performance/Production (Acting, Child Drama, Design/Technology)

Bachelor of Music (B.M.)

Choral-General Music

Instrumental Music (Instrumental, String)

Music Therapy

Performance (Voice, Keyboard, Guitar, Orchestral Instrument, Piano

Accompanying, Jazz, Music Theatre)

Theory and Composition (Theory, Composition)

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. 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. In addition, students wishing to be admitted to the Professional Teacher Preparation Program in the College of Education leading to teaching certification must have completed 56 hours with a 2.50 GPA and also have passed the three Pre-Professional Skills Tests.

Graduate Degrees

Master of Arts (M.A.)

Art

Art Education

Art History

Music History and Literature

Theatre

Master of Fine Arts (M.F.A.)

Art

Concentrations in Ceramics, Drawing,
Fibers, Metals, 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)

Piano Accompanying

Music Theatre Performance

Music Theatre Musical Direction

Theory and Composition

Theory

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, Theatre Education

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.

Admission

Students meeting basic admission standards of Arizona State University may matriculate in the College of Fine Arts. Separate admissions procedures and approvals are required for some programs within the college. Students must contact specific departments or schools for details.

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.

Advisement

Advisement is handled as a decentralized activity within the college. To offer personalized attention, each academic unit establishes its own graduate advisement procedures. Students are encouraged to make appointments through the central office of their major discipline.

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 for the major. Dependent on the major, 18-24 hours must be selected from upper-division courses (300- or 400-level). The semester hour requirements in the major are distributed between a field of specialization (30-45 hours) and one or more related fields (an additional 15 hours). 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 for the major. At least 30 of these hours, 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 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 Requirements

To meet the General Studies requirement, a minimum of 35 semester hours must be completed in the General Studies areas. Six semester hours must also

be completed in the awareness areas. A course may concurrently satisfy a core area requirement and an awareness area requirement. Neither courses in the major nor related area courses may be cross-listed in fulfillment of both major and General Studies requirements except where concurrent listing is specifically allowed in the university's General Studies guidelines.

	<i>Semester Hours</i>
Core Areas:	
Literacy and Critical Inquiry	6
Numeracy	6
* Humanities and Fine Art	6 or 9
(Fine arts majors must elect to take at least 6 semester hours of fine arts course work in areas outside of the major school or department. These may be courses in art, dance, music or theatre.)	
* Social and Behavioral Sciences	6 or 9
Natural Sciences	8
Awareness Areas:	
Global Awareness	3
Historical Awareness	3
<hr/>	
Total	41

* 15 hours total

Refer to pages 42-45 of this *Catalog* for a description of the university's General Studies requirements. General Studies courses are regularly reviewed. To determine whether a course meets one or more General Studies course credit requirements, see the listing of courses by core and awareness area, pages 45-66. General Studies courses are also identified following course descriptions according to the following key:

**Key to General Studies
Credit Abbreviations**

- L1 Literacy and Critical Inquiry Core Courses (Intermediate level)
- L2 Literacy and Critical Inquiry Core Courses (Upper division)
- N1 Numeracy Core Courses (Mathematics)
- N2 Numeracy Core Courses (Statistics and Quantitative Reasoning)
- N3 Numeracy Core Courses (Computer Applications)
- HU Humanities and Fine Arts Core Courses
- SB Social and Behavioral Science Core Courses
- S1 Natural Science Core Courses (Introductory)
- S2 Natural Science Core Courses (Additional Courses)
- G Global Awareness Courses
- H Historical Awareness Courses

Graduation Requirements

Several programs require additional General Studies electives which may be selected from anthropology, architecture, biology, botany, chemistry, communication, economics, English (except English 101, 102, 105, 107 and 108), foreign languages, geography, geology, history, humanities, interdisciplinary studies in liberal arts (LIA), journalism and telecommunication, philosophy, physical education (except activity courses), physical science, physics, political science, psychology, religious studies, sociology, zoology and any College of Fine Arts course outside of the student's major to meet the minimum number required for a particular degree program. Additional electives to complete the total of 126 semester hours 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). Foreign students may satisfy this requirement by taking ENG 107 and 108. These courses may not be used to meet General Studies elective requirements.

All Bachelor of Arts degrees require the equivalent of 16 semester hours in one foreign language. (Exception: The Bachelor of Arts degrees in Studio Art and in Dance strongly recommend but do 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 secondary school, two years of instruction in one foreign 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 and piano accompanying have specific foreign language requirements. These are stated in each of the degree requirements (pages 353 and 354). There is no foreign language requirement for other areas of specialization of the Bachelor of Fine Arts or Bachelor of Music degrees.

The minimum graduation requirement is the completion of 126 semester hours with a minimum cumulative scholarship index of 2.00. Of these 126 semester hours at least 50 must be selected from upper-division courses number 300 to 400. Many professional programs within the College of Fine Arts require additional semester hours for graduation and a higher cumulative scholarship index of their majors. To be acceptable as graduation credit, all course work in the major discipline must show an earned grade of "C" (2.00) or higher.

Academic Standards

The terms of disqualification, reinstatement and appeals are consistent with those set forth by the university on pages 41-42 of this *Catalog*, except for Theatre. For the B.F.A. in Theatre, a student must have a 3.00 GPA in the major to enroll in upper-division courses and remain in good standing. In addition, a student disqualified in any program is normally not eligible for reinstatement for two semesters.

Special Programs

Together with faculty, visiting scholars and artists-in-residence, students in all fields of the College of Fine Arts participate in dynamic, innovative programs. The creative energy that infuses the visual and performing arts finds expression in research and study.

The VARI Studio, in the School of Art, conducts research in historical and contemporary technologies in the visual arts. VARI is the only studio of its kind in this country. It brings together artists, master printers and photographers to encourage collaboration and research. Students are appointed to assist VARI personnel in the planning and production of projects in the Print Research facility, the Photography Collaborative facility and the Pyracantha Press.

The School of Art also offers opportunities to explore and refine a new artistic medium: computer graphics. Students may work with software for "painting," solid modeling, animated solid modeling and live video mapping. While computer graphics makes use of the latest technology, other areas preserve and revitalize established media. The newly established neon studio contributes to the revival of interest in neon as an artistic medium and trains students in this difficult craft. Students in the emerging field of photographic studies are trained in photographic history, criticism and exhibition management. The School of Art publishes *The History of Photography Monograph Series* which receives international acclaim. The Northlight Gallery, operated entirely by students, has also become known internationally for photographic exhibitions.

Recognized as one of the top programs in the country, the Department of Dance emphasizes the choreography, performance and theory of modern dance. The artist-in-residence program brings major figures and companies to campus each year. The department recently was selected as one of five in the United States to participate for three years in the Curriculum Development Project of the Dance Notation Bureau in important research on labanota-

tion. Students work closely with visiting artists, artists-in-residence, a curator-of-dance and researchers investigating labanotation, as well as the possibilities of video and computer technology in dance and dance music composition. At the American College Dance festivals for the past several years, graduate students have taken top honors at both the regional and national levels.

An ambitious performance program offers to the public several concerts each year, some with works created and performed by graduate and undergraduate students and others featuring works by faculty and visiting artists. ASU Dance Repertory Company gives graduate and undergraduate students the opportunity to perform and tour in the metropolitan area, the region and the state.

Faculty in the School of Music include a wide range of performers, teachers, conductors and scholars whose knowledge and guidance support the training of students in degree programs. The school sponsors such events as the recent Tercentenary Festival, celebrating the 300th birthdays of J.S. Bach, George Frederick Handel and Domenico Scarlatti with an outstanding, comprehensive program. The Festival featured more than 50 performances by faculty, students, ensembles, distinguished musicologists and Baroque performers. Such unique events as the Festival complement the established success of the school's programs, which include the acclaimed Lyric Opera Theatre. LOT's production of *The Cunning Little Vixen* won a first place award in the national opera contest of the National Opera Association.

The Theatre Department takes special pride in its child drama program, which enjoys an international reputation, provides comprehensive training and attracts students, scholars and visitors from around the world. Students are challenged to excel in every aspect of theatrical training. They have the opportunity to act in and direct mainstage and touring shows as well as teach on and off campus. The program has developed Hayden Library's Child Drama Special Collection, which includes rare books, plays and personal and national association archives. It is the most complete and extensive collection in the country.

The design/technology program and the playwright-in-residence program enrich graduate study and bring together talented students with those who practice the theatrical arts. The new M.F.A. in Creative Writing encourages graduate students to work closely with writers of drama, fiction and poetry as they explore the possibilities of the verbal arts. This interdisciplinary program, involving the artistic, research and teaching interests of faculty in

the Theatre and English Departments, offers students a unique opportunity to tailor a course of study to fit individual needs, talents and goals.

General Information

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 average 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.

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.

School of Art

PROFESSORS:

LEHRER (ART 102), BRECKENRIDGE, CHOU,
GASOWSKI, HELLER, JAY, KELLY,
LINDERMAN, MAGENTA, MEISSINGER,
STULER, J. J. TAYLOR, J. R. TAYLOR,
WAGNER, WOODS

ASSOCIATE PROFESSORS:

ALQUIST, BRITTON, deMATTIES, DETRIE,
ECKERT, GILLINGWATER, GULLY, HAJICEK,
JENKINS, JOHNSON, KAIDA, KRONENGOLD,
OTIS, PILE, PIMENTEL, RABINER, RISSEEUW,
ROWLEY, SCHMIDT, SHARER, SWEENEY,
WATSON, WHITE, WILSON, YOUNG

ASSISTANT PROFESSORS:

BERNHISEL-OSBORN, COCKE,
HAYES-THUMANN, SHIPP, UMBERGER, WILD

PROFESSORS EMERITI:

BROADLEY, FARNESS, FINK, GOO,
GRIGSBY, HAHN, HALE, JACOBSON,
SCHAUMBURG, WOOD

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 three emphases at the Bachelor of Arts level: studio art, photographic studies 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 as approved by the student's advisor. An emphasis in studio art requires 30 semester hours in studio including ART 111, 112, 113, 115 and 15 hours in a related field(s) including ARS 101 and 102. 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 as approved by the student's advisor.

An emphasis in art history requires 33 semester hours of art history courses and 12 in a related field(s). Normally the related field is studio art. At least 18 of the 45 hours must be upper-division credit. All credit applied to the major must be with a "C" or better. The art history areas of ancient, medieval, Renaissance, baroque, modern and non-western art must each be represented with at least one course. Satisfactory completion of ARS 480, Research Methods, is required before the senior year. Other requirements are ARS 101, 102, lower-division ARS (non-western course), one ARS 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 Language Department.

Photographic Studies. Consists of a minimum of 48 semester hours as approved by the student's advisor. Required courses include ARS 450, 451 and 454, ART 409 and one upper-division ARS course in modern art and one in criticism. Knowledge in at least one foreign language is required, equivalent to the level obtained through the completion of two years of study at the college level. For specific courses, see Foreign Language Department.

Bachelor of Fine Arts Degree Curriculum

Art. Consists of 75 semester hours, 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, metals, 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; ARS 101 and 102.

At least 30 upper-division semester hours must be earned within the major, with a minimum of 12 semester 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.

Graphic Design. The concentration in graphic design requires a special application procedure. The application procedure for new and transfer students is separate from, and in addition to, the required admission to Arizona State University. Acceptance is determined by the graphic design faculty and is based on an application, test and portfolio. Applications must be made between February 15 and March 15 for admission for the following fall semester. Students are accepted for entry into the graphic design program in the fall semester only of each academic year. Selection of applicants is made by April 1. Due to space limitations, not all qualified applicants can be accommodated and the admission process is necessarily selective. For application forms and further information contact the School of Art.

Art Education. The concentration in art education consists of 75 semester hours in art including ART 111, 112, 113, 115, 201, 223, one three-dimensional course (either ART 231, 261, 272, 274, 276); ARS 101, 102 and two ARS upper-division electives (including one in 20th Century Art). The following art education courses are required: ARE 350, 380, 470, 480, 484 (Internship), 494 (Special Topics) and 496. In addition, a minimum of 21 hours (including 12 hours of upper-division credit) are to be taken in a specific area of art proficiency approved by an advisor in art education. The art proficiency can be in drawing, painting, intermedia, photography, printmaking, sculpture, ceramics, metals, wood, fibers, or art history. Teaching experience is provided in the children's art workshop which is an on-campus art history-based studio program for children ages five to fifteen. Participation in the workshop is part of the requirements for ARE 484.

A student with a GPA of 2.50 or better, pursuing a B.F.A. with a concentration in Art Education may also choose to become certified for teaching art K-12. If certification is elected while pursuing the Art Education undergraduate degree, 31 semester hours are required of specified course work in the College of Education. Certification may also be pursued after receiving an undergraduate degree through a post-baccalaureate program in the College of Education. For additional certification requirements, see an art education advisor.

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, metals, painting, photogra-

phy, printmaking, sculpture, or 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 concentration in art education. Consult the *Graduate Catalog* for requirements for all graduate degrees.

STUDIO CORE CURRICULUM

ART 111 Drawing I. (3) F, S, SS

Fundamental, technical and perceptual skills using common drawing media and their application to pictorial organization. 6 hours a week.

112 Two-dimensional Design. (3) F, S, SS

Fundamentals of pictorial design. 6 hours a week.

113 Color. (3) F, S, SS

Principles of color theory as related to the visual arts. 6 hours a week. Prerequisites: ART 111, 112.

115 Three-dimensional Design. (3) F, S, SS

Fundamentals of three-dimensional form. 6 hours a week. Prerequisites: ART 111, 112.

DRAWING

ART 211 Drawing II. (3) F, S, SS

Continued development of technical and perceptual skills. Emphasis on materials and pictorial content. 6 hours a week. Prerequisites: ART 113, 115.

214 Life Drawing I. (3) F, S, SS

Development of skill and expressiveness in drawing the basic form, construction and gesture from the human figure. 6 hours a week. Prerequisites: ART 113, 115.

311 Drawing III. (3) F, S

Emphasis on composition, exploration of drawing media. 6 hours a week. Prerequisites: ART 211, 214; instructor approval.

314 Life Drawing II. (3) F, S

Drawing from the model with greater reference to structural, graphic and compositional concerns. 6 hours a week. Prerequisite: ART 214 or instructor approval.

315 Life Drawing III. (3) F, S

The human figure as the subject for drawing. Emphasis on conceptual alternatives and management of materials. 6 hours a week. Prerequisite: ART 314 or instructor approval.

411 Advanced Drawing. (3) F, S

Visual and intellectual concepts through problem solving and independent study. Emphasis on the individual creative statement. May be repeated for credit. 6 hours a week. Prerequisites: ART 311; instructor approval.

412 Drawing Techniques of the Old Masters. (3) N

Techniques of drawing from early Renaissance to the present; silver point, bistre ink, quill pen, pastels and chiaroscuro drawings. May be repeated for credit. 6 hours a week. Prerequisite: instructor approval.

414 Advanced Life Drawing. (3) F, S

Various media and techniques on an advanced level. The human figure as an expressive vehicle in various contexts. May be repeated for credit. 6 hours a week. Prerequisite: ART 315 or instructor approval.

415 Art Anatomy. (4) N

Study of human anatomical structures as applied to the practice of figure oriented art. 3 hours lecture, 5 hours studio a week. Prerequisite: ART 214.

PAINTING

ART 223 Painting I. (3) F, S, SS
Fundamental concepts and materials of traditional and experimental painting media. Emphasis on preparation of painting supports, composition and color. 6 hours a week. Prerequisites: ART 113, 115.

227 Watercolor I. (3) F, S
Painting in all water-soluble media. Emphasis on techniques, composition and color. 6 hours a week. Prerequisites: ART 113, 115.

323 Painting II. (3) F, S
Development of competency in skills and expression. Assigned problems involve light, space, color, form and content. 6 hours a week. Prerequisite: ART 223 or instructor approval.

324 Painting III. (3) F, S
Continuation of ART 323. 6 hours a week. Prerequisite: ART 323 or instructor approval.

325 Figure Painting. (3) F, S
The human figure clothed and nude as the subject for painting in selected media. 6 hours a week. Prerequisites: ART 314, 323.

327 Watercolor II. (3) A
Explorations using a variety of surfaces and a combination of media and materials. 6 hours a week. Prerequisite: ART 227.

421 Painting Materials and Techniques. (3) A
Traditional and modern materials and techniques of painting. Experimental problems in tempera, encaustic, casein emulsions, Maroger's Medium and synthetic media. 6 hours a week. Prerequisite: instructor approval.

423 Advanced Painting. (3) F, S
Continuation of ART 324. May be repeated for credit. 6 hours a week. Prerequisite: ART 324.

425 Advanced Figure Painting. (3) F, S
Continuation of ART 325. May be repeated for credit. 6 hours a week. Prerequisites: ART 315, 324, 325.

427 Advanced Watercolor. (3) F, S
Continuation of ART 327. May be repeated for credit. 6 hours a week. Prerequisite: ART 327.

INTERMEDIA

ART 340 Intermedia. (3) F, S
Experimental, conceptual and inter-disciplinary studio art with emphasis on new media and technologies. 6 hours a week. May be repeated once for credit. Prerequisites: ART 113, 115; 6 hours additional studio requirements; or instructor approval.

341 Mixed Media. (3) A
Exploring visual effects by combining traditional and non-traditional methods, techniques and concepts. May be repeated once for credit. 6 hours a week. Prerequisites: ART 113, 115; 6 hours additional studio requirements; or instructor approval.

440 New Media Concepts. (3) F, S
Continued experiments with new media and interdisciplinary concerns in art. May be repeated for credit. 6 hours a week. Prerequisite: ART 340.

441 Video Art. (1) F, S
Utilizing video and audio equipment essential to the production of broadcast quality video art. May be repeated for credit. 2 hours a week. Corequisites: ART 340, 341 or 440; instructor approval.

PHOTOGRAPHY

ART 201 Photography I. (3) F, S
Development of skills and techniques of black and white photography. Emphasis on camera work and darkroom procedures. 2 lectures, 3 hours lab.

301 Photography II. (3) F, S
Photography as an art medium with additional exploration into personal photographic aesthetics. 6 hours a week. Prerequisites: ART 113, 115, 201; or instructor approval.

304 Advanced Photography. (3) F, S
Interpretation and manipulation of light as a tool in the performance of expressive photography. 6 hours a week. Prerequisites: ART 301; instructor approval.

305 Color Photography I. (3) F, S
Application of color transparencies and prints to photographic art. 6 hours a week. Prerequisite: ART 304 or instructor approval.

306 Photo Techniques. (3) F, S
Exploration of camera and darkroom techniques with emphasis on creative control for the well-crafted black and white print. 6 hours a week. Prerequisites: ART 301; instructor approval.

401 Nonsilver Photography. (3) F, S
Recognition of the inherent characteristics of nonsilver processes and the use of these processes in the communication of ideas. May be repeated for credit. 6 hours a week. Prerequisites: ART 306; instructor approval.

403 Black and White Photography. (3) F, S
Advanced exploration of experimental, interpretive and straight photography. May be repeated for credit. 6 hours a week. Prerequisites: ART 304; instructor approval.

404 Portraiture Photography. (3) F, S
Photographing people. Critical discussions and slide lectures on issues in portraiture. May be repeated for credit. 6 hours a week. Prerequisites: ART 304, 306; or instructor approval.

405 Advanced Color Photography. (3) F, S
Intensive use of subtractive color process in photographic printing. May be repeated for credit. 6 hours a week. Prerequisites: ART 305; instructor approval.

409 Photographic Exhibition. (3) A
Care of photographic prints, print presentation and exhibition. Practical experience in gallery operations. May be repeated for credit. 6 hours a week. Prerequisites: ART 304; instructor approval.

PRINTMAKING

ART 252 Lithography I. (3) F, S
Black and white lithographic printmaking utilizing stone and aluminum plate processes. 6 hours a week. Prerequisites: ART 113, 115.

351 Intaglio I. (3) F, S
Introduction to contemporary and traditional developmental techniques for black and white prints. 6 hours a week. Prerequisite: instructor approval.

352 Lithography II. (3) F, S
Continuation of ART 252. Introduction to color techniques and advanced image-formation processes. 6 hours a week. Prerequisite: ART 252 or instructor approval.

354 Screen Printing I. (3) A
Various methods and applications including the photographic, stencil and transfer techniques. 6 hours a week. Prerequisite: instructor approval.

344 SCHOOL OF ART

355 Photo Process for Printmaking I. (3) A

Introduction to photographic principles and skills for photo-mechanical printmaking processes, including photo-silkscreen, photo-litho and photo-etching. 6 hours a week. Prerequisite: instructor approval.

451 Advanced Intaglio. (3) F, S

Various contemporary and traditional methods of printing to achieve color prints. May be repeated for credit. 6 hours a week. Prerequisite: instructor approval.

452 Advanced Lithography. (3) F, S

Continuation of ART 352. May be repeated for credit. 6 hours a week. Prerequisite: instructor approval.

454 Advanced Screen Printing. (3) A

Continuation of ART 354. May be repeated for credit. 6 hours a week. Prerequisite: instructor approval.

455 Advanced Photo Processes for Printmaking. (3) A

A continued study of photomechanical techniques and applications to printmaking or photographic processes. Prerequisite: ART 355 or instructor approval.

456 Fine Printing and Bookmaking I. (3) A

Letterpress printing and typography as fine art. Study of history, alphabets, mechanics of hand typesetting, presswork and various forms of printed matter. Prerequisite: instructor approval.

457 Fine Printing and Bookmaking II. (3) A

Continuation of ART 456. Bookbinding, book design and printing, advanced typography, theory and presswork. May be repeated for credit. Prerequisites: ART 456; instructor approval.

458 Papermaking. (3) F, S

History, theory, demonstrations, sheet forming, collage treatments and 3-dimensional approaches. May be repeated for credit. 6 hours a week. Prerequisite: instructor approval.

459 Monoprinting. (3) F, S

The non-multiple printed image using a variety of technical approaches. May be repeated for credit. 6 hours a week. Prerequisites: ART 311, 323 or any 300-level printmaking class; instructor approval.

SCULPTURE

ART 231 Sculpture I. (3) F, S, SS

Exploration and expression of sculptural form through ideas and concepts related to basic materials; studio safety. 6 hours a week. Prerequisites: ART 113, 115.

331 Sculpture II. (3) F, S

Continuation of ART 231. 6 hours a week. Prerequisite: ART 231.

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. 6 hours a week. Prerequisite: ART 331.

333 Experimental Sculpture. (3) N

An experimental approach to form-material relationship toward atmospheric, kinetic, audio, electronic and earth works. 6 hours a week. Prerequisite: ART 332 or instructor approval.

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. 6 hours a week. Prerequisites: ART 332; instructor approval.

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. 6 hours a week. Prerequisite: ART 332 or instructor approval.

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. 6 hours a week. Prerequisite: ART 332 or instructor approval.

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. 6 hours a week. Prerequisite: instructor approval.

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. 6 hours a week. Prerequisite: instructor approval.

CERAMICS

ART 261 Ceramic Survey. (3) F, S, SS

Handforming methods, throwing on the wheel, decorative processes, glaze application. 6 hours a week. Prerequisites: ART 113, 115.

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. 6 hours a week. Prerequisite: ART 261.

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. 6 hours a week. Prerequisites: ART 231, 360.

460 Ceramic Clay. (3) A

Research into various clay body formulations, local natural materials, slip glazes and engobes. 6 hours a week. Prerequisite: ART 360, 364; or instructor approval.

463 Ceramic Glaze. (3) A

Glaze formulation and calculation. 6 hours a week. Prerequisite: ART 460 or instructor approval.

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. 6 hours a week. Prerequisite: ART 364 or instructor approval.

FIBERS

ART 276 Fiber Arts I. (3) F, S

Structural use of fiber utilizing a variety of techniques. Surface treatment including batik, block printing, fold and dye. 6 hours a week.

376 Fibers: Loom Techniques. (3) A

Investigation of loom controlled techniques. Plain weave, double weave, tapestry will be explored. 6 hours a week. Prerequisites: ART 113, 276; or instructor approval.

377 Fibers: Surface Design. (3) A

Surface design techniques: silk screening, painting, stamping, dyeing on fabric will be explored. Prerequisites: ART 113, 276; or instructor approval.

476 Advanced Fibers. (3) F, S

Experimentation with advanced techniques in fiber and fabric. May be repeated for credit. 6 hours a week. Prerequisites: ART 376; instructor approval.

METALS

ART 272 Jewelry I. (3) F, S

Emphasis on fabrication in jewelry making. Basic techniques of forming, cutting and piercing, forging and soldering. 6 hours a week.

372 Jewelry II. (3) F, S

Fabricated approach to jewelry making. Techniques in stone setting and surface embellishment. 6 hours a week. Prerequisites: ART 113, 115, 272; or instructor approval.

373 Metalworking I. (3) A

Compression, die and stretch forming as applied to hollow form construction. Hot and cold forging techniques as applied to smithing. 6 hours a week. Prerequisites: ART 113, 115, 272; or instructor approval.

472 Advanced Jewelry. (3) F, S

Jewelry making with emphasis on developing personal statements and craftsmanship. May be repeated for credit. 6 hours a week. Prerequisites: ART 372; instructor approval.

473 Advanced Metalworking. (3) A

Forging and forming techniques in individualized directions. May be repeated for credit. 6 hours a week. Prerequisites: ART 373; instructor approval.

WOOD

ART 274 Wood I. (3) F, S

Fundamental woodworking techniques to produce creative functional 3-dimensional objects. 6 hours a week.

374 Wood II. (3) F, S

Individual and directed problems in wood, related to the production of unique functional art objects. 6 hours a week. Prerequisites: ART 113, 115, 274; or instructor approval.

378 Furniture I. (3) A

Design and building of contemporary furniture. Exploration in the technique of joinery, lamination, carving and finishing procedures. 6 hours a week. Prerequisites: ART 113, 115, 274; or instructor approval.

474 Advanced Wood. (3) F, S

Extended experience and advanced techniques in the use of wood to create functional works of art. May be repeated for credit. 6 hours a week. Prerequisites: ART 374; instructor approval.

478 Advanced Furniture. (3) A

Form concepts are explored in construction of inventive furniture. Emphasis on media experimentation. May be repeated for credit. 6 hours a week. Prerequisite: ART 378.

GRAPHIC DESIGN

ART 283 Letterforms I. (3) F

Drawing of letterforms with focus on proportion and structure. Introduction to letterform nomenclature and classifications. 6 hours a week. Prerequisites: ART 113, 115; acceptance into graphic design program. Corequisite: ART 284.

284 Visual Communications I. (4) F

Theoretical and applied studies in shape, drawing and color. 8 hours a week. Prerequisites: ART 113, 115; acceptance into graphic design program. Corequisite: ART 283.

285 Typeset I. (3) S

Theoretical exercises in spatial and textural qualities of type. Problems in tension, activation and balance. Exercises in simple typographical applications. 6 hours a week. Prerequisites: ART 283, 284; acceptance into graphic design program. Corequisite: ART 286.

286 Visual Communications II. (4) S

Transition from theoretical to applied problems. Emphasis on refinement of visual skills. 8 hours a week. Prerequisites: ART 283, 284; acceptance into graphic design program. Corequisite: ART 285.

382 Graphic Representation. (3) F

Studio practice in drawing with an application towards graphic communication. May be repeated once for credit. 6 hours a week. Prerequisites: ART 284; instructor approval.

385 Typeset II. (3) F

Problems in composition, choice and combinations of type faces, formats and their application to a variety of design projects. 6 hours a week. Prerequisites: ART 285, 286. Corequisite: ART 386.

386 Visual Communications III. (3) F

Problems in specific design applications such as poster, packaging, publications, etc. Emphasis on development of concepts in visual communications. 6 hours a week. Prerequisites: ART 285, 286. Corequisite: ART 385.

387 Visual Communications IV. (3) S

Client oriented projects. Problems will be multi-faceted and the emphases will be on continuity of design in more than one medium and format. 6 hours a week. Prerequisite: ART 386.

481 Visual Communications V. (3) F, S

Studio problems with an emphasis on analysis, problem-solving and professional portfolio preparation. 6 hours a week. Prerequisites: ART 387; instructor approval.

482 Visual Communications VI. (3) S

Individual and group projects with outside clients. All projects culminate in an exhibit. 6 hours a week. Prerequisite: ART 481.

485 Graphic Design Pre-Professional Program. (3) F, S, SS

Pre-professional client/designer situations from concept to printed work. Studio workshop and internships for selected students. May be repeated once for credit. 6 hours a week. Prerequisite: instructor approval.

SPECIAL STUDIO ART

ART 444 Computer Art I. (3) F, S

A study of PC hardware and software for creating art. Emphasis on computer graphics history, hardware/software configurations, DOS, principles of 2D and 3D graphics. 2 hours lecture, 2 hours studio. Prerequisites: ART 111, 112 or equivalent; instructor approval. *[Satisfies General Studies Requirement: N3]*

621 Studio Problems. (3) F, S, SS

Advanced study in the following areas:

- | | |
|-----------------|----------------|
| (a) Drawing | (f) Ceramics |
| (b) Painting | (g) Metals |
| (c) Photography | (h) Wood |
| (d) Printmaking | (i) Fiber Art |
| (e) Sculpture | (j) Studio Art |

May be repeated for credit. 6 hours a week each section. Prerequisite: instructor approval.

680 Practicum: M.F.A. Exhibition. (1-15) F, S, SS

Studio work in preparation for required M.F.A. exhibition. Public exhibit to be approved by the student's supervisory committee and accompanied by a final oral examination. Photographic documentation and written statement of problem. Prerequisite: approval of the student's supervisory committee.

Special Courses: ART 294, 394, 484, 493, 494, 498, 499, 591, 592, 594, 598. (See pages 36-37.)

ART EDUCATION

ARE 301 Art in the Elementary School. (3) F, S
(For non-majors only.) The study of children's visual art work from early childhood to early adolescence. 1 lecture, 4 hours studio.

350 Design. (3) F, S
Principles of visual organization; design as a tradition in art and art education; sequencing design instruction. 2 lectures, 2 hours studio. Prerequisites: ART 113, 115; ARS 101, 102; or instructor approval.

380 Studio Art: Art History I. (3) F, S
Art traditions prior to the 20th century as a basis for studio and art history instruction with K-12 and community college populations. 2 lectures, 2 hours studio. Pre- or corequisite: ARE 350.

420 Crafts for the Elementary School Teacher. (3) A
Practical laboratory experiences stressing a variety of media and activities for classroom teaching. (Not for M.A. credit in art education.) 1 lecture, 4 hours studio.

470 Art Criticism: Aesthetics. (3) F, S
Traditions of aesthetics and art criticism; conceptual issues in contemporary art; education in the visual arts. 2 lectures, 2 hours studio. Prerequisite: ARE 380. Corequisite: ARE 480 recommended.

480 Studio Art: Art History II. (3) S
Art traditions of the 20th century as a basis for studio and art history instruction with K-12 and community college populations. 2 lectures, 2 hours studio. Must be taken before enrollment in ARE 484 Internship: Art Education. Prerequisite: ARE 380. Corequisite: ARE 470 recommended.

484 Internship: Art Education. (3) N
The implementation and evaluation of art instruction for K-9 population. Includes teaching of Saturday classes in the Children's Art Workshop. Prerequisite: ARE 480.

496 Senior Project. (3) A
Individual or group research on an art education problem which incorporates theory and practice. Prerequisites: ARE 470, 480, 484; or instructor approval.

510 Art in the Self-Contained and Open Classroom. (3) A
Alternate teaching/learning strategies, art concepts and skills relevant to elementary school art experiences for teachers.

511 Issues in Art Education. (3) A
Investigation of issues in art education.

515 Art Foundations of Art Education. (3) A
Foundations of art education with an emphasis on psychological, philosophical and historical frames of reference.

525 Art and Society. (3) A
Interrelationship of art, society and social change and their relevance to areas such as government, museums and technology

540 Instructional Resources, Art Education. (3) N
Development of audio visual materials in art and inquiry into strategies for their implementation. May be repeated once for credit.

545 Perception and Learning. (3) A
Concepts of perception and learning in art instruction.

550 Aesthetic Inquiry. (3) A
Literature on aesthetics, methods of inquiry and implications for art education.

570 Analyzing Works of Art. (3) N
The critical examination of art or statements about art and the development of ways for guiding this examination.

575 Curriculum in Art and Education. (3) A
Literature in art education and education on existing strategies for developing curriculum, the issues and problems of differing curriculum orientations.

610 Issues and Trends in Art Education. (3) N
Doctoral level investigation of historical and contemporary issues related to teaching and research in art education.

611 Curriculum Development in Art Education. (3) N
Doctoral level inquiry into the philosophical, psychological and sociological foundations of curriculum development.

Special Courses: ARE 294, 394, 484, 493, 494, 498, 499, 584, 590, 591, 592, 593, 594, 598, 599, 690, 691, 692, 790, 791, 792, 799. (See pages 36-37.)

ART HISTORY

ARS 100 Introduction to Art. (3) F, S, SS
Development of understanding and enjoyment of art and its relationship to everyday life through the study of painting, sculpture, architecture and design. May not be taken for credit by student who has completed ARS 300, nor used as art history credit by art majors. [Satisfies General Studies Requirements: HU, H]

101 Art of the Western World I. (3) F, S
History of Western art from the Paleolithic period to the Middle Ages. [Satisfies General Studies Requirements: HU, H]

102 Art of the Western World II. (3) F, S
History of Western art from the Renaissance to the present. [Satisfies General Studies Requirements: HU, H]

201 Art of the Non-Western World I. (3) A
History of the art of the Asian cultures, with an emphasis on India, China and Japan. [Satisfies General Studies Requirements: HU, G, H]

202 Art of the Non-Western World II. (3) A
History of the art of Africa, Oceania and the New World. [Satisfies General Studies Requirements: HU, G, H]

300 Introduction to Art. (3) F, S
Course content same as ARS 100 but requires a higher level of accomplishment and comprehension. May not be taken for credit by student who has completed ARS 100, nor used as art history credit by art majors. [Satisfies General Studies Requirements: HU, H]

325 History of Christian Art. (3) N
Christian art from the 4th century in Rome to the present. Meaning and use of architectural, painting, sculptural and decorative art forms. Prerequisites: ARS 101, 102; or instructor approval. [Satisfies General Studies Requirements: HU, H]

400 History of Printmaking. (3) A
History of the print as an art form and its relation to other modes and forms of artistic expression. Prerequisites: ARS 101, 102; or instructor approval. [Satisfies General Studies Requirements: HU, H]

402 Ancient Near Eastern Art. (3) N
History of painting, sculpture and architecture in Mesopotamia, Egypt and the Aegean. Prerequisites: ARS 101, 102; or instructor approval. [Satisfies General Studies Requirements: HU, H]

404 Greek Art. (3) A
Art and architecture of Greece and the Hellenistic Empire. Prerequisites: ARS 101, 102; or instructor approval. [Satisfies General Studies Requirements: HU, H]

- 406 Roman Art.** (3) A
Art and architecture of Etruria, Rome and the Roman Empire. Prerequisites: ARS 101, 102; or instructor approval. *[Satisfies General Studies Requirements: HU, H]*
- 410 Early Christian and Byzantine Art.** (3) A
Art and architecture of the early church and the Byzantine Empire from the 4th to the 15th century. Prerequisites: ARS 101, 102; or instructor approval. *[Satisfies General Studies Requirements: HU, H]*
- 412 Early Medieval Art.** (3) A
Architecture, sculpture and painting in the Latin West from the 7th century to the end of the Ottoman Period. Prerequisites: ARS 101, 102; or instructor approval. *[Satisfies General Studies Requirements: HU, H]*
- 414 Romanesque Art.** (3) A
Sculpture, painting, architecture and minor arts in western Europe during the Romanesque period. Prerequisites: ARS 101, 102; or instructor approval. *[Satisfies General Studies Requirements: HU, H]*
- 416 Gothic Art.** (3) A
Painting, sculpture and architecture in western Europe during the Gothic period. Prerequisites: ARS 101, 102; or instructor approval. *[Satisfies General Studies Requirements: HU, H]*
- 418 Renaissance Art in Northern Europe.** (3) A
Painting, sculpture and architecture during the 1400s and 1500s north of the Alps. Prerequisites: ARS 101, 102; or instructor approval. *[Satisfies General Studies Requirements: HU, H]*
- 420 Early Renaissance Art in Italy.** (3) A
Painting, sculpture and architecture in Italy from 1300 to 1500. Prerequisites: ARS 101, 102; or instructor approval. *[Satisfies General Studies Requirements: HU, H]*
- 422 Italian High Renaissance Art and Mannerism.** (3) A
History of Italian art during the 16th century, including the achievements and influence of Leonardo da Vinci, Raphael and Michelangelo. Prerequisites: ARS 101, 102; or instructor approval. *[Satisfies General Studies Requirement: HU]*
- 424 Italian Baroque Art.** (3) A
Italian painting, sculpture and architecture of the 17th century. Prerequisites: ARS 101, 102; or instructor approval. *[Satisfies General Studies Requirements: HU, H]*
- 426 Art of the 17th Century in Northern Europe.** (3) A
Baroque painting, sculpture and architecture in Flanders, the Netherlands, France and England. Prerequisites: ARS 101, 102; or instructor approval. *[Satisfies General Studies Requirements: HU, H]*
- 428 Art of the 18th Century.** (3) A
History of painting, sculpture, architecture, graphic arts and the decorative arts from 1700 to the French Revolution (1789). Prerequisites: ARS 101, 102; or instructor approval. *[Satisfies General Studies Requirements: HU, H]*
- 430 Art of Spain and Its Colonies.** (3) A
Architecture, painting and sculpture from 1500 to 1800. Colonial focus on Mexico and American Southwest. Prerequisites: ARS 101, 102; or instructor approval. *[Satisfies General Studies Requirements: HU, H]*
- 432 Art and Revolution.** (3) A
Impact of American and French Revolutions and the Napoleonic epoch on visual arts. Concentration on Goya, David, Gercault, Blake, etc. Prerequisites: ARS 101, 102; or instructor approval. *[Satisfies General Studies Requirement: HU]*
- 434 Romanticism and Realism.** (3) A
History of the visual arts in the first half of the 19th century. Prerequisites: ARS 101, 102; or instructor approval. *[Satisfies General Studies Requirement: HU]*
- 436 Impressionism and Late 19th Century Art.** (3) A
History of painting, sculpture and graphic arts in latter half of the 19th century. Prerequisites: ARS 101, 102; or instructor approval. *[Satisfies General Studies Requirement: HU]*
- 438 Art of the 20th Century I.** (3) A
Developments and directions in art between 1900 and World War II. Prerequisites: ARS 101, 102; or instructor approval. *[Satisfies General Studies Requirement: HU]*
- 439 Art of the 20th Century II.** (3) A
Art since World War II, with consideration of new concepts and experimentation with media and modes of presentation. Prerequisites: ARS 101, 102, 438; or instructor approval. *[Satisfies General Studies Requirements: HU, H]*
- 442 American Art I.** (3) A
Art in the United States from European settlement to 1850. Prerequisites: ARS 101, 102; or instructor approval.
- 443 American Art II.** (3) A
Art in the United States from 1850 to the Armory Show in 1913. Prerequisites: ARS 101, 102; or instructor approval.
- 444 American Art III.** (3) A
Art in the United States from 1913 to World War II. Prerequisites: ARS 101, 102; or instructor approval.
- 450 19th Century Photography.** (3) A
History of photography from the medium's pre-history to 1914: personalities, processes, images and ideas. Prerequisites: ARS 101, 102; or instructor approval. *[Satisfies General Studies Requirements: HU, H]*
- 451 20th Century Photography.** (3) A
Personalities, processes, images and ideas in photography from 1914 to present. Prerequisites: ARS 101, 102; or instructor approval. *[Satisfies General Studies Requirements: HU, H]*
- 454 Research and Writing in Photography.** (3) A
Principles and practice of research and writing in the history and criticism of photography. Papers required. Prerequisites: ENG 101, 102 or equivalent; ARS 450, 451; or instructor approval. *[Satisfies General Studies Requirement: HU]*
- 456 History of Art Criticism I.** (3) N
History of theories of criticism of the visual arts. Readings from visual arts critical literature from Plato to 18th century. Prerequisites: ARS 101, 102; or instructor approval. *[Satisfies General Studies Requirements: HU, H]*
- 457 History of Art Criticism II.** (3) N
Theories of criticism of the visual arts from late 18th century to present. Prerequisites: ARS 101, 102; or instructor approval. *[Satisfies General Studies Requirements: HU, H]*
- 458 20th Century Art Criticism.** (3) N
Seminal, influential writings in development of modern art criticism. Role of art critic, art journals in relation to art community. Prerequisites: ARS 101, 102; or instructor approval. *[Satisfies General Studies Requirement: HU]*
- 459 Writing Art Criticism.** (3) N
Traditional and contemporary approaches to the criticism of art. Students will write critical essays. The latter half of the semester will stress the criticism of contemporary art in various media. Prerequisite: ARS 458 or instructor approval. *[Satisfies General Studies Requirement: HU]*
- 462 Pre-Columbian Art I.** (3) A
Architecture, sculpture, ceramics, manuscripts, painting and other arts of Mesoamerica prior to European contact. Prerequisites: ARS 101, 102; or instructor approval. *[Satisfies General Studies Requirements: HU, H]*
- 463 Pre-Columbian Art II.** (3) A
Architecture, sculpture, ceramics, textiles and metalwork of Central and South America prior to European contact. Prerequisites: ARS 101, 102; or instructor approval. *[Satisfies General Studies Requirement: HU]*

465 North American Indian Art. (3) A

Native American art forms of the United States and Canada from prehistoric times to present. Prerequisites: ARS 101, 102; or instructor approval. [Satisfies General Studies Requirement: HU]

466 Southwest Indian Art. (3) A

American Indian art in the southwestern states from its origins to the present day. Prerequisites: ARS 101, 102; or instructor approval. [Satisfies General Studies Requirements: HU, H]

468 Shamanism and Art. (3) A

Performance arts as well as traditional art objects associated with the shaman in Siberia and North America. Prerequisites: ARS 101, 102; or instructor approval. [Satisfies General Studies Requirements: HU, SB, G]

469 Mexican Art. (3) A

Art of Mexico and related Central American cultures from the prehistoric to the contemporary schools. Prerequisites: ARS 101, 102; or instructor approval. [Satisfies General Studies Requirements: HU, G, H]

472 Art of China. (3) A

Study of major forms in Chinese art: ritual bronze, sculpture, ceramic, calligraphy, painting and architecture. Prerequisites: ARS 101, 102; or instructor approval. [Satisfies General Studies Requirements: HU, G, H]

473 Art of Japan. (3) A

Japanese art from the Joman period to the present. Prerequisites: ARS 101, 102; or instructor approval. [Satisfies General Studies Requirements: HU, G, H]

475 Chinese Painting. (3) A

From Ku K'ai-chin to Ch'i Pai-shih. Major artists, styles and movements in Chinese painting. Prerequisites: ARS 101, 102; or instructor approval. [Satisfies General Studies Requirements: HU, H]

480 Research Methods. (3) F, S

Methodology and resource material for art historical research. Techniques of scholarly and critical writing and evaluation of bibliographic sources. Prerequisites: ARS 101, 102; or instructor approval. [Satisfies General Studies Requirements: HU, H]

498 Pro-Seminar. (3-6) A

Undergraduate seminar in topics selected from the following. Problems or criticism in:

- | | |
|---------------------|--------------------------|
| (a) Chinese Art | (f) Modern Art |
| (b) Ancient Art | (g) American Indian Art |
| (c) Medieval Art | (h) Pre-Columbian Art |
| (d) Renaissance Art | (i) Photographic History |
| (e) Baroque Art | (j) American Art |

Prerequisite: instructor approval.

591 Seminar. (3-6) A

Graduate seminar in topics selected from the following. Problems or criticism in:

- | | |
|---------------------|--------------------------|
| (a) Chinese Art | (f) Modern Art |
| (b) Ancient Art | (g) American Indian Art |
| (c) Medieval Art | (h) Pre-Columbian Art |
| (d) Renaissance Art | (i) Photographic History |
| (e) Baroque Art | (j) American Art |

Prerequisite: instructor approval.

Special Courses: ARS 294, 394, 480, 484, 492, 493, 494, 498, 499, 500, 590, 592, 598, 599. (See pages 36-37.)

ART AUXILIARY COURSES

ARA 202 Introduction to Photo Aesthetics. (3) F, S

Slide lecture course in understanding photography as a fine art form. [Satisfies General Studies Requirement: H]

454 Museum Studies I. (3) A

History of the origins and development of museums. Topics covered will be the history of collecting, connoisseurship and conservation. Prerequisite: instructor approval.

456 Museum Studies II. (3) N

Practical operation of museums; methodology; theory/practice including organization, administration, fund raising, grant proposals, collecting, registration, budgets, personnel and education programs. Prerequisite: ARA 454.

460 Gallery Exhibitions. (3) F, S

Practical experience in all phases of department gallery operations and preparation of gallery publications. May be repeated for credit. Prerequisite: instructor approval.

485 Women's View of Art. (3) A

Study of women visual artists, their lives and the social, political, aesthetic and educational issues related to their art. Lecture, discussion, readings and studio experiences. 3 hours a week. Prerequisite: instructor approval.

488 Understanding Art. (3) F, S

Understanding art as an emergent cultural phenomenon with an emphasis on a critical examination of conceptual issues in art. Writing required. Prerequisites: ARS 101, 102; or instructor approval. [Satisfies General Studies Requirements: L2, HU]

Special Courses: ARA 294, 394, 484, 494, 498, 584, 591, 594, 598. (See pages 36-37.)

Dance

PROFESSORS:

LESSARD (PEBE 107B), JONES, LUDWIG, NAGRIN

ASSOCIATE PROFESSORS:

CHLISTOWA, HUSKEY, MARION

ASSISTANT PROFESSORS:

CHENG, KAPLAN

INSTRUCTORS:

HARPER, MATT

CURATOR OF DANCE:

ROSEN

PROFESSORS EMERITI:

GISOLO, DESJARDIN

Departmental Major Requirements

For advisement purposes, all students registering in a Dance degree program will enroll through the College of Fine Arts. Each degree program and area of specialization has its own check sheet which describes the particulars of course sequence and special requirements. These are available in the Department of Dance office.

Bachelor of Arts Degree Curriculum

Dance. Consists of a minimum of 50 semester hours in dance, of which the following are required: DAH 160, 401, 402; DAN 130, 131, 134, 135, 232,

234, 235, 261, 262, 334, 464 and 494. Fifteen additional hours approved by an advisor must be in no more than two related fields. Additional requirements are listed on the departmental check sheet.

At least 50 semester hours, including 18 in the major, must be upper-division. Grades in classes required for the major must be "C" or better. First semester students should take: DAH 160; DAN 134 Modern; DAN 135 Ballet; ENG 101; MUS 100; and one general studies requirement.

Bachelor of Fine Arts Degree Curriculum

Dance. Consists of 66 to 85 hours of credit with a concentration in either performance and choreography or dance education. Core courses required are: DAH 160, 401, 402; DAN 130, 131, 134, 135, 230, 232, 234, 235, 261, 262, 263, 334, 464, 465, 490 and 494. For the concentration in performance and choreography additional requirements include DAN 331, 332, 335, 371, 434; MUS 100; MUS 347 or 355 or 356; THP 101. For the specialization in Secondary Education, MUS 100, DAN 360, 361, 367 and one hour of Jazz Dance 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 semester hours, including at least 30 in the major, must be upper-division. Grades in classes required for the major must be "C" or better. First semester students should take: DAH 160; DAN 134 Modern; DAN 135 Ballet; ENG 101; MUS 100; and one general studies requirement.

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 focusing on history, styles and theatrical aspects of the art form. [Satisfies General Studies Requirement: HU]

160 Introduction to the Dance Profession. (1) F
Seminar introducing career options, study of anatomical landmarks and basic injury prevention principles.

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 for credit by student who has completed DAH 100. [Satisfies General Studies Requirement: HU]

301 Philosophy and Criticism of Dance. (3) F, S
Philosophical issues in dance and dance criticism, with emphasis on written analysis and interpretation. Prerequisite: 1 semester of First-Year Composition. [Satisfies General Studies Requirements: L1, HU]

401 Dance History I. (3) F
Cultural and theatrical development of dance from pre-history through the 19th century Romantic period, including the early history of ballet. [Satisfies General Studies Requirements: HU, H]

402 Dance History II. (3) S
Cultural and theatrical development of dance from 19th century Romantic period through Contemporary times. Includes ballet, modern and musical theatre dance. [Satisfies General Studies Requirements: HU, H]

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) S
Theories of criticism; aesthetic 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 36-37.)

DANCE

DAN 130 Dance. (1) F, S, SS
Ballet, improvisation, jazz, modern and other dance activities. 2 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 instructor approval.

134 Technique and Theory of Modern Dance. (3) F, S
Elementary concepts of modern dance technique. Development of movement quality and performance skills. 6 hours weekly. May be repeated for credit. Placement audition required. Prerequisite: dance major.

135 Technique and Theory of Ballet. (2) F, S
Elementary ballet technique with emphasis on alignment, control and development of the feet with proper awareness of style and phrasing. 4 hours weekly. Placement and auditions required. May be repeated for credit.

230 Dance. (1) F, S
Intermediate levels. Continuation of DAN 130. 2 hours a week. May be repeated for credit.

232 Dance Notation I. (3) S
Survey of systems of dance notation. Introduction to effort-shape analysis of movement. Emphasis on learning elementary Labanotation. Prerequisite: MUS 100 or instructor approval.

234 Technique and Theory of Modern Dance. (3) F, S
Intermediate concepts of modern dance technique. Development of movement quality and performance skills. 6 hours weekly. May be repeated for credit. Placement audition required. Prerequisite: dance major.

235 Technique and Theory of Ballet. (2) F, S
The advanced study of elementary ballet technique through the traditional exercises, with proper awareness of style and phrasing. 4 hours weekly. May be repeated for credit. Placement audition required.

237 Beginning Pointe. (1) F, S
The study of elementary pointe technique through the traditional exercises. 2 hours weekly. May be repeated for credit. Prerequisites: basic ballet training; instructor approval.

350 DANCE

261 Fundamentals of Choreography. (3) F, S

Introduction to and application of basic choreographic principles with emphasis on movement invention and development of evaluative skills. Prerequisites: DAN 130 (Improvisation I); instructor approval.

262 Dance Production I. (2) F

Theory of lighting, scenery and sound as related to dance.

263 Dance Production II. (2) S

Theory and practice of publicity, makeup, costuming, house and stage management as related to dance production. Prerequisite: DAN 262 or instructor approval.

330 Dance. (1) F, S

Advanced levels. Continuation of DAN 230. 2 hours weekly. May be repeated for credit.

331 Music Literature for Dance. (3) F

Historical survey of music relative to dance. Emphasis on developing listening skills and knowledge of musical versus choreographic forms. Prerequisite: DAN 131 or instructor approval.

332 Dance Notation II. (2) F

Intermediate study of Labanotation. Emphasis on score reading. 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. 6 hours weekly. May be repeated for credit. Placement audition required.

335 Technique and Theory of Ballet. (2) F, S

Intermediate ballet technique with emphasis on strength, dynamics, rhythmical impulses and transitions with awareness of proper style and phrasing. 4 hours weekly. May be repeated for credit. Placement audition required.

337 Intermediate Pointe. (1) F, S

Study of intermediate and advanced pointe technique through the traditional exercises. 2 hours weekly. May be repeated for credit. Prerequisite: DAN 237 or instructor approval.

342 Ideokinesis. (3) F, S

A study of posture using the visualization of image/goals to facilitate improved alignment and movement efficiency. May be repeated for credit.

360 Theory and Practice of Teaching Dance. (3) F

Analysis and acquisition of teaching materials for the technique, improvisation and choreography of modern dance.

361 Theory and Practice of Teaching Dance. (2) S

Analysis and acquisition of teaching techniques and materials for ballet and jazz dance forms.

364 Dance and Video. (2) N

Fundamentals of dance video production including camera operation, scripting and in-camera editing. Prerequisite: at least junior standing or instructor approval.

367 Children's Dance. (3) F, SS

Theory and practice of teaching creative and other dance forms for children. Designed for dance majors and related curriculum, but open to all students.

371 Dance Theatre Performance/Production. (1) F, S

Performance or technical theatre work in designated dance productions. 3 hours a week per semester hour. May be repeated for credit. Prerequisite: instructor approval.

380 Jazz Dance Styles. (2) F

Study of 150 years of jazz dance in America through the learning of period dances, reading, creative work and performance. May be repeated for credit. Prerequisite: instructor approval.

434 Technique and Theory of Modern Dance. (3) F, S

Preparation in the performance and comprehension of professional level modern dance technique. 6 hours weekly. May be repeated for credit. Placement audition required.

435 Technique and Theory of Ballet. (2) F, S

The study of professional advanced ballet technique with emphasis on preparation for performance. 4 hours weekly. May be repeated for credit. Placement audition required.

437 Partnering. (2) S

Fundamental technique, theory and practice of partnering applicable to all dance forms. Variations from ballet (on pointe and off). May be repeated for credit. Prerequisite: instructor approval.

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. Prerequisite: DAN 261 or instructor approval.

465 Advanced Choreography. (3) S

Investigation and practice of contemporary styles of choreography. Prerequisite: DAN 261 or instructor approval.

490 Senior Performance in Dance. (2) F

Original choreography for group performance with analysis and critique of problems encountered in production. Must be repeated for a total of 4 credits. Prerequisites: DAN 464, 465.

530 Advanced Problems in Analysis of Dance Technique. (3) S

Theories and principles of human anatomy and biomechanics applied to analysis and evaluation of dance movement. Prerequisite: instructor approval.

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. Prerequisite: instructor approval.

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. 6 hours weekly. May be repeated for credit. Placement audition required.

535 Technique and Theory of Ballet. (2) F, S

Graduate-level study of professional advanced ballet technique with emphasis on preparation for performance. 4 hours weekly. May be repeated for credit. Placement audition required.

537 Partnering. (2) S

Fundamental technique, theory and practice of partnering, applicable to all dance forms. Variations from ballet (on pointe and off). May be repeated for credit. Prerequisite: instructor approval.

542 Ideokinesis. (3) F, S

A theoretical examination of Ideokinetic methods of facilitating postural change and movement efficiency.

560 Graduate Dance Pedagogy. (3) F

Advanced analysis of teaching techniques for modern dance and ballet. Prerequisite: instructor approval.

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 263 or equivalent.

563 Individual and Group Choreography. (3) F

Original choreography created for solo and group performance. May be repeated once for credit. Prerequisites: DAN 464, 465; or equivalent.

564 Video Dance Production. (2) N

Dance video production and analysis of current research in the field. Special projects, including thesis documentation, are discussed.

571 Dance Theatre. (1) F, S

Performance in specially choreographed dance productions. 3 hours a week. May be repeated for credit. Prerequisite: instructor approval.

580 Jazz Dance Styles. (2) F

Study of 150 years of jazz dance in America, learning period dances, reading and choreographic assignments. May be repeated for credit. Prerequisite: instructor approval.

591 Seminar. (0-3) F, S

Seminar focusing on enrichment topics, production aspects of thesis projects, teaching concerns, special lectures, films or critiques.

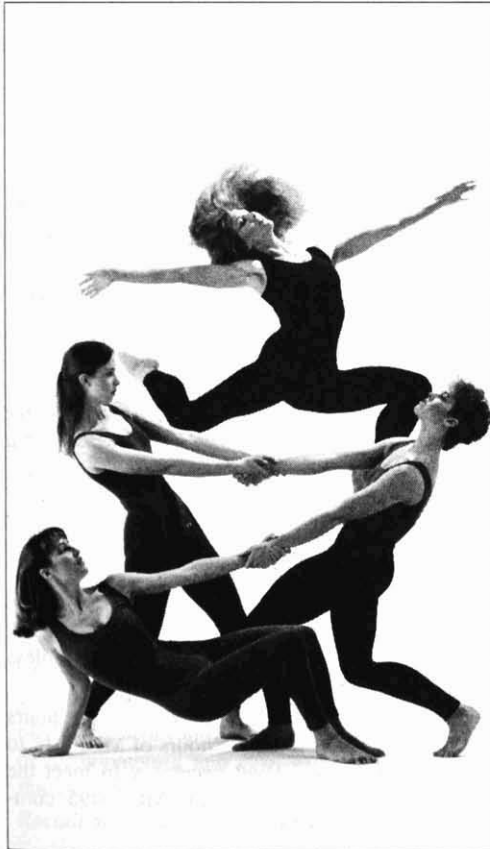
632 Dance Notation III. (3) S

Advanced study of Labanotation. Experiences in notating and reconstruction of Labanotation dance scores. Prerequisite: DAN 332 or equivalent.

680 MFA Performance. (1-9) F, S

Studio work in preparation for required M.F.A. 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 294, 484, 494, 498, 499, 500, 580, 584, 590, 591, 593, 594, 598, 691. (See pages 36-37.)



School of Music

PROFESSORS:

UMBERSON (MUSIC 183), ADDRESS, ATSUMI, BOSWELL, BRITTON, CARROLL, CLARK, DOAN, HAMILTON, HICKMAN, HOOVER, KLIEWER, LOCKWOOD, LOMBARDI, MAGERS, McEWEN, McLEOD, PAGANO, PERANTONI, ROSEN, SEIPP, SHINN, SKOLDBERG, SPINOSA, STOCKER, STRANGE, SWAIM, WYTKO

ASSOCIATE PROFESSORS:

BARROLL, COSAND, CROWE, DEBENPORT, DeMARS, FLEMING, HACKBARTH, HAEFER, HANNA, HARRIS, HOFFER, HOLBROOK, HUMPHREYS, KOONCE, MAROHNIC, METZ, MEYER, OLDANI, RAUSCH, RAVE, REYNOLDS, ROUX, SMITH, STALZER, SUNKETT, UNG, WELLS, WILLIAMSON, WILSON

ASSISTANT PROFESSORS:

DAVIES, FERRIS, MAY, METZ (ASU WEST CAMPUS), ROGERS

PROFESSORS EMERITI:

AUTENRIETH, BOWERS, COEHN, D'ANDREA, DRESSKELL, ENGLISH, FLETCHER, HINES, HOWERY, LAMM, RICKEL, RIDER, ROBINSON, SCOLAR

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/her 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 42-68 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 and piano at another institution; they are required to reach a minimum level of achievement indicated on the Theory Placement Exam and Piano Placement Exam.

Bachelor of Arts Degree Curriculum in the Music Program

Consists of 50 semester 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 semester 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 semester hours, 12 in field of specialization, must be upper-division. Language requirements are listed on page 339 of this *Catalog*.

Bachelor of Music Degree Curriculum in the Music Program

Consists of 84 semester 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 313, 315, 480.

Major performing medium: Eight semester hours of MUP 111 and 8 semester 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

Instrumental Concentration

(*Note: It is strongly recommended that this degree program include a minor in Choral Music or a minor in Jazz Education.*)

Music theory: MTC 125, 221, 222, 223, 327.

Music history: MHL 341, 342.

Conducting: MUP 210, 340.

Music education: MUE 315, 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 semester hours of MUP 111 and 8 semester 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.

Recital attendance: Six semesters of MUP 100.

Instrumental Music

String Concentration

Music theory: MTC 125, 221, 222, 223, 327, 433.

Music history: MHL 341, 342.

Conducting: MUP 210, 340.

Music education: MUE 315, 317 or 318 (whichever does not include the major instrument), 485, 486, MUP 121 (4 hours, a string instrument in the area other than the major instrument), MUP 121 (2 hours, a third string instrument), MUP 121 (2 hours, a fourth string instrument).

Class piano: MUP 131, 132, 231, 232 (unless waived by proficiency exam).

Major performing medium: Eight semester hours of MUP 111 and 8 semester 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. Must have a minimum of six semesters of MUP 345.

Recital attendance: Six semesters of MUP 100.

Recommended electives: MUE 313 and MUP 481.

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.

Major performing medium: Sixteen semester 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 semester 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 semester 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 semester hours of large ensembles within a minimum of six different semesters, plus four semester 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 semester hours selected from MUP 453, 454 or a repeated enrollment of MUP 451.

Diction: MUP 250; four semester hours of diction for singers—English, Italian, German, French.

Conducting: MUP 209.

Major performing medium: Sixteen semester 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 semester 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 semester hours 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 451, 481.

Conducting: MUP 210.

Major performing medium: Sixteen semester 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 semester hours of ensemble within a minimum of six different semesters. Four of the eight hours 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.

Major performing medium: Sixteen semester hours of MUP 127, 8 semester hours of MUP 311, 8 semester 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.

Language: Eight hours of one foreign language: French, Italian, or German are required.

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.

Major performing medium: Eight semester hours of MUP 111 and 8 semester 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 semester 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 semester hours of MUP 111 and 8 semester 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 209 or 210.

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 four 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 semester hours of functional dance; specified courses in science and social and behavioral sciences.

(Note: Students 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 Concentration

Music theory: MTC 125, 221, 222, 223, 320, 321, 323, 327, 422, 425, 428, 496, 10 hours electives in MTC courses 300 or above, to be chosen in consultation with advisor.

Music history: MHL 341, 342, 447, and three elective hours.

Conducting: MUP 209 and 339 or MUP 210 and 340.

Applied music: Twelve semester 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 496.

Recital attendance: Six semesters of MUP 100.

Language: The equivalent of 16 semester hours of credit in one foreign language; the choice of language subject to approval of advisor.

Music Composition Concentration

Music theory: MTC 125, 221, 222, 223, 320, 321, 323 (four semesters), 327, 422, 425, 428, 429, 430, 433.

Music history: MHL 341, 342, 447 and three elective semester hours.

Conducting: MUP 209 and 339, or MUP 210 and 340.

Applied music: Twelve semester 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

For information concerning Music Education minors, consult with the School of Music Undergraduate Coordinator.

Graduate Programs

The School of Music offers the following graduate programs: the Master of Arts degree provides ad-

vanced 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 musical direction, music theatre performance), Choral Music (choral music, general music), Instrumental Music, and Theory and Composition. 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 non-music majors with sufficient symbol 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 non-music majors. *[Satisfies General Studies Requirement: HU]*

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. *[Satisfies General Studies Requirements: HU, H]*

347 Jazz in America. (3) F, S, SS Current practices employed by contemporary jazz musicians; the historical development of jazz techniques. *[Satisfies General Studies Requirement: HU]*

353 Survey of Afro-American Music. (3) A Afro-American music traced from its origins in Africa to the present with emphasis on spiritual, blues, jazz, gospel and classical styles. *[Satisfies General Studies Requirements: HU, H]*

354 Popular Music. (3) A Emphasis on historical, cultural and performance patterns in a variety of popular music idioms. *[Satisfies General Studies Requirement: HU]*

355 Survey of American Music. (2) F, S, SS Growth and development of America's music. *[Satisfies General Studies Requirement: HU]*

356 Survey of the Musical Theatre. (3) N Music's place in the theatre, viewed in terms of historical importance and relative function. *[Satisfies General Studies Requirement: HU]*

357 Aesthetic Perception in Music Performance. (3) F, S, SS Introduces the non-music major to the aesthetics of performance by stressing their physical and emotional involvement in the direction, motion, intensity and color spectrum of music. *[Satisfies General Studies Requirement: HU]*

Special Courses: MUS 294, 298, 394, 484, 492, 493, 494, 497, 498, 499, 500, 580, 583, 584, 590, 591, 592, 593, 594, 598, 599, 600, 680, 683, 684, 690, 691, 692, 693, 700, 780, 783, 784, 790, 791, 792, 799. (See pages 36-37.)

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MUSIC EDUCATION

MUE 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 as a Behavioral Science. (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. Prerequisite: music major.

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. Prerequisite: music major.

The following Educational Methods for Teaching Instruments (317-339) offer teaching and playing skills. Three hours per week.

317 Educational Methods for Violin and Viola. (1) F, S

Teaching and playing skills for music teachers.

318 Educational Methods for Cello and String Bass. (1) F, S

Teaching and playing skills for music teachers.

319 Educational Methods for Strings. (1) F

Teaching and playing skills for music therapists and music minors.

327 Educational Methods for Trumpet and Horn. (1) F, S

Teaching and playing skills for music teachers.

328 Educational Methods for Trombone, Euphonium and Tuba. (1) F, S

Teaching and playing skills for music teachers.

329 Educational Methods for Brass. (1) S

Teaching and playing skills for music therapists and music minors.

335 Educational Methods for Guitar. (1) F, S

Teaching and playing skills for music teachers.

336 Educational Methods for Percussion. (1) F, S

Teaching and playing skills for music teachers.

337 Educational Methods for Flute, Clarinet, Saxophone. (1) F, S

Teaching and playing skills for music teachers.

338 Educational Methods for Double Reed Instruments. (1) F, S

Teaching and playing skills for music teachers.

339 Educational Methods for Woodwinds. (1) F

Teaching and playing skills for music therapists and music minors.

361 Music Therapy Theory and Practice in Psychopathology. (3) F

Influence of music on behavior; principles and practices of music therapy and psychiatric clients. Prerequisites: MUE 261; music therapy major.

362 Music Therapy Techniques. (3) S

Organization, administration and use of music in rehabilitation with various client populations. Prerequisites: MUE 361; music therapy major.

381 Music Therapy Research. (3) S

Statistics and research design appropriate for investigations in music therapy. [Satisfies General Studies Requirement: L2]

384, 385, 386, 387, 388 Therapy Pre-Clinical I-V. (1) F, S

Paired students will provide music therapy for small groups at a community agency for mentally retarded, geriatrics or physically disabled clients for a minimum of ten clock hours. Prerequisites: MUE 211, 261.

441 Psychology of Music. (3) S

Psychological and physiological aspects of music emphasizing musical behavior, function, perception and learning. Prerequisites: music therapy major or instructor approval; junior standing.

475 Group Process and Music Therapy. (1) F

Principles of group process, verbal counseling, professional writing, as related to music therapy practice. Prerequisites: MUE 362; music therapy major.

476 Internship in Music Therapy. (1) F, S

A 6-month residency in an approved clinical institution.

480 Choral Music Practicum. (3) S

Methods of instruction, organization and presentation of appropriate content in choral music classes. Prerequisite: secondary education, major.

481, 482 Instrumental Music Practicum. (5) F, S

Instrumental music as a means of developing music skills, understandings and attitudes in elementary and secondary school students. Prerequisite: secondary education major.

485, 486 String Practicum. (2) F, S

A 2-semester course for students preparing to administer a string program and teach strings at the elementary level.

549 Foundations of Music Education. (3) A

A treatment of historical perspectives, philosophy-aesthetics identified with music education, and learning theories applied to music teaching/learning. Basic research and writing skills appropriate to graduate studies in music education.

550 Studies in Music Curricula. (3) A

Scope and sequence of musical experiences. Development of criteria for the evaluation of music curricula.

551 Advanced Studies in Elementary School Music. (3) A

For experienced teachers; organization and content of the general music classes in kindergarten and the first 6 grades of elementary school. Emphasis on teaching music reading and ear training to young children.

552 General Music, Music Theory and Music History Classes in the Junior and Senior High School. (3) N

Organization and content of school music classes which are not performance oriented.

553 Contemporary Elementary Music. (3) F

Identification 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 with school music classes and organizations.

564 Instrumental Music, Advanced Rehearsal Techniques. (3) A

An in-depth analysis of instrumental techniques in preparation for a thorough discussion of band tuning problems and solutions. Discussion of productive conducting and rehearsal techniques for school music teachers.

566 Instrumental Literature for Schools. (3) N

Comprehensive study and analysis of all types of instrumental music.

568 Choral Music, Advanced Rehearsal Techniques. (3) A

Musical and vocal techniques necessary for presentation of choral literature. Analysis and experimentation with psychological, acoustical and other problems of rehearsal and performance.

570 Choral Literature for Schools. (3) A

Comprehensive study and analysis of choral music for the high school with special emphasis on octavo literature.

579 Psychology of Music. (3) N

The nature of musicality and its evaluation. A review of recent research.

585 Vocal Acoustics and Production. (3) A

An in-depth approach to the psychological/physiological workings of the vocal mechanism.

733 Contemporary Issues and Research in Music Education. (3) S

Emphasis upon recent research relating to music instruction at all levels; current and historical issues in choral, general and instrumental music.

744 Higher Education Instruction. (3) F

Philosophical and psychological principles of college/university teaching. Patterns of music teacher education and a projection of course outlines.

755 Philosophy and Aesthetics in Music Education. (3) SS

Philosophy and aesthetics as they influence curriculum content and teaching procedures.

Special Courses: MUE 294, 298, 394, 484, 492, 493, 494, 497, 498, 499, 500, 580, 583, 584, 590, 591, 592, 593, 594, 598, 599, 600, 680, 683, 684, 690, 691, 692, 693, 700, 780, 783, 784, 790, 791, 792, 799. (See pages 36-37.)

MUSIC HISTORY**MHL 142 Music Listening.** (1) S

Aural perception of a variety of music traditions, genres, forms and techniques. Prerequisite: music major.

152 Jazz Listening. (1) F

An introduction to jazz forms, idioms and major innovators.

341, 342 Music History. (3) F, S

Western music from the Greeks to the present day. Need not be taken in sequence. Prerequisite: MTC 221.

352 The Evolution of Jazz. (3) F

Origin, development and styles of jazz music and its exponents. Prerequisite: MTC 223. [Satisfies General Studies Requirement: H]

438 Music in the Classic Era. (3) N

Development of the classic style of the 18th century; major works of Haydn, Mozart and Beethoven. Prerequisites: MHL 341, 342; MTC 327.

439 Music in the 19th Century. (3) N

European art music after Beethoven. Prerequisites: MHL 341, 342; MTC 327. [Satisfies General Studies Requirement: L2]

441 Music of the Baroque Era. (3) N

Works of major composers and stylistic tendencies of the period. Prerequisites: MHL 341, 342; MTC 327. [Satisfies General Studies Requirement: L2]

447 Music Since 1900. (3) F, SS

Survey of the works by major composers and stylistic trends. Prerequisites: MHL 341, 342; MTC 327. [Satisfies General Studies Requirement: L2]

456 History of Opera. (3) S

The development of opera from its creation c. 1600 to present. Emphasis placed on major stylistic developments and representative works. Prerequisites: MHL 341, 342; MTC 222.

466 North American Indian Music. (3) N

Various styles of Indian music in the United States, Canada and Mexico. Open to music majors and non-majors. [Satisfies General Studies Requirement: HU]

532 Music Bibliography. (3) F

Major historical and analytical writings; systematic and historical collections of music. Reading knowledge of a foreign language recommended.

535 Medieval Music. (3) F

Music of Europe in the Middle Ages, Gregorian chant, religious and secular monophony and polyphony to 1400.

536 Music of the Renaissance. (3) F

Music in Europe, with emphasis on stylistic concepts and changes, c. 1400-1580.

544 World Music I. (3) N

Music of traditional and folk cultures of Africa, Europe and the Americas.

545 World Music II. (3) N

Traditional, folk and art music of the Pacific, Near East and Asia.

547 Topics in American Music. (3) S

Selected topics in the history of music. Composers working in the Americas with emphasis upon music since 1900.

575 History of Choral Music. (3) F

Major choral works.

644 Notation of Polyphonic Music. (3) N

Music notation from the 15th through 17th centuries, including problems of transcription into modern notation.

Special Courses: MHL 294, 298, 394, 484, 492, 493, 494, 497, 498, 499, 500, 580, 583, 584, 590, 591, 592, 593, 594, 598, 599, 600, 680, 683, 684, 690, 691, 692, 693, 700, 780, 783, 784, 790, 791, 792, 799. (See pages 36-37.)

MUSIC THEORY AND COMPOSITION**MTC 125 Basic Music Theory.** (3) F, S

For music majors. Designed to develop aural and notational skills. Meets daily.

221 Music Theory: 18th Century. (3) F, S

Music from the 18th century with a view toward developing students' abilities to analyze, theorize, perform and create examples within the style. Development of related aural, visual and keyboard skills. Prerequisite: MTC 125.

222 Music Theory: 19th Century. (3) F, S

Musical compositions chosen from the late 18th and 19th centuries. Harmonic progressions, melodic construction and rhythmic developments; development of related aural, visual and keyboard skills. Prerequisite: MTC 221.

223 Music Theory: 20th Century. (3) F, S

Representative 20th century compositions with particular emphasis on those elements of melodic, harmonic and rhythmic treatment which break with past conventions. Development of related aural, visual and keyboard skills. Prerequisite: MTC 222.

315 Modern Arranging. (2) F

Techniques in arranging for the contemporary jazz, radio, television and studio orchestra. Prerequisite: MTC 223.

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- 316 Modern Arranging.** (2) S
Continuation of MTC 315. Prerequisite: MTC 315.
- 320 Modal Counterpoint.** (2) F
Counterpoint based on 16th-century vocal polyphonic style. Prerequisite: MTC 221.
- 321 Tonal Counterpoint.** (2) S
Counterpoint based on 18th-century polyphonic style. Prerequisite: MTC 221.
- 323 Composition.** (2) F, S
Creative writing in the smaller forms including the use of harmonic textures and contrapuntal devices. May be repeated for credit. Prerequisite: MTC 223.
- 324 Survey of Jazz Styles.** (2) A
Large ensemble compositions and recorded improvised solos. Prerequisite: MHL 352.
- 327 Form and Analysis I.** (2) F, S
Organizing elements in the most important contrapuntal and homophonic musical forms from the Renaissance through the 19th century. Prerequisite: MTC 223.
- 422 Musical Acoustics.** (4) F, S
Properties of sound and tone. Harmonic series, instruments, the ear, auditorium acoustics and the reproduction of sound. A thorough knowledge of musical notation, intervals, scales and harmony, or 2 years of music theory will be assumed.
- 425 Studies in 20th Century Theory.** (3) F
Continued development of analytical techniques and aural skill, with an examination of the theoretical systems applicable to 20th century music. Prerequisite: MTC 223.
- 428 Form and Analysis II.** (2) S
Organizing principles of the large forms of musical composition in the 19th and 20th centuries. Prerequisite: MTC 327.
- 429 Canon and Fugue.** (2) N
Writing of canons and fugues in tonal style. Prerequisite: MTC 321.
- 430 20th Century Counterpoint.** (2) N
Counterpoint studies utilizing 20th-century idioms. Prerequisite: MTC 223.
- 431 Choral Arranging.** (2) S
Practical studies in editing and arranging for choral organizations. Preparation of suitable materials for young choirs and advanced groups. Study of accompaniments. Prerequisite: MTC 223.
- 433 Orchestration.** (3) N
Theoretical and practical study of scoring for orchestral instruments in various combinations, ranging from small ensembles to symphonic orchestra and concert band. Prerequisite: MTC 223.
- 436 Electronic Studio Techniques.** (2) F, S
Principles of electronic music systems and their applications in the composition and recording of electronic music. May be repeated for credit. Cannot be used to fulfill theory requirements on graduate degrees.
- 441 Jazz Composition.** (3) F
Creative writing in the smaller forms and in the idiom of jazz. Prerequisite: MTC 321.
- 495 Final Project.** (0) F, S
A half recital of compositions or approval of a large scale composition or a research paper.
- 496 Theory Project.** (3) F, S, SS
Supervised individual writing project dealing with music theory.
- 501 Ear Training Review.** (2) SS
Melodic and harmonic dictation. Credit cannot be applied toward the graduate theory requirement.

- 520 Analytical Techniques.** (3) S, SS
Analytical techniques systematically applied to music. Concentration on structural and compositional procedures.
- 523 Advanced Composition.** (2) F, S
Creative writing in the larger forms for chorus, orchestra and band. May be repeated for credit.
- 525 Pedagogy of Theory.** (3) N
Practices and principles of teaching music theory. Emphasizes most desirable and practical offerings possible. Comparative studies of existing practices.
- 527, 528 Evolution of Musical Theory.** (3) F, S
Theory from Pythagoras to the present. Need not be taken in sequence.
- 553 Advanced Choral Arranging.** (2) F
Choral techniques in composition and arranging. Vocal writing through analysis of choral works. Projects in both arranging and composition.
- 554 Advanced Scoring Problems.** (2) N
Instrumentation. Playing characteristics of each instrument; writing and arranging idiomatic music for the instrument. Projects in both scoring and composition.
- Special Courses:** MTC 294, 298, 394, 484, 492, 493, 494, 497, 498, 499, 500, 580, 583, 584, 590, 591, 592, 593, 594, 598, 599, 600, 680, 683, 684, 690, 691, 692, 693, 700, 780, 783, 784, 790, 791, 792, 799. (See pages 36-37.)

MUSIC PERFORMANCE

- MUP 100 Concert Attendance.** (0) F, S
Required of all music majors for 6 semesters in each degree program, with a minimum of 7 concerts attended each semester.
- 111, 311, 511 Studio Instruction.** (2) F, S
For majors in music degree program. Placement audition required. Piano, organ, harpsichord, voice, harp, flute, oboe, clarinet, saxophone, bassoon, trumpet, cornet, horn, euphonium, guitar, trombone, tuba, percussion, violin, viola, cello, contrabass. May be repeated for credit. Minimum contact of 1 hour plus studio class weekly. May not be taken for audit.
- 121, 321, 521 Studio Instruction.** (1) F, S, SS
For secondary or minor instrument instruction and nonmajors in the university. Placement examination and audition required. Piano, organ, harpsichord, voice, harp, flute, oboe, guitar, clarinet, saxophone, bassoon, trumpet, cornet, horn, euphonium, trombone, tuba, percussion, violin, viola, cello, contrabass. May be repeated for credit. Minimum contact of 1/2 hour per week. May not be taken for audit.
- 127, 327, 527 Studio Instruction.** (4, 4, 4 or 2) F, S
For performance majors in bachelor of and master of music degree programs only. Placement examination and audition required. Piano, piano accompanying, organ, harpsichord, voice, harp, flute, oboe, clarinet, guitar, saxophone, bassoon, trumpet, cornet, horn, euphonium, trombone, tuba, percussion, violin, viola, cello, contrabass. May be repeated for credit. Minimum contact of 1 hour plus studio class weekly. May not be taken for audit.
- 130 Beginning Group Piano.** (1) F, S
Provides a basic introduction to playing piano through music reading, chords, rhythmic and written activities. Non-music majors only.
- 131, 132, 231, 232 Class Piano.** (1) F, S
A 4-semester sequence of courses designed for those lacking piano experience and those who need piano as a classroom tool. Emphasis on keyboard technique, sight reading simple accompaniments and improvisation. 2 hours a week. May not be taken for audit.

133, 134, 233, 234 Class Voice. (1) F, S

Open to all students interested in the development of basic singing techniques. 2 hours a week. May not be taken for audit.

141 Jazz Fundamentals. (1) F

Principles, methods and theory of jazz performance, especially designed for the small jazz ensemble. 2 hours per week.

142 Jazz Fundamentals. (1) S

Continuation of MUP 141. 2 hours per week.

209 Beginning Choral Conducting. (1) F, S

Essentials of choral conducting techniques. 2 hours a week.

210 Beginning Instrumental Conducting. (1) S

Essentials of instrumental conducting techniques. 2 hours per week.

217, 218 Improvisation Workshop. (2) F, S

Emphasis on basic jazz literature, chord symbol reading, melodic patterns, ear training, melodic concepts and analysis of improvised solos. Must be taken in sequence; may not be taken for audit. Prerequisites: MTC 125; MUP 111 (1 semester).

235, 236 335, 336 Jazz Piano. (1) F, S

A 4-semester sequence designed for jazz keyboard experience. Emphasis will be on chord symbol reading, simple improvisation and voicing. 2 hours per week. Prerequisite: MUP 132.

250 Diction for Singers. (1) F, S

Use of phonetics in the study of song and opera literature. Language emphasis differs each semester. May be repeated for credit.

301 Advanced Class Piano. (1) F

Required for choral and general majors. Open to other music majors who have completed MUP 232. Emphasis on accompaniments, ensemble playing, score reading, advanced harmonizations, repertoire, technique and improvisation. May not be taken for audit. 2 hours per week. Prerequisites: MUP 232 or proficiency; placement examination.

302 Advanced Class Piano. (1) S

Required for choral and general majors. Open to other music majors who have completed MUP 301. A sequential continuation of MUP 301 skills which include both group and studio instruction. May not be taken for audit. 2 hours per week. Prerequisites: MUP 301 or proficiency; placement examination.

328 Fretboard Harmony and Pedagogy. (3) S

Application of traditional melodic and harmonic concepts to the fingerboard. Method books and pedagogical approaches. Prerequisite: MTC 223.

337 Studio Instruction-Piano Accompanying. (2) S

Lessons for accompanying majors only. Repertoire to be selected from vocal and instrumental literature. Placement examination required. 1 hour lesson a week. May be repeated for credit.

339 Choral Conducting. (2) F, S

Elements of choral conducting technique and interpretation. 3 hours a week. Prerequisite: MUP 209 or 211.

340 Instrumental Conducting. (2) F

Fundamentals of score reading and interpretation of instrumental music. 3 hours a week. Prerequisite: MUP 210 or 211.

341 Jazz Pedagogy. (3) S

Training and supervised practice in conducting jazz ensembles with emphasis on literature, programming and rehearsal techniques. 2 class hours and 2 field experience hours each week. Prerequisite: MUP 210.

344 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.

345 Symphony Orchestra. (1) F, S

Open to all students who can qualify on the basis of auditions with the director. Over a 4-year period, the student is introduced to the masterpieces of symphony orchestra literature. 3 times a week. May be repeated for credit.

350 Choral Union. (1) F, S

Open to all students in the university and to interested singers in the community by audition. Preparation and performance of the larger choral works. May be repeated for credit. 2 hours per week.

352 Concert Choir. (1) F, S

Membership chosen by audition. May be repeated for credit. 4 hours a week.

353 University Choir. (1) F, S

Membership chosen by audition. May be repeated for credit. 4 hours a week.

355 Men's Chorus. (1) F, S

Open to all male students in the university who can qualify on the basis of auditions. Rehearsal and performance of music for male voices. 2 hours a week. May be repeated for credit.

357 Women's Chorus. (1) F, S

Membership chosen by audition. 2 hours a week. May be repeated for credit.

361 Marching and Concert Bands. (1) F, S

Open to all students who can qualify on the basis of auditions with the director. Staging of formations and drills for football games and other events (Fall); masterpieces of symphonic band literature (Spring). Meets daily. May be repeated for credit.

362 Concert Bands. (1) F

Night rehearsals. Membership chosen by audition. May be repeated for credit.

370 Music Theatre: Techniques. (1) F, S

Exercises and improvisations for the singing actor emphasizing body awareness, isolations and freedom of the vocal and breath mechanisms. Section 1 (Interpretation); Section 2 (Expression); Section 3 (Movement for Singers). Each section: 3 hours per week. May be repeated for credit.

371 Music Theatre: Workshops. (1) F, S

Development of specific skills for musical-dramatic interpretation. Section 1 (Role Preparation); Section 2 (Styles); Section 3 (Opera Scenes); Section 4 (Musical Comedy); Section 5 (Revue Ensembles). Each section: 1 lecture demonstration, 1 lab per week. May be repeated for credit.

372 Music Theatre: Orchestras. (1) F, S

Open to all students who can qualify on the basis of auditions with the instructor. Participation in Lyric Opera Theatre productions. Section 1 (Orchestra); Section 2 (Chamber Orchestra); Section 3 (Chamber Ensemble). May be repeated for credit.

373 Music Theatre: Performance. (1) F, S

Open to all students who can qualify on the basis of auditions with the instructor. Participation in Lyric Opera Theatre productions. Section 1 (Principal Roles); Section 2 (Chorus). May be repeated for credit.

374 Music Theatre: Production. (1) F, S

Participation in Lyric Opera Theatre productions. Section 1 (Vocal Performance); Section 2 (Technical Music Theatre); Section 3 (Problems in Production) to be taken concurrently with MUP 373. Section 2. May be repeated for credit.

360 SCHOOL OF MUSIC

379 Chamber Music Ensembles. (1) F, S

String, brass, woodwind, percussion, keyboard, vocal and mixed ensembles. May be repeated for credit. 2 hours a week. Prerequisite: instructor approval.

382 Collegium Musicum. (1) F, S

Singers and instrumentalists specializing in the performance of early and unusual music. May be repeated for credit. 2 hours a week. Prerequisite: instructor approval.

383 New Music Ensemble. (1) F, S

Rehearsal and performance of music written in the last 20 years. May be repeated for credit. Prerequisite: instructor approval.

384 Brass Choir. (1) F, S

Specializing in public performance of music written for brass instruments. May be repeated for credit. 3 hours a week. Prerequisite: instructor approval.

385 Percussion Ensemble. (1) F, S

Rehearsal and performance of standard and original repertoire for the percussion ensemble and related instruments. Membership by instructor approval. May be repeated for credit. 2 hours a week.

386 Stage Band. (1) F, S

Rehearsal and performance of literature for the stage band. Membership by instructor approval. May be repeated for credit. 4 hours a week.

388 Piano Accompanying. (1) F, S

Accompanying majors (others at the discretion of instructor). Piano accompaniments found in vocal and instrumental literature; discussion of styles and performance practices; experience in public performance. May be repeated for credit. 2 hours a week.

417, 418 Advanced Improvisation. (2) F, S

Emphasis on analysis and performance of advanced jazz literature; composition in contemporary styles. Must be taken in sequence. May not be taken for audit. Prerequisite: MUP 218.

440 Keyboard Harmony. (1) F

Performance-oriented class emphasizing chord progressions, harmonization, figured bass realization, stylistic improvisation, transposition, open score reading and sight reading. Prerequisite: keyboard major or instructor approval.

451 Repertoire. (2) F, S

Literature available for performance in all performing media. May be repeated for credit. Prerequisite: junior standing in major performance field.

452 Piano Repertoire II. (2) S

Continuation of MUP 451 (Piano). Romantic and contemporary keyboard literature. Prerequisites: junior standing as piano major; instructor approval.

453 Song Literature. (2) A

American, Russian, Spanish, Scandinavian and contemporary song.

454 Song Literature. (2) A

Early Italian, English, German and French art song.

481 Performance Pedagogy and Materials. (2) F, S

Principles and methods of performance techniques for each performance field. May be repeated for credit. Prerequisite: senior standing or instructor approval.

482 Piano Pedagogy II. (2) N

Continuation of MUP 481 (Piano). Problems and techniques of teaching intermediate to advanced piano students. Prerequisites: junior standing as piano major; instructor approval.

487 Piano Accompanying. (1) F

Keyboard majors. Piano accompaniments found in vocal and instrumental literature; discussion of styles and performance practices; experience in public performance. May be repeated for credit. 2 hours per week. May not be taken for audit.

495 Solo Performance. (0) F, S

For bachelor of music degree candidates where one-half recital is a graduation requirement.

496 Solo Performance. (0) F, S

For bachelor of music in performance degree candidates where a full recital is a graduation requirement. Prerequisite: MUP 495.

507 Group Piano Practicum. (2) F

Curricula, materials, teaching techniques for group teaching at the university and community college levels. Observation/supervised teaching in group piano.

508 Studio Observation. (1) F, S

Weekly observation of studio teaching by various piano faculty. Paper as final requirement. Prerequisite: M.M. performance/pedagogy piano student.

540 Advanced Conducting. (3) F

Score preparation and conducting techniques for instrumental music. Concentration on study of historical styles. Required of D.M.A. students in instrumental music.

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. 3 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. 2 hours per week. May be repeated for credit.

551 Repertoire. (2) N

Literature available for performance in all performing media. May be repeated for credit.

552 Concert Choir. (1) F, S

Membership chosen by audition. 4 hours a week. May be repeated for credit.

553 University Choir. (1) F, S

Membership chosen by audition. 4 hours a week. May be repeated for credit.

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. 2 hours a week. May be repeated for credit.

557 Women's Chorus. (1) F, S

Membership chosen by audition. 2 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: 3 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); Section 4 (Musical Comedy); Section 5 (Revue Ensembles). Each section: 1 lecture-demonstration, 1 lab 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 (Orchestra); Section 2 (Chamber Orchestra); Section 3 (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 (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. 2 hours a week. May be repeated for credit. Prerequisite: instructor approval.

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. 2 hours a week. May be repeated for credit. Prerequisite: instructor approval.

583 New Music Ensemble. (1) F, S

Rehearsal and performance of music written in the last 20 years. May be repeated for credit. Prerequisite: instructor approval.

584 Brass Choir. (1) F, S

Public performance of music written for brass instruments. 2 hours a week. May be repeated for credit. Prerequisite: instructor approval.

585 Percussion Ensemble. (1) F, S

Rehearsal and performance of standard and original repertoire for the percussion ensemble and related instruments. Membership by instructor approval. 2 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 instructor approval. 4 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. 2 hours per week. May be repeated for credit.

595, 596 Solo Performance. (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 or 2) F, S

For D.M.A. candidates only. Minimum contact of 1 hour per week. May be repeated for credit.

796 Solo Performance. (1-5) F, S

For D.M.A. candidates only. May be repeated for credit.

Special Courses: MUP 294, 298, 394, 484, 492, 493, 494, 497, 498, 499, 500, 580, 583, 584, 590, 591, 592, 593, 594, 598, 599, 600, 680, 683, 684, 690, 691, 692, 693, 700, 780, 783, 784, 790, 791, 792, 799. (See pages 36-37.)

Theatre

PROFESSORS:

WRIGHT (GHALL 232), AKINS, DOBKIN,
DOYLE, YEATER

ASSOCIATE PROFESSORS:

BARTZ, ENGEL, SALDAÑA, THOMSON, VINING

ASSISTANT PROFESSORS:

BARKER, RISKE, SINGER, STARK

VISITING LECTURER:

GRANGER

VISITING ASSISTANT PROFESSOR:

BRITTEN

Departmental Major Requirements

For advisement purposes, all students registering in a Theatre degree program will enroll through the College of Fine Arts. Special advisement check sheets, providing complete information regarding requirements and suggested electives, are available in the Department of Theatre office for each degree program and area of concentration.

Bachelor of Arts Degree Curriculum

Theatre. Consists of a minimum of 45 semester hours and a maximum of 60 semester hours. Within the major (including related area studies considered part of the major), only courses with a grade of "C" or higher may be applied toward graduation. The following core of course work in Theatre is required: THE 220, 225, 320, 321; THP 101, 213, 315, 330, 340, 345; at least two semester hours in THP 301, chosen from different production options; and at least three hours in THE 325. 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 338 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 completion 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

Consists of 84 hours in Theatre (including approved related area studies considered part of the major). On the basis of personal interests and professional objectives, the student may select one of two curriculum options: Theatre Education or Performance/Production with an emphasis in acting, child drama, or design/technology. Candidates for the B.F.A. degree must take the last 60 hours of course work in residence at ASU. Retention in the B.F.A. program will be determined by annual faculty review of all candidates for the degree; the review process will include consideration of the student's academic record, professional activities and growth and artistic potential. A minimum of 42 hours in General Studies is required. See page 338 for approved areas of study and distribution of hours as required by the College of Fine Arts. Some adjustments are made in the Theatre Education option in order to meet certification requirements. Admission procedures and theatre course requirements for each curriculum option/emphasis follow:

Performance/Production

Acting. Students should declare an acting emphasis at the time of admission. Retention in the emphasis will be determined by audition during the spring semester of freshman and sophomore years. Auditions for advanced placement of transfer students and for scholarship applicants will be held only in spring and in late summer. Specific dates may be obtained from the Theatre Office. The following courses are required: THE 220, 313, 320, 321, 325 (3 hours); THP 103, 104, 107, 110, 113, 200, 203, 204, 207, 210, 213, 301 (4 hours), 307, 310, 315, 370, 371, 375, 376, 410, 470, 471, 475, 476 and 498 (Senior Project); 9 hours of theatre history and literature; and graduation requirements selected in consultation with a B.F.A. advisor.

Child Drama. Acceptance in this emphasis is by interview only (or submission of three letters of recommendation and a letter of intent if distance prohibits coming to campus) and with the approval

of the faculty of the Department of Theatre. Application will normally be made at the end of the sophomore year; applications for early admission of ASU freshmen will be accepted toward the end of the second semester of full-time study. Retention in this emphasis is determined at the end of each semester of the junior year. The following theatre and professional courses are required: THE 220, 320, 321, 325 (3 hours); THP 101, 113, 213, 311, 312, 315, 318, 330, 340, 345, 411, 418, EED 313, LIS 410. Two hours credit in THP 301 chosen from different production options; three hours of theatre history or literature; and theatre and related area electives selected in consultation with an advisor to complete the major requirement of 84 hours.

Design/Technology. Acceptance in this emphasis is by interview and portfolio review. Retention in the emphasis is determined at the end of each semester of the junior year. The following theatre courses are required: THE 220, 320, 321, 325 (3 hours); THP 101, 213, 315, 330, 340, 345, 406, 431, 435, 440, 445, 498 (Senior Project), three hours of theatre history or literature; and theatre related area electives selected in consultation with a B.F.A. advisor, to complete the major requirement of 84 hours.

Theatre Education

Acceptance in this option is by interview only (or submission of three letters of recommendation and a letter of intent if distance prohibits coming to campus) and with the approval of the faculty of the Department of Theatre. Application will normally be made at the end of the sophomore year; applications for early admission of ASU freshmen will be accepted toward the end of the second semester of full-time study. The student will also be required to meet admission standards mandated by the ASU College of Education and the Arizona Department of Education for teacher certification (see page 225).

The following theatre professional courses are required: THE 220, 320, 321, 325 (3 hours), 480; THP 101, 110, 113, 213, 270, 275, 311, 315, 330, 340, 345, 411, 415, 498 (Production Practicum); a minimum of two hours credit in THP 301, Summer High School Theatre Workshop; and all course/test requirements in professional education as established by the College of Education to complete the major requirements of 84 hours. For retention in the Theatre Education option a grade point average of 3.00 in the major and professional courses and a 2.50 in graduate requirements course work in addition to an annual review is required.

Departmental Minor Teaching Field Requirements

Elementary Education Major: Minor in Theatre. Consists of 27 semester hours, including: THE 220; THP 101, 213, 311, 312, 318, 411 and 418; plus one additional course in technical theatre.

Secondary Education Major: Minor in Theatre. Consists of 24 semester hours, including: THE 220, 480, THP 101, 213, 311, 315, 415 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. [*Satisfies General Studies Requirement: HU*]

220 Principles of Dramatic Analysis. (3) S
Analysis, interpretation and evaluation of dramatic literature for theatrical production. Selected readings of classic, modern and contemporary plays. Prerequisite: theatre major.

225 Orientation to Theatre. (1) F
Orientation to university and department resources and procedures. Career planning and guidance. Research and writing related to theatre production. Required for B.A. theatre majors.

300 Film: The Creative Process. (3) F, S, SS
Elements of the theatrical film: cinematography, sound, editing, directing, acting, scriptwriting, producing and criticism. 3 lectures, 2 hours lab. [*Satisfies General Studies Requirement: HU*]

313 Theatre Design. (3) S
Survey of modern theatre design/technology principles and elements. Intended for non-majors and B.F.A. acting students. Prerequisite: THP 213.

320, 321 History of the Theatre. (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. [*Satisfies General Studies Requirements HU, H*]

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. Prerequisite: theatre education and child drama major.

Prerequisite: theatre major.
[*Satisfies General Studies Requirement: HU*]

400 Focus on Film. (1) F, S, SS
Intensive study of a particular film, director, actor, genre or other film topic. May be repeated for credit. Prerequisite:

THE 300, ENG 360 or instructor approval. [*Satisfies General Studies Requirement: HU*]

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. [*Satisfies General Studies Requirements: HU, H*]

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. [*Satisfies General Studies Requirements: HU, H*]

425 History of the Oriental Theatre. (3) N
History and production techniques of theatre forms in India, China and Japan. Prerequisite: 6 hours of theatre history or instructor approval.

480 Methods of Teaching Theatre. (3) F
Methods of drama and theatre instruction at the secondary school level. Prerequisite: acceptance to the Professional Teacher Preparation Program.

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.

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

520, 521 Theatre History and Literature. (3) F, S
A survey of historical periods, dramatic genres and theatre literature. THE 520: Beginning - 17th Century; THE 521: 17th Century - Present.

591 Seminar. (3) A
Selected topics in child drama, community theatre and theatre history. Prerequisite: written instructor approval.

Special Courses: THE 294, 394, 484, 492, 494, 498, 499, 500, 590, 591, 592, 593, 594, 598, 599. (See pages 36-37.)

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.

103, 104 Voice/Movement for the Stage I, II. (2) F, S
An introduction to stage speech and movement techniques for the professional actor. Second semester is a continuation of skill development. Prerequisite: B.F.A. acting majors.

107 Acting: Beginning Techniques. (3) F
An introduction to the work processes and terminology of the professional actor, preparatory to further study. Lectures, exercises and projects. Prerequisite: B.F.A. acting majors.

110 Acting: Beginning Scene Study. (3) F, S
Rehearsal and performance of modern plays with emphasis on realistic acting styles. 6 hours a week including lab/rehearsal period. Spring semester limited to B.F.A. acting majors. Prerequisites: THP 101 or 107; written instructor approval.

113 Makeup. (3) F, S
Techniques of theatrical make-up. 1 hour lecture; 2 hours lab.

364 THEATRE

200 Actor's Workshop. (0) F, S

Attendance at a variety of guest lectures and performances, demonstrations of new techniques and individual acting projects. Required of all B.F.A. acting majors for 6 semesters.

203, 204 Voice/Movement for the Stage III, IV. (2) F, S

The development of increased physical flexibility, vocal power and variety for the professional actor. Second semester is a continuation of skill development. Prerequisites: THP 104; B.F.A. acting major.

207 Acting: Intermediate Scene Study. (3) F, S

Rehearsal and performance of modern realistic and non-realistic plays. Emphasis on scene structure, character analysis and actor-to-actor relationships. 6 hours a week including lab/rehearsal period. Fall semester limited to B.F.A. acting majors. Prerequisites: THP 110; written instructor approval.

210 Acting: TV/Film. (3) S

Special technical aspects of acting before a camera. Prerequisites: THP 207 and B.F.A. acting major; or written instructor approval.

213 Introduction to Technical Theatre. (3) F, S

Procedures of technical theatre production and demonstration. Topics include design and construction of scenery, lighting and properties. 2 hours lecture; 3 hours lab.

270 Introduction to Stage Speech. (3) A

Exercises and techniques to free the voice and improve projection, resonance and articulation. International Phonetic Alphabet and Standard Stage Speech covered. Non-B.F.A. acting majors only. Prerequisite: THP 101 or instructor approval.

275 Introduction to Stage Movement. (3) A

Movement vocabulary and physical training in relaxation, alignment, conditioning, rhythm and poise. Non-acting majors only. Prerequisite: THP 101 or instructor approval.

294 Special Topics. (1-4) A

(a) Acting Techniques

301 Theatre Production. (1-4) F, S, SS

Participation in University Theatre productions. Prerequisite: written instructor approval. May be repeated for credit.

307 Acting: The Inner Process. (3) F

An advanced class for individualized work on concentration, personalization, self-awareness, visualization, substitution, creating inner and outer characters. Exercises, monologues and scenes. Prerequisites: THP 210, B.F.A. acting major; or written instructor approval.

310 Acting: Advanced Scene Study. (3) S

Script analysis and performance of modern classics. 6 hours a week. Prerequisites: THP 307, B.F.A. acting major; or written instructor approval.

311 Creative Drama. (3) F, S, SS

Theories, procedures and materials for creative drama in the elementary and junior high schools. Related drama activities—storytelling and choral speaking. Not open to freshmen.

312 Puppetry With Children. (3) F

Construction and manipulation of puppets; practice in performance skills. Emphasis on educational and recreational uses of puppetry by and with children. Prerequisite: junior standing or above required.

315 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 instructor approval.

318 Theatre for Children. (3) F

Dramatic literature for children. Experience in acting, directing and production techniques for child audiences. Prerequisites: written instructor approval; not open to freshmen.

330 Introduction to Costuming. (3) F, S

History of theatrical costume. Laboratory experience in construction of costumes. 3 lectures, 2 hours lab.

340 Scene Design. (3) F, S

Studio projects in designing realistic scenery for the contemporary proscenium stage. Prerequisite: THP 213 or instructor approval.

345 Lighting Design. (3) F, S

Principles of modern stage lighting. 2 lectures, 2 hours lab. Prerequisite: THP 213 or instructor approval.

370, 371 Voice for the Stage V, VI. (2) F, S

Exercises to develop vocal flexibility and power; mastery of standard speech and phonetic alphabet; introduction to dialects. Second semester continues skill development. Prerequisites: THP 204, B.F.A. acting major; or written instructor approval.

375, 376 Movement for the Stage V, VI. (2) F, S

Training for a strong, well-aligned, flexible, expressive body. Tumbling, mime, juggling, combat, characterization. Second semester is a continuation of skill development. 4 hours a week. Prerequisites: THP 204, B.F.A. acting major; or written instructor approval.

394 Special Topics. (1-4) A

Intermediate Acting Techniques.

401 Theatre Practicum. (1-3) F, S, SS

Performance and production assignments for advanced students of acting, technical production and design. May be repeated for credit. Prerequisite: B.F.A. student.

406 Scenography. (3) N

Concepts of total design direction. Production analysis and design incorporating all major visual elements including scenery, lighting, costumes and makeup. Prerequisites: THP 330, 340, 345; senior standing; instructor approval.

410 Acting: Classical Styles. (3) A

Rehearsal and performance of period, classical and non-realistic plays. Emphasis on delivery of poetic language. Prerequisites: THP 310, B.F.A. acting major; or written instructor approval.

411 Advanced Studies in Creative Drama. (3) S

Application of theories, techniques and materials for dramatization. Regular participation with children. Prerequisite: THP 311 or instructor approval.

415 Directing Workshop. (3) F, S

Rehearsal and performance of scenes and short plays. May not be taken concurrently with THP 110. Prerequisites: THP 315; written instructor approval.

417 Stage Management. (3) F, S

Readings in stage management and participation as a stage manager in a University Theatre production. Prerequisite: written instructor approval.

418 Advanced Studies in Theatre for Children. (3) F

Concentration on specific directing and producing techniques in theatre for young audiences. Practical experience in directing scenes from plays. Prerequisite: THP 318.

430 Costume Design. (3) N

Principles of costume design, with projects in both modern and period styles. Prerequisite: THP 330.

431 Costume Construction. (3) A

Uses of materials and techniques for stage costumes with actual construction of period apparel. Prerequisite: THP 330.

435 Advanced Technical Theatre. (3) N

Selection of materials, drafting of working drawings, tool operation and construction techniques. 2 lectures, 2 hours lab. Prerequisites: THP 340, 345; instructor approval.

440 Advanced Scene Design. (3) A

Advanced studio projects in designing nonrealistic scenery for a variety of stage forms. Prerequisite: THP 340 or instructor approval.

441 Scene Painting. (3) A

Studio projects in painting stage scenery. Prerequisite: THP 340 or instructor approval.

445 Advanced Lighting Design. (3) N

Specialized techniques in stage lighting. 2 lectures, 2 hours lab. Prerequisite: THP 345 or instructor approval.

450, 451 Theatre Organization and Management. (3) N

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 instructor approval.

461 Playwrights Workshop. (3) F, S

Staged readings and discussion of completed works and works in progress by advanced students of playwriting. May be repeated for credit. Prerequisite: THP 460 or written instructor approval.

470, 471 Voice for the Stage VII, VIII. (2) F, S

Vocal techniques and language skills for the classical and non-realistic theatre. Second semester includes advanced dialects and requires knowledge of International Phonetic Alphabet. Prerequisites: THP 371, B.F.A. acting major; or written instructor approval.

475, 476 Movement for the Stage VII, VIII. (2) F, S

Movement techniques for the classical and non-realistic theatre. Second semester is a continuation of skill development. Prerequisites: THP 376, B.F.A. acting major; or written instructor approval.

494 Special Topics. (1-4) A

Topics may be selected from the following:

- (a) Advanced Acting Techniques
- (b) Curriculum and Supervision of Child Drama in the School
- (c) Puppetry in Performance
- (d) Storytelling
- (e) Advanced Scene Painting
- (f) Costume Design II
- (g) Drafting for Theatre
- (h) Lighting Design III
- (i) Technical Theatre III
- (j) Properties and Dressings Design and Construction
- (k) Rendering
- (l) Scene Design III
- (m) Video and Industrial Scene Design

498 Pro-Seminar. (1-7) A

Topics may be selected from the following:

- (a) Senior Project: Acting
- (b) Children's Theatre Tour
- (c) Theatre in Education
- (d) Technical Theatre

Prerequisite: written instructor approval.

506 Scenography. (3) N

Concepts of total design direction. Production analysis and design incorporating all major visual elements including scenery, lighting, costume and makeup. Prerequisites: THP 330, 340, 345; senior standing; instructor approval.

511 Creative Drama Workshop. (3) A

Readings in textual materials for creative drama, alternative methods and materials for drama with children and special populations, practicum included. Prerequisites: THP 311; instructor approval.

512 Puppetry Workshop. (3) F

Survey of puppetry in education, puppetry as an art form design and performance.

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 415; instructor approval.

518 Directing Practicum. (4) A

A study of recent production practices and practical experience in directing and producing an entire play or musical for young audiences. Prerequisites: THP 418; instructor approval.

584 Internship. (1-3) A

Field research and on-site training in child drama, community theatre and production techniques. Prerequisite: written instructor approval.

594 Conference and Workshop in Child Drama. (3) A

Prerequisite: instructor approval.

593 Applied Projects. (1-12) A

Prerequisite: instructor approval.

611 Creative Drama Seminar. (3) A

Examination of current theory and practices in the field. Prerequisite: instructor approval.

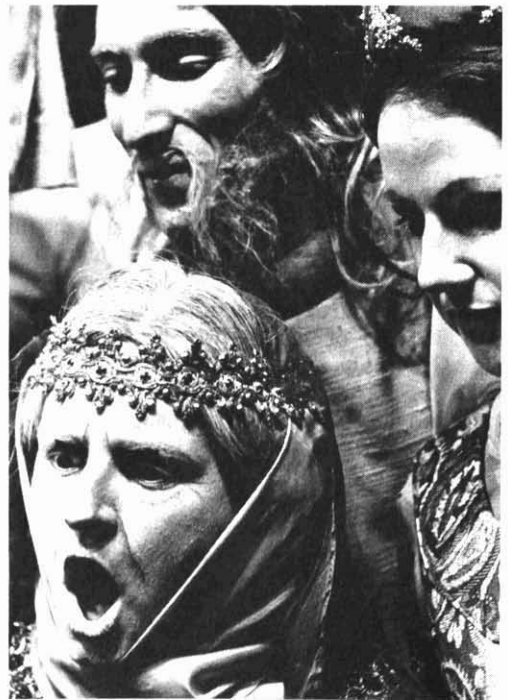
618 Directing Practicum. (2) A

Practical experience in directing and producing an entire play or musical for young audiences. Prerequisites: THP 518; instructor approval.

684 Internship. (3-6) F, S

Field research in creative drama, children's theatre, puppetry and scenography. Prerequisite: instructor approval.

Special Courses: THP 294, 394, 484, 492, 494, 498, 499, 580, 584, 590, 591, 592, 593, 594, 598, 599. (See pages 36-37.)



College of Law

Paul Bender, LL.B.

Dean

Purpose

The prime function of the College of Law is to train men and women for the practicing legal profession and related professional assignments. In addition, the college has the responsibility to contribute to the quality of justice administered in our society.

Juris Doctor Degree

The College of Law offers a three-year program of professional studies at the graduate level leading to the degree of Juris Doctor. Graduates enter many branches of the legal profession as well as careers in government, business, finance, industry and education.

To fulfill the requirements for a J.D. degree, a student must satisfy all of the following:

1. Admission to the college as a candidate for the degree and satisfaction of any conditions imposed at the time of admission or prior to graduation during the law course.
2. Satisfaction of residency requirements for the College of Law.
3. Successful completion of a minimum of 87 hours of academic credit of which 60* must be graded with a cumulative weighted average of 70 or better and no more than eight semester hours of "D" (60-69) grade work after the first year can be applied toward the 87 hours.
4. Completion of all required college courses.
5. Completion of the degree requirements within five years of entry into law school.
6. Completion of one substantial paper.

Except in the case of a transfer student, a student must be in residence at the college as a full-time student for a minimum of six semesters or their

equivalent. A semester in residence is earned where a student has been enrolled in a minimum of ten hours of course work. A transfer student must complete the work of at least three semesters in the college immediately preceding the granting of a degree.

The College of Law and the Department of Economics offer a joint degree program in which participating students can earn the J.D. degree and an M.S. in Economics, usually in three and one-half years of study. Additional information about the program is available from the Department of Economics or the College of Law.

Admissions

First-year students are admitted only for the fall semester. The formal requirements for admission to the College of Law are:

1. An undergraduate degree from an accredited four-year college or university (B.S., B.A. or equivalent).
2. A score on the Law School Admission Test (administered by the Law School Admissions Services, Box 2000, Newtown, PA 18940, in centers throughout the country).

To be assured of consideration 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 personal statement not to exceed three pages should be received by the College of Law no later than March 1.

Each year many more students apply than can be accepted. The College of Law receives about ten applications for each of the 150 places to be filled in the entering class. Accordingly, the admission process is selective. An attempt is made to identify those applicants whose credentials evidence abilities to think clearly, read and synthesize complicated materials, write well and make a significant

* Students who wish to be eligible for membership in the Order of the Coif, an honor society open to the top 10% of each graduating class, must complete at least 75% (66 hours) of their law studies in graded classes.

contribution to the educational program of the law school.

Two main factors considered in the admissions process are the cumulative undergraduate grade point average (GPA) and the LSAT score. In combination, these give a starting point for detailed examination of the file. When the combination of these two items is high, the likelihood of admission is also high.

The selection process is often not strictly mathematical since other matters often bear upon the validity of the GPA or LSAT and the capability of the candidate. Therefore, the College of Law, through an Admissions Committee comprised of faculty, staff and student members, may review such factors as an improved grade trend, the college or university attended, course selection patterns, the rigor of the academic program undertaken, distribution of college grades, a change in performance after an absence from college, unusual writing ability as evidenced by publication, a unique cultural background, performance despite educational or economical disadvantage, employment experience, graduate study, significant community/collegiate activities and Arizona residency.

Affirmative Action. The College of Law has an affirmative action admission policy, and applications from members of minority groups are encouraged. Under the program, special consideration is given in admissions and financial aid decisions to qualified members of cultural, ethnic or racial groups who have not had a fair opportunity to develop their potential for academic achievement, who lack adequate representation within the legal profession and who would not otherwise be meaningfully represented in the entering class. Groups usually qualifying have been Blacks, Native Americans, Chicanos, Asians, senior citizens, the physically handicapped and the seriously economically disadvantaged.

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. Also, in the Legal Research and Writing program, first-year students prepare legal briefs and memoranda and receive

feedback through the use of practice examinations. The focus of the program is on the development of writing and organizational skills necessary for success in law school and the practice of law. 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, the college has a number of faculty-supervised clinical education programs and a program of supervised externships.

Law Journal. The College of Law publishes a professional law review, the *Arizona State Law Journal*, edited by students of the second- and third-year classes. Membership on the law journal is determined by grade performance in the first year and, for some, by submitting written work in a writing competition. Participation on law review is hard but rewarding work. For those eligible, the review provides one of the finest avenues for legal education thus far developed. Its work contributes to the student's intellectual advancement, to the development of law and the legal profession and to the stature of the law school.

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.

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 or summer session. However, any student whose average for the first semester of the first year falls below 70 is placed on probation, except that an average below 65 disqualifies such a student from further attendance. Any student who fails to achieve a 70 average in any one semester, regardless of cumulative average, is automatically placed on probation. Continuation of enrollment by probationary students shall be upon such terms and conditions as the college may impose.

A student whose cumulative average falls below the required level or whose semester average is less than 70 in the consecutive semesters 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 Readmission. 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 conditional 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. The college also bestows membership in the Order of the Coif upon students in the top 10% of the class. Recipients of these awards are selected by the Law faculty on the basis of academic performance.

Master of Laws Degree

Through the Graduate College, faculty in the College of Law offer a program leading to the Master of Laws (LL.M.) degree. For details concerning this graduate degree program, refer to the current *Graduate Catalog*.

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.

Center for the Study of Law, Science and Technology

The Board of Regents has recently established a Center for the Study of Law, Science and Technology to be operated by the College of Law.

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 85287-0604.

Law

PROFESSORS:

BENDER (AH 102D), ALTMAN, ARTERIAN-FURNISH, BARTELS, M. BERCH, BROWN, CALLEROS, ELLMAN, FURNISH, GUERIN, KADER, KARJALA, KAYE, LESHY, LOWENTHAL, MATHESON, MORRIS, ROSE, SCHROEDER, SPRITZER, STANTON, WINER

ASSOCIATE PROFESSORS:

AIKEN, BLAZE, FELLER, GREY, HALL, SUGGS, TESON, TUCKER, WEINSTEIN

CLINICAL PROFESSORS:

DALLYN, WEEKS

DIRECTOR:

LEGAL RESEARCH & WRITING AND ACADEMIC SUPPORT GROUP, R. BERCH

PROFESSORS EMERITI:

CLEARY, DAHL, EFFLAND, PEDRICK

LAW

LAW 515 Contracts. (4) F
The creation and enforcement of binding agreements.

516 Criminal Law. (3) F
The substantive law of crimes.

517 Torts. (3) F
Legal protections of personality, property and relational interests against physical and emotional harms.

518 Civil Procedure. (4) F
The nature of judicial power.

519 Legal Research and Writing I. (2) F
Techniques of research, use of the law library, preparation of legal memoranda.

521 Criminal Procedure. (3) S
The nature of the criminal procedural system with special focus on constitutional protections for the accused.

522 Constitutional Law I. (3) S
Role of courts in the federal system, distribution of powers between state and federal governments, role of procedure in litigation of constitutional questions.

523 Property. (4) S
An introduction to the law of real and personal property.

524 Legal Research and Writing II. (2) S
Continuation of 519.

600 Administrative Law. (3) A

Administrative process, emphasizing nature of powers exercised by administrative agencies of government, problems of procedure and scope of judicial review.

601 Antitrust Law. (3) F, S

Legislation and its implementation to prevent monopoly and business practices in restraint of trade, including restrictive agreements involving price-fixing, trade association activities and resale price maintenance.

602 Partnership Taxation. (2-3) A

Federal tax consequences of forming, operating, terminating or transferring partnerships.

603 Conflict of Laws. (3) A

Problems arising when the operative facts of a case are connected with more than one state or nation. Choice of law, bases of jurisdiction, effect of foreign judgments, underlying federal and constitutional issues.

605 Evidence. (3) A

Principles and practice governing the competency of witnesses and presentation of evidence, including the rules of exclusion and roles of lawyer, judge and jury under the adversary system.

606 Federal Income Taxation. (3) F, S

Federal income tax in relation to concepts of income, property arrangement, business activity and current tax problems, with focus on the process of tax legislation and administration.

607 Advanced Civil Procedure. (3) F, S

Obtaining and exchanging information in advance of trial, isolating the area of controversy, disposing of cases or issues without trial, defining the scope of litigation in terms of parties and subject matter and the relationship between successive litigations. Litigation through appeal, including jurisdiction, right to jury, selection of jury, withdrawing case from jury, instructing jury, verdicts, judgments, appellate review.

608 Business Associations I. (3) A

Partnerships, limited partnerships and small business corporations. Includes a brief introduction to accounting. Detailed analysis of the problems of forming a close corporation, state law duties of care and loyalty, management, dividends and redemptions, issuance of stock, internal dispute resolution, dissolution and the general law of derivative actions.

609 Business Associations II. (3) A

Interrelationship of federal and state law and a brief introduction to corporate finance (1933 Act). A broad overview of large company regulations including reporting rules, proxy regulation, insider trading, sale of control, tender offers and takeovers and going private. Prerequisite: LAW 608.

610 Advanced Criminal Procedure. (3) A

Topics in criminal procedure, with emphasis on legal constraints on grand jury investigations, police practices, pre-trial release, preliminary hearings, prosecutorial discretion and plea bargaining.

611 Estate Planning I. (3) A

Tax laws relating to transfer of wealth both at death and during lifetime, including federal estate tax, gift tax and income taxation of estates and trusts.

612 Family Law. (3) A

Legal and nonlegal problems which an individual may encounter because of a situation as a family member.

613 Federal Courts. (3) A

Federal judicial system; relationship of federal and state law; jurisdiction of federal courts and their relation to state courts.

614 Labor Relations. (3) A

Collective bargaining, including the right of employees to organize and to engage in concerted activities; resolution of questions concerning the representation of employees; duty of employers and unions to bargain; administration and enforcement of collective bargaining agreements.

615 Public International Law. (3) A

Role of law in international disputes. Drafting and interpretation of treaties and multilateral conventions will be considered.

616 Jurisprudence. (3) A

Introduction to legal philosophy, with readings on the nature of law and legal reasoning, the relationship between law and morality and equality and social justice.

618 Trusts and Estates I. (3) A

Substantive concepts involved in transmitting wealth, including interstate 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. (2-3) A

Continuation of 618.

620 Civil Rights Legislation. (2-3) 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. (3) 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.

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.

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.

370 COLLEGE OF LAW

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 Natural Resource Law. (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 statutes concerned with regulating the securities market.

641 State and Local Government. (2,3) N

Legal problems involved in the organization and administration of governmental units including the city, county, town, village, school district and special district.

643 Water Law. (3) A

Acquisition of water rights; water use controls; interstate conflicts.

644 Intellectual Property. (3) N

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) N

In-depth study of the substantive law and sentencing provisions of the 1978 Arizona Criminal Code.

702 Alternative Dispute Resolution. (2-3) A

A broad exposure to methods of settling disputes in our society such as mediation, arbitration/conciliation and negotiation, including examination of the current litigation model.

703 Law, Science and Technology. (2-3) A

The legal mechanisms used in dealing with various issues raised by contemporary science and technology. Current legal responses to science and technology are explored.

705 Mass Communications. (2-3) A

An examination of First Amendment principles and statutory and regulatory requirements with respect to the conventional

print and broadcast media as well as recent technologies such as cable.

706 Immigration Law. (2-3) A

Exploration of political, economic, social and legal issues concerning immigration. Specific topics covered include citizenship and naturalization, denaturalization, deportation and refugee rights and asylum.

707 Corrections and Sentencing. (2-3) N

Justifications for punishment, the effect of punishment upon the individual and society, statutory basis for sentencing in Arizona and the role of the lawyer in the sentencing process.

709 International Human Rights. (2-3) N

International rules and procedures governing the protection of human rights.

710 Real Estate Tax Planning. (2-3) A

Discussion of topics including but not exclusive to real estate investments as tax shelters, alternative acquisition finance devices, refinancing techniques and non-taxable exchanges.

711 Real Estate Transfer. (2-3) A

An examination of the legal aspects of the sale and purchase of real property encompassing three areas: the role of the lawyer and broker in the transaction, the sales contract and issues relating to title protection.

712 Religion and the Constitution. (2-3) A

An in-depth study of the "establishment" and "free exercise" clauses of the First Amendment to the United States Constitution.

714 Law and Social Science. (2-3) N

Investigation of the use of social science research and methods in the legal system. Topics include: psychology of eye-witness identification, social-psychological studies of decision making, statistical evidence of discrimination, econometric studies of the deterrent effects of capital punishment and clinical predictions of violent behavior.

715 Professional Sports. (2-3) N

Unique legal problems relating to professional sports, including their relationship to antitrust laws, the nature of the player contracts and associated tax problems.

717 Legislative Process. (2-3) N

Explore both the legal and the practical context within which the legislative process operates with a major component of the course being a legislative drafting project.

720 Problems in Evidence. (2-3) N

An examination of the use (and abuse) of statistical methods in proving facts and in studying rules of evidence and procedure. Prerequisite or corequisite: LAW 605.

721 Education and the Law. (2-3) N

Current legal problems affecting institutions of higher education, faculty, students and governing boards.

727 Federal Income Tax Policy. (2-3) N

Advanced consideration of federal personal income tax policy with reference to selected problems, including the income-sheltering process. Prerequisite: LAW 606.

733 Negotiation, Mediation and Counseling. (3) N

Explores alternative models of negotiated dispute resolution, as well as the roles of lawyer and client in the negotiation process. Extensive use of simulation exercises.

735 Estate Planning II. (2-3) N

Preparation of actual estate plans and implementing legal documents for a variety of typical private clients. Both tax and nontax elements in preparation of the plans will be considered. Prerequisite: LAW 611.

736 Planning for the Business Client. (2-3) A

Planning transactions involving business organizations with special emphasis on income tax and corporate considerations.

737 Planning Private Real Estate Developments. (2-3) N
Legal aspects of real estate development, including negotiation, legal devices for financing, promotion of sales, leasing problems and compliance with legal controls, as well as creation of private controls over land use.

738 Practice Court. (2-3) A

Students act as lawyers in conducting a case through all stages of trial, from commencement of the action to final judgment.

740 Problems of Litigation. (2-3) N

Current developments in the fields of practice, procedure and evidence.

742 Equality in Modern Society. (2-3) N

Discrimination, its social and legal effects and remedies. Focus on constitutional, statutory and private organizational attacks upon discrimination on the basis of race, religion, sex or other classifications.

745 The Supreme Court. (2-3) N

Intensive examination of selected current decisions of the U.S. Supreme Court.

751 Problems in Labor Law. (2-3) N

Advanced questions in the collective bargaining area

761 Selected Problems in Antitrust. (2-3) N

Analysis of the private enforcement techniques in antitrust. Review and analysis of the various defenses, procedural problems and damage issues.

767 Selected Problems in Developing Nations. (2-3) N

The effect of law in social change and development through agrarian reform, industrial development, economic integration. Emphasis on Latin America.

768 International Business Transactions. (2-3) N

Problems and policy considerations involved in international trade; tariffs, international monetary controls, development loans, etc.

770 Law Journal. (1-3) F, S

Academic credit for successful completion of work by a member of the staff of *Arizona State Law Journal*; five semester hour maximum.

771-779 Internships in Law. (1-6) F, S

Civil, defender or prosecutor placement and related classroom component.

780 Moot Court. (1-3) F, S

Academic credit for successful completion of work as a member of the Moot Court Board of Directors; three semester hour maximum.

781, 782, 783 Individual Study. (1-3) F, S

With the approval of a faculty member, a student may research a legal subject of special interest and prepare a paper suitable for publication.

784 Moot Court Competition. (1-3) S

Successful participation and completion of a national moot court competition.

785 Externship. (1-12) S, F, SS

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.

791 Seminar in Law. (1-12) F, S



College of Nursing

Janelle C. Krueger, Ph.D.

Dean

Purpose

The faculty of the College of Nursing acknowledge their 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 of Nursing is to provide educational programs that prepare professional nurses to meet the nursing care needs of individuals, groups and communities. To achieve this purpose, the college offers three programs, the baccalaureate, the graduate and the continuing education programs. Within the context of a liberal education, the degree programs prepare professional nurses who: (a) understand and respond to changing health and social needs and services; (b) influence nursing practice and health care through leadership and participation in professional and sociopolitical activities; and (c) utilize scientific knowledge to advance professional nursing practice. The continuing education program provides opportunities for nurses to improve and expand their nursing practice to meet the health care needs of various populations and to further their own professional development.

Organization

The College of Nursing recognizes the three major missions of the university, i.e., teaching, research and service. The associate dean for academic programs is responsible for the degree programs; in addition, each degree program has a coordinator who assumes responsibility for the progression of students through the programs. The graduate program coordinator is available to advise graduate students.

The associate dean for research is responsible for research development and works with both faculty and students to facilitate research activities. The assistant dean for community resources is responsible for the continuing education and service activities of the college.

The faculty are grouped under four divisions of major clinical areas within nursing: adult health/medical-surgical nursing, community health nursing; community mental health/psychiatric nursing; and parent-child nursing. Each division has a chair and each faculty member belongs to a division.

Degrees

Master of Science

The College of Nursing offers a program leading to a Master of Science degree which requires 40 semester hours. Requirements for this program are described in the *Graduate Catalog*. Persons interested in applying for admission to the program should write to the Arizona State University Graduate College for a *Catalog* and application form.

Bachelor of Science in Nursing

The completion of the four-year curriculum in Nursing leads to a Bachelor of Science in Nursing degree. The purpose of the program is to prepare beginning professional nurses who possess the theoretical foundation and the clinical competence to function in various health care settings. The graduate is prepared to deliver nursing care services to individuals, families, population groups and communities. The baccalaureate program provides a foundation for graduate studies in nursing at the master's level.

The program objectives for the baccalaureate curriculum are directed toward preparation of graduates with generalists abilities. Based on the theoretical and empirical knowledge from nursing, the humanities, physical, biological and behavioral sciences, the graduates are prepared to:

1. Synthesize knowledge from the sciences and humanities with nursing theory to meet the goals of professional practice which include health promotion, maintenance and restoration, illness care, rehabilitation, health counseling and education.

2. Provide professional nursing care to culturally diverse individuals, families, population groups and communities using theory-based nursing process.
3. Accept individual responsibility and accountability for providing nursing care to clients and for evaluating the outcomes of that care.
4. Incorporate ethical and legal aspects of nursing into nursing practice.
5. Evaluate research for its application to the improvement of nursing practice.
6. Assume a leadership role at the generalist level in the promotion, maintenance and restoration of health, rehabilitation and in illness care.
7. Develop cooperative and collaborative relationships with clients and other disciplines who are concerned with health, health care issues and quality of life.
8. Participate in identifying and evaluating current and needed health care services and policies.
9. Continue professional development in response to trends and issues in health care, changing nursing roles and the impact of these and other health care issues on the client.

The baccalaureate program in Nursing includes 64 hours in nursing, 65 hours in other prescribed courses and 3 hours free electives for a total of 132 hours for graduation. The prescribed courses include the 35 semester hours of General Studies required by the university (pages 42-66) for graduation as well as course work that is either pre- or corequisite to nursing courses.

Admission

Students are admitted directly to the major as freshmen. In addition to meeting the university requirements for admission, students are required to have one year each of high school physics and chemistry. Two years of high school chemistry are recommended.

A 2.50 cumulative grade point average is required for admission into the upper-division (300-400-level) nursing courses.

State Board of Nursing Requirement. Students must have a high school diploma or GED certificate to be eligible to write the State Board Examination for licensure as a Registered Nurse.

CPR Certification. All students entering the professional nursing courses must be certified in cardiopulmonary resuscitation (CPR) as evidenced by a current CPR card. This certification must be maintained while in the program. CPR is taught in the college in the course NUR 119 and is also available outside the College of Nursing.

College Health Requirements. Students enrolled in the professional Nursing major are responsible for fulfilling the requirements of the current health policies of the College of Nursing. The student is responsible for providing proof to the Student Services Office of having met these requirements prior to enrollment in NUR 211 Nurse Client Relationships. The policy includes:

1. College of Nursing Health History Inventory and Records of Physical Examination,
2. Proof of rubella immunity,
3. A tuberculin skin test is required annually while in the nursing major. A nursing student may not participate in any clinical experience without meeting this requirement.

ASU Health Requirements. All university students must meet university health requirements, including proof of measles (rubeola) inoculation if born after January 1, 1957. Admission may be denied or canceled for any applicant who has been shown by the university to have either an uncompensated psychiatric illness or a physical illness which can be hazardous to the safety of other persons (see page 23).

Insurance Requirements

Liability insurance: Students are covered by University Liability Insurance while they are participating in any clinical learning experience sponsored by the university. They are not covered in any activity outside of school requirements, in non-lab courses, or when a felony is involved.

Health and accident insurance: It is strongly recommended that all students carry their own health and accident insurance. Each student is personally responsible for costs related to any accident or illness during or outside of school activities.

Student Employment. Students intending to pursue the professional Nursing major on a full-time basis should expect to spend approximately 45 hours per week in class and study. Thus any additional activities or employment should be kept at a minimum.

Transfer Students. Any student enrolled in good standing at any NLN-accredited baccalaureate school of nursing, or having been enrolled in good standing within the past two years, may apply for admission with advanced standing.

Transfer students must complete the application process at least one full semester before the anticipated date of admission. Transfer students must submit official transcripts, a catalog from the institution of transfer and course outlines in order that course equivalencies may be assessed. A grade point average of 2.50 is required for admission. All other admission requirements are the same as outlined on page 25.

Admission of Registered Nurses. Registered nurses have alternatives available to them in the completion of the baccalaureate degree. They are encouraged to work closely with an advisor in planning their program of study. NUR 306 Professional Development for RN's is required. This course builds on the knowledge and skills of the student by promoting professional development. All other admission requirements are the same as outlined on pages 22-27. In addition, registered nurses must submit a photostatic copy of the current license to practice nursing.

Readmission. Students who have not been in continuous enrollment must petition for readmission to the major. Along with the petition, students must provide the following documents:

1. Proof of current enrollment or readmission to ASU,
2. Transcripts from all colleges attended,
3. Applications for Admission to the Professional Nursing Major,
4. Health History/Physical Examination.

Academic Advisement. Students are responsible for meeting the degree requirements and seeking advisement regarding their program status/progress. This includes having transcripts of all college courses sent to the university registrar. Advisor signatures are required on various university registration forms for validation. All nursing students are assigned a faculty advisor. The faculty advisor assists students with program planning, registration, preparation of needed petitions, verification of graduation requirements, referrals to university and community resources and assistance with career planning.

Degree Requirements

General Studies/Pre- or Corequisites

English Proficiency	<i>Semester Hours</i>
ENG 101 (3) and ENG 102 (3) 6 or ENG 105 (3)**	
** Students who complete ENG 105 (3) have satisfied the English proficiency requirement and do not have to take any additional English credits.	

Literacy and Critical Inquiry Core 6
One 3-hour course from ASU General Studies intermediate literacy requirement; NUR 403 (3), fulfills the advanced literacy and critical inquiry requirement.

Numeracy Core 6
MAT 117 (3) and select one 3-hour course from ASU General Studies numeracy requirement in the statistics category.

Humanities and Fine Arts Core 6
Select two 3-hour courses from the ASU General Studies program requirements. One must be an upper-division course.

Social and Behavioral Sciences Core 15
PGS 100 (3); PGS 341 (3) or CDE 232 (3); SOC 101 (3) or 301 (3); SOC 415 (3) or FAS 331 (3). In addition, select one 3-hour course which has cultural awareness as its basic content.

Humanities and Fine Arts and Social and Behavioral Sciences Elective 3
Select one upper-division 3-hour course from the ASU General Studies program list in humanities and fine arts and social and behavioral science courses.

Historical and Global Awareness
If this requirement was not satisfied in humanities and fine arts and social and behavioral sciences, select one course in each area from the ASU General Studies program requirements.

Natural Sciences 26
BIO 181 (4), 182 (4); CHM 231 (4), 261 (3); FON 141 (3) or 444 (3); MIC 205 (3), 206 (1); ZOL 360 (4)

Nursing Core Courses		<i>Semester Hours</i>
** NUR 119	Introduction to Nursing and Health	3
* NUR 204	Pharmacological Therapeutics for Nursing	3
** NUR 211	Nurse Client Relationships	3
** NUR 213	Basic Clinical Skills	2
** NUR 214	Health Assessment in Nursing Practice	3
*** NUR 223	Nursing Process and Hospitalized Adult	6
* NUR 308	Pathophysiology	3
*** NUR 327	Comprehensive Nursing Care of Children	4
*** NUR 328	Childbearing and Women's Health Care	4
*** NUR 329	Psychiatric/Mental Health Nursing	6
*** NUR 330	Care of Acute and Chronically Ill Adult	4
* NUR 403	Research in Nursing Practice ...	3
* NUR 406	Leadership and Management in Nursing	2
* NUR 407	Contemporary Issues in Nursing and Health	2
** NUR 411	Gerontological Nursing	3
* NUR 427	Community Health Nursing Concepts	3
*** NUR 428	Management of Clients in Health Care Settings	4
*** NUR 429	Community Health Nursing Clinical	4
*** NUR 430	Home Health Care	2
Total		64

- * Nursing theory only
- ** Nursing theory and laboratory/observation
- *** Nursing theory and clinical experience

General Studies courses are regularly reviewed. To determine whether a course meets one or more General Studies course credit requirements, see the listing of courses by core and awareness area, pages 45-66. General Studies courses are also identified following course descriptions according to the following key:

Key to General Studies Credit Abbreviations

- L1 Literacy and Critical Inquiry Core Courses (Intermediate level)
- L2 Literacy and Critical Inquiry Core Courses (Upper division)
- N1 Numeracy Core Courses (Mathematics)
- N2 Numeracy Core Courses (Statistics and Quantitative Reasoning)
- N3 Numeracy Core Courses (Computer Applications)
- HU Humanities and Fine Arts Core Courses
- SB Social and Behavioral Science Core Courses
- S1 Natural Science Core Courses (Introductory)
- S2 Natural Science Core Courses (Additional Courses)
- G Global Awareness Courses
- H Historical Awareness Courses

Academic Standards

Academic. Progress into the upper-division nursing courses is contingent on achieving at least a “C” in all required courses and a cumulative grade point average of 2.50.

Probation and disqualification is in accordance with university policies.

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 health examination and the results made available to the Standards Committee of the College of Nursing. Students whose health, behavior and/or performance have been questioned will be reviewed for continuation in clinical nursing courses by the Standards Committee. The student may appear in person before the committee and personally present information relevant to the committee’s review. Additional information may also be presented in writing without personal appearance. The decision of the committee is final.

Professional. Professional behavior and appearance is required during all clinical nursing course activities. Academic dishonesty is not tolerated in any courses and will be subject to specific College of Nursing policies and procedures.

Grading Policy for Nursing Courses

Within the baccalaureate program, grades are assigned to reflect levels of achievement in relation to course objectives. Students who do not complete a required nursing course satisfactorily, receiving a grade of “D” or “E” (failing) or a mark of “W” (withdrawal), are not eligible to progress in the professional nursing major. Receiving a grade of “D” or “E” necessitates repeating the course in its entirety. A required nursing course may be repeated only once.

Any petition for curriculum adjustment, course substitution, overload, readmission to a nursing course or readmission to the professional nursing major must be approved by the Baccalaureate Standards Committee.

Withdrawal is in accordance with the withdrawal policy of the university. Students who withdraw from required nursing courses must complete the form, “Interruption in Curricular Progression.” 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. See page 39 for university policy.

Audits and pass/fail grades are not acceptable for courses in the minimum 132 semester hour requirement for graduation.

Special Programs

Continuing Education Program. This program presents a variety of non-credit offerings on the main ASU campus, ASU West Campus and at off-campus locations. These offerings are designed to assist practicing professional nurses to maintain and enhance their competencies, to broaden their scientific knowledge base and to further develop their skills in the changing health care environment. Programs are organized in response to both the nursing care needs of the population and the learning needs of nurses engaged in a variety of professional roles and clinical specialties. Workshops, conferences, institutes, short evening courses and special programs are offered at times convenient to the working professional. Some offerings are multidisciplinary and are open to other than Registered Nurses.

In addition, to meet continuing education needs and interests, registered nurses may also choose to enroll as unclassified students in selected nursing credit courses offered by the College of Nursing. Registered nurses who want more information about the degree programs or the courses that may be taken by unclassified students should contact the Nursing Student Services Office (602/965-2987).

For descriptions of current continuing education offerings, please contact the Continuing Education Program, College of Nursing (602/965-7431).

Offerings from all programs are available on the main ASU campus and ASU West Campus.

Program for Health and Nursing Research/Office of Research. The College of Nursing Program for Health and Nursing Research/Office of Research supports the conduct and development of research in all phases of nursing with a special emphasis on clinical nursing problems, health promotion, illness prevention and the impact of health technology on the quality and cost of health care. Program efforts are directed toward strengthening the research productivity of faculty, students and nurse researchers in clinical settings. The college strives to develop research excellence in an effort to form a research base for improving health care through the contributions of nursing theory, clinical nursing practice and the biomedical, behavioral and social sciences.

Student Responsibilities

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.

Comprehensive Assessment Tests. All students who will take the professional licensing examination (NCLEX State Board Exam) are required to take a comprehensive assessment test prior to graduation. Arrangements for taking the test and payment of fees must be made during the student's final semester.

General Information

Student Services. The Student Services Office in the College of Nursing provides academic advisement, general advisement and referral to university resources. Prospective students with academic issues or questions relating to the College of Nursing should contact the College of Nursing Student Services Office.

Scholarship and Financial Aid. For information regarding scholarships and loans, see page 21 of this *Catalog*. Information about scholarship and

loan funds for nursing students may be obtained from the University Financial Aid Office, College of Nursing Student Services Office or the associate dean for Academic Programs.

Student Activities. All ASU students are members of the Associated Students of ASU (ASASU) and participate in those campus activities which are of interest to them. The ASASU is the student government for the university. Associated Students has a strong presence at the university in a variety of ways. It is the official representative of the student body in matters of governance and budgeting.

Nursing College Council. The council is a member of ASASU and serves as the governing body of all student activities in the college. The council consists of the officers of the Baccalaureate Student Nurse Organization, Graduate Nurse Organization and Student Nurses' Association. Nursing College Council provides for communication, cooperation and understanding among undergraduate students, graduate students and faculty as well as representing the college in university and non-university affairs.

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.

Baccalaureate Student Nurse Organization. The Baccalaureate Student Nurse Organization (BSNO) is the coordinating body for nursing students in the baccalaureate program. It is responsible for providing information to faculty and students on student affairs and for coordinating student-faculty affairs. All nursing students are members of this organization.

Student Nurses' Association. SNA is a professional nurse organization. By being a member of SNA the student belongs to the National Student Nurses' Association which is the student counterpart of the American Nurses Association for registered nurses. NSNA provides means for financial assistance, career planning, a voice in Washington, an opportunity for involvement and low cost comprehensive malpractice insurance.

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.

Learning Resources. The College of Nursing offers learning resources which include the university's Hayden Library, the Noble Science and Engineering Library and the College of Nursing's Learning Resources Center.

Clinical Facilities. Learning experiences with patients and families are provided under the supervision of qualified faculty with the cooperation of a variety of federal, state, county, private health and other agencies. The College of Nursing has contracts with more than 80 different agencies in the Phoenix metropolitan area and also operates its own unique nurse-managed clinic in a community setting. Thus a variety of clinical laboratory facilities is available to students in this significant component of the programs.



Nursing

PROFESSORS:

KRUEGER (NURS 457), BRANSTETTER, LUDEMANN, MUHLENKAMP, MURPHY, STEFFL, TAYLOR, ZORNOW

ASSOCIATE PROFESSORS:

BRUNER, FELLER, GRONSETH, KNUDSEN, KOMNENICH, MILLER, NORTH, ROBERTS, THEOBALD

ASSISTANT PROFESSORS:

BAGWELL, ELLISON, FINCH, GARRITY, KATZMAN, KILLEEN, LUDLOW, MELVIN, MOORE, MULHOLLAND, OLSON, PERRY, PRIMAS, RICHARDS, SEHESTED, SHERIDAN, TOBIASON, WURZELL

INSTRUCTORS:

ADAMS, ANDERSEN, BECK, BROERMAN, COHEN, ENTZ, FLYNN, FRITZ, HOUZENGA, HULL, KEHRER, KRUSE, LYNCH, MEYERS, PICKENS, RADIN, STILLWELL, THORNE, WILLIAMS

LECTURERS:

GALE, KASTENBAUM

PROFESSORS EMERITI:

BARDEWYCK, JOHNSON, SQUIRES, STUMPF

NURSING

NUR 119 Introduction to Nursing and Health. (3) F, S
Basic nursing philosophy, process and skills including health promotion content as related to nursing practice. 2½ hours lecture, 1½ hours lab. Prerequisite: BIO 181.

204 Pharmacological Therapeutics for Nursing. (3) F, S
Drug classifications and prototypes. Psychophysiologic principles of drug action. Knowledge basic to safe administration in nursing practice. Prerequisites: BIO 182; CHM 261; MIC 205; NUR 119; or instructor approval.

211 Nurse Client Relationships. (3) F, S
Focus on the therapeutic relationship and its application to nursing. Concepts of anxiety, loss and grief will be emphasized. 2 hours lecture, 3 hours lab. Prerequisites: ENG 102; NUR 119; PGS 100; SOC 101 or 301.

213 Basic Clinical Skills. (2) F, S
Scientific principles, nursing concepts and selected psychomotor skills for clinical nursing practice. 1 hour lecture, 3 hours lab. Prerequisites: NUR 119, 214. Corequisites: NUR 204, 223.

214 Health Assessment in Nursing Practice. (3) F, S
Introductory knowledge and skills for systematic physical, psychosocial, nutritional and developmental nursing assessment for clients over life span. 2 hours lecture, 3 hours lab. Prerequisite: BIO 181, 182; FON 141. Pre- or corequisite: NUR 211; RN or instructor approval. Corequisite: CDE 232 or PGS 341.

223 Nursing Process and Hospitalized Adult. (6) F, S
Theories, concepts and practice in application of the nursing process in care for the hospitalized adult with selected

378 COLLEGE OF NURSING

medical-surgical problems. 3 hours lecture, 9 hours lab. Prerequisites: BIO 182; CHM 261; MIC 205; NUR 211. Pre- or corequisite: NUR 214. Corequisites: NUR 204, 213.

306 Professional Development for Registered Nurse Students: Process, Roles and Function. (4) F, S
Philosophical and theoretical bases for professional nursing practice. Nursing process for decision making. Professional issues, values and norms. Prerequisites: BIO 182; CHM 261; ZOL 360.

308 Pathophysiology. (3) F, S
Focuses on concepts explicating alterations in health states. A psychophysiological viewpoint provides the unifying framework. Prerequisites: BIO 182; CHM 261; ZOL 360.

327 Comprehensive Nursing Care of Children. (4) F, S
Nursing concepts and practice in caring for well and hospitalized children in a variety of clinical settings. 2 hours lecture, 6 hours lab. Prerequisites: CDE 232 or PGS 341; NUR 223. Pre- or corequisite: FAS 331 or SOC 415.

328 Childbearing Family and Women's Health Care. (4) F, S
Nursing concepts and practice in the reproductive and perinatal periods. Includes the impact on family members and their relationships. 2 hours lecture, 6 hours lab. Prerequisite: NUR 223. Pre- or corequisite: FAS 331 or SOC 415.

329 Psychiatric/Mental Health Nursing. (6) F, S
Guided nursing experiences with individuals and groups based on theory and research. 3 hours lecture, 9 hours lab. Prerequisites: CDE 223 or PGS 341; NUR 223. Corequisite: FAS 331 or SOC 415.

330 Care of Acute and Chronically Ill Adults. (4) F, S
Nursing concepts and practice in caring for hospitalized adults with complex acute and chronic medical-surgical problems. Theoretical bases and related nursing management. 1½ hours lecture, 7½ hours lab. Prerequisites: NUR 308, 327, 328, 329 (one may be concurrent).

403 Research in Nursing Practice. (3) F, S
Components of the research process. Significance of research to the improvement of nursing practice and development of the profession. Prerequisites: MAT 115 or 117; NUR 223; three hours statistics. [Satisfies General Studies Requirement: L2]

406 Leadership and Management in Nursing. (2) F, S
Selected theoretical frameworks for organization, management and leadership in nursing. Prerequisite: NUR 403 or RN.

407 Contemporary Issues in Nursing and Health. (2) F, S
Selected contemporary issues influencing nursing and the health care system. Prerequisite: NUR 403.

411 Gerontological Nursing. (3) F, S
Provides perspective of biopsychosocial gerontological content applicable to nursing practice and research. 2 hours lecture, 3 hours lab. Prerequisites: FON 141; NUR 330.

427 Community Health Nursing. (3) F, S
Introduction to public health theory and principles of community health nursing practice. Prerequisite: NUR 330 or instructor approval.

428 Management of Clients in Health Care Settings. (4) F, S
Application of principles of nursing management and leadership in health care settings. 1 hour lecture, 9 hours lab. Pre- or corequisites: NUR 330, 406, 407

429 Community Health Nursing Clinical. (4) F, S
Clinical experience in community health nursing roles and leadership strategies in a variety of settings. 12 hours lab and conference. Pre- or corequisite: NUR 427.

430 Home Health Care. (2) F, S
Issues, trends and practice in the development and delivery of home health care. 1 hour lecture, 3 hours lab. Pre- or corequisites: NUR 427, 429; or instructor approval.

431 Introduction to Cardiovascular Nursing. (3) F, S, SS
Selected aspects of cardiovascular nursing. Diagnostic evaluation, history and physical assessment, medical and surgical interventions, preventive and rehabilitative management. Prerequisite: NUR 223 or instructor approval.

432 Cardiovascular Nursing Laboratory. (1) F, S, SS
Experiences to accompany NUR 431. Observation, direct care, decision making and planning for clients in various stages of cardiac disease. 3 hours lab. Prerequisite: NUR 223 or instructor approval. Corequisite: NUR 431.

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. 2 hours lecture; 3 hours lab optional. Prerequisite: NUR 328† or instructor approval.

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. 2 hours lecture; 3 hours lab optional. Prerequisite: instructor approval.

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. 2 hours lecture; 3 hours lab optional. Prerequisite: NUR 327 or instructor approval.

438 Aging and Mental Health. (3) S
Explores and assesses psychosocial and mental health aspects of aging, geropsychiatric theory and gerontological research applicable to practice. Prerequisite: 12 hours in nursing major and/or instructor approval.

439 Aging and Mental Health Practicum. (1) S
Optional clinical practicum for students enrolled in NUR 438. 3 hours per week.

440 Introduction to Computer Applications in Health Care. (3) F, S, SS
Emphasis on applications which impact most directly on nurses in staff positions. Prerequisite: senior standing in Nursing major or instructor approval.

441 School Nursing Practice. (3) S, SS
Role of the professional nurse in planning, implementation and evaluation of the school health program.

442 Sexuality in Illness and Disability. (3) F, SS
Consideration of illnesses, injuries and treatments that have implications for sexual function of patients and clients.

457 Third-World Women. (3) F
Economic, socio-political and demographic context for understanding the roles of third-world women in health, family, work, education and community. Prerequisite: 6 hours of social science credit or instructor approval. [Satisfies General Studies Requirements: SB, G]

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 nursing major or instructor approval.

500 Research Methods. (3) F, S
Research methods including research conceptualization and design in nursing. Pre- or corequisite: graduate-level inferential statistics course.

501 Perspectives of Adult Health Nursing. (2) F, S
Provides students with an overview of theories, concepts and research relevant to the nursing care of adults.

502 Adult Health Nursing: Theory I—Health Restoration.

(2) F

Evaluates theories, models, concepts and research applicable to the care of adults requiring nursing intervention for restoration of health. Corequisite: practicum.

503 Adult Health Nursing: Theory II—Health Promotion.

(2) S

Evaluates theories, models, concepts and research applicable to the care of adults requiring nursing interventions for promotion/maintenance of health. Corequisite: practicum.

504 Critical Care of the Adult: Theory I. (2) F

Theoretical knowledge essential to the care of critically ill adults. Behavioral and physiological concepts are addressed. Pre- or corequisite: NUR 582. Corequisite: practicum.

505 Critical Care of the Adult: Theory II. (2) S

Theoretical knowledge essential to the care of critically ill adults. Multiple organ system dysfunctions are addressed. Prerequisite: NUR 504. Corequisite: practicum.

506 Neuroscience Nursing Theory. (2) S

Theoretical basis for assessment and management of disorders of the nervous system. Prerequisite: instructor approval. Corequisites: NUR 507, 584; practicum.

507 Therapeutics of Neurological Dysfunction. (2) S

Diagnostic and therapeutic regimens of care for patients with neurological dysfunction. Prerequisite: instructor approval. Corequisites: NUR 506, 584.

511 Public Health and Community Health Nursing Perspectives. (2) F, S

Analysis of contemporary public health and community health nursing issues, research and conceptual/theoretical foundations.

512 Community Health Nursing: Theory I. (2) F

Analysis of theories/research approaches for the study of community health nursing, community health program development and family health care. Corequisite: practicum.

513 Community Health Nursing: Theory II. (2) S

Analyze issues, theories and research relevant to community health nursing leadership, program planning/evaluation and management of health care systems. Prerequisite: NUR 512. Corequisite: practicum.

521 Community Mental Health/Psychiatric Nursing Perspectives. (2) F, S

Comparison of nursing theories with psychiatric/psychological theories. Applies to practice in mental health/psychiatric settings and provides basis for multiple roles.

522 Community Mental Health/Psychiatric Nursing: Theory I. (2) F

Analysis of issues, theories and research in restoration and promotion of mental health. Emphasizes developing conceptual framework for psychiatric nursing. Corequisite: practicum.

523 Community Mental Health/Psychiatric Nursing: Theory II. (2) S

This course assists the student to critically analyze issues, theories and research relevant to community mental health nursing. Prerequisite: NUR 522. Corequisite: practicum.

531 Perspectives of Parent-Child Nursing. (2) F, S

Overview of concepts, theories and research relevant to childbearing families and children.

532 Nursing of Children: Theory I. (2) F

Analysis of concepts, theories and research related to nursing care of well children. Focuses on health, client and environment. Corequisite: practicum.

533 Nursing of Children with Special Needs: Theory II.

(2) S

Analysis of concepts, theories and research related to nursing care of children with special problems or at risk. Prerequisite: NUR 532. Corequisite: practicum.

534 The Childbearing Family: Theory I. (2) F

Analysis of concepts, theories and research related to nursing care of childbearing families. Focuses on health, client and environment. Corequisite: practicum.

535 Childbearing Family with Special Needs: Theory II.

(2) S

Analysis of concepts, theories and research related to nursing care of childbearing families with special needs and high-risk. Prerequisite: NUR 534. Corequisite: practicum.

551 Theory Development. (3) F, S

Purpose is to provide the student with opportunities to analyze, evaluate and develop concepts relevant to nursing.

552 Contemporary Issues: Health Care and Nursing. (3) F, S

Analysis of health policy, economics and program planning for nursing health professionals. Emphasizes political, sociocultural and demographic factors.

562 Health Promotion. (2) F

First didactic nurse clinician course. Focuses on health care concepts and strategies to promote and maintain health of the child, adult and family. Prerequisite: instructor approval. Corequisite: practicum.

563 Health Management. (2) S

Second didactic nurse clinician course. Analysis of common self-limiting health problems with integration of health assessment for clinical decision making. Prerequisite: instructor approval. Corequisite: practicum.

568 Nursing Leadership Perspectives. (2) F

Critical analysis of historical, contemporary and futuristic projections of concepts, theories, styles and issues in nursing leadership roles.

571 Teaching in Nursing Programs. (2) S

Analysis of theories, issues and research related to teaching in nursing. Focuses on the process of teaching/learning.

576 Computer Applications in Health Care. (3) F, S

Analysis of current and developing computer applications in health care. Emphasis on nursing applications in administration, education and practice. Prerequisites: NUR 440 or equivalent; graduate standing in nursing or related field.

578 Gestalt Theory I. (3) F, S

An introduction to theory and methodology of Gestalt therapy, its uses for mental health promotion and restoration.

579 Gestalt Theory II. (3) F, S

Focus is on further development of Gestalt therapy and its application in working with various client populations. Prerequisite: NUR 578.

580 Practicum (Electives). (1-4) N

Clinical application of theories, concepts and principles such as health promotion, health management, health maintenance, teaching, management and special clinical studies.

580 Advanced Nursing Practicum I, II. (2-6) F, S

Clinical application of theories, concepts and principles. Conferences included. Tracks within the areas of concentration include:

- (1) Adult Health Nursing
- (2) Critical Care Nursing
- (3) Neuroscience Nursing
- (4) Community Health Nursing
- (5) Community Mental Health/Psychiatric Nursing
- (6) Nursing of Children
- (7) Childbearing Family

Prerequisites: admission to graduate program; instructor approval

581 Family Systems Theory in Health Care. (3) F, S
Critical analysis of issues and research relevant to family systems theory. Emphasis on relationship between theory and practice

582 Advanced Human Physiology. (3) F
Analyzes major theory and concepts of human physiology. Interrelationship of physiology and health is explored.

583 Pathophysiology. (3) S
Manifestation of altered human physiology and disease. Systems theory is used to analyze the relationships of disease and physiology.

584 Human Neuroanatomy, Physiology, Pathophysiology. (3) S
Normal neuroanatomy/neurophysiology including embryology. Pathophysiological basis of nervous system dysfunction. Prerequisite: instructor approval. Corequisites: NUR 506, 507.

585 Stress Reduction. (3) F
Theory, application and evaluation of mind/body relaxation methods including physiological effects. Research findings emphasized. Daily student practice. Prerequisite: graduate standing or instructor approval.

588 Qualitative Methods in Nursing Research. (2) SS
Provides an introduction to the use of qualitative approaches, discovery procedures, analysis, interpretation of data and contribution to theory building.

591 Seminar (Electives). (2-4) N
Advanced topics including curriculum development, cultural perspectives, health promotion, child mental health, etc. Prerequisite: instructor approval in selected courses.

598 Special Topics (Electives). (2-4) N
Special study including issues in health care and organizations, management in nursing, ethical issues, values, epidemiology, etc. Prerequisite: instructor approval in selected course

599 Thesis. (1-6) F, S, SS
Research proposal development, data collection and analysis, thesis writing and thesis oral defense. Six hours required.

The following courses, described in the 1985-87 ASU Catalog, will be offered through the semesters noted below. These courses are open only to nursing students eligible to

graduate under the requirements of the 1985-87 or earlier Catalog. Students wishing to register for one or more of these courses listed below must receive approval from the College of Nursing.

Fall 1988:

219 Health Promotion and Self Care Competencies. (2) F, S, SS

Spring 1989:

303 Nursing Process, Roles and Functions. (2) F, S

304 Pharmacology for Nursing. (3) F, S

313 Basic Competencies in Nursing Practice. (2) F, S

314 Health Assessment. (3) F, S

323 Care of the Hospitalized Adult I. (5) F, S

Fall 1989:

305 Development of Professional Nursing. (2) F, S

327 Care of the Well and Hospitalized Child. (3) F, S

328 Parent-Infant Nursing. (3) F, S

329 Mental Health Nursing. (5) F, S

Spring 1990:

403 Nursing Research. (2) F, S

426 Care of the Hospitalized Adult II. (4) F, S

427 Community Health Nursing. (4) F, S

Fall 1990:

429 Community Nursing of Populations at Risk. (4) F, S

Special Courses: NUR 580, 590, 591, 592, 598, 680, 690, 691. (See pages 36-37.)

HUMAN DEVELOPMENT

HDE 395 Overview of Aging. (3) F
Multidisciplinary introduction to gerontology. Explores the characteristics, experiences, problems and needs of older persons. Cross-listed as SOC 348.

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.



College of Public Programs

Louis F. Weschler, Ph.D.

Acting 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 Walter Cronkite School of Journalism and Telecommunication, the School of Justice Studies, the Department of Leisure Studies, and the School of Public Affairs. Each academic unit is administered by a chair/director.

The general administration of the college is the responsibility of the dean, who is responsible to the university president through the 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.)

The Bachelor of Science (B.S.) program is under review by the faculty and is not available for students entering under this *Catalog*.

Leisure Studies:

Bachelor of Science (Recreation) (B.S.)

Specific degree requirements are explained in detail under the respective school 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 school or department section, lead to the following graduate degrees:

Communication:

Master of Arts (M.A.)

Justice Studies:

Master of Science (M.S.)

Concurrent M.A. Anthropology/M.S. Justice Studies

Doctor of Philosophy (Ph.D.)

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 appointed 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.

Doctor of Philosophy in Justice Studies

A Ph.D. degree program in Justice Studies reflects a law and society perspective and integrates philosophical, legal and ethical approaches with social science and policy science methodologies. This program is interdisciplinary in nature and participating faculty are appointed by the dean of the Graduate College to serve as members of the Arizona State University Committee on Law and Social Sciences. Students may develop an individualized area of substantive specialization through consultation with their program committee and/or choose from the areas of concentration identified with the program. The areas of concentration are: criminal and juvenile justice; dispute resolution; law, policy and evaluation; law, justice and minority populations; women, law and justice.

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 22-26 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 cumulative grade point average of 2.50, plus whatever additional requirements the respective school/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."

Most upper-division courses in the college are not open to pre-majors. Pre-majors should check the

Catalog course listing in their major field to determine which 300- and/or 400-level courses are open to pre-majors.

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 department/school.

Transfer Credit. In most cases, course work successfully completed at a regionally accredited four-year institution of higher education will be accepted into the College of Public Programs respective academic unit.

Course work successfully completed at an accredited two-year institution of higher education (community or junior college) will transfer as lower-division credit up to a maximum of 64 semester hours.

Successful completion is defined for purpose of transfer as having received a grade comparable to an "A," "B," or "C" at ASU. The acceptance of credits will be determined by the director of Admissions and the utilization of credits toward degree requirements will be at the discretion of the individual academic unit.

Advisement

A student who has been admitted to the College of Public Programs will be assigned an academic advisor from the faculty of the academic unit that the student has selected as his/her major area of study. Questions on advisement should be directed to the student's academic advisor or to the Student Services Office of the College of Public Programs.

Course Load. A normal course load per semester is 15-16 semester hours. The maximum number of hours for which a student can register is 18 semester hours unless an overload petition has been filed and approved by the Department/School Standards Committee and the Undergraduate Standards Committee of the College.

Overload petitions are not ordinarily granted to students who have a cumulative grade point average of less than 3.00 and do not state valid reasons for the need to register for the credits. Students who register for semester hours in excess of 18 and do not have an approved overload petition on file will have courses randomly removed through an "administrative drop" action.

Degree Requirements

English Proficiency

Students must demonstrate reasonable proficiency in written English 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.

Writing Competence Requirement

In addition to English 101 and 102, or their equivalent, one of the following courses in written composition is required of all undergraduate majors: ENG 200, ENG 211, ENG 301, GNB 233, or JRN 201. This course may be counted as fulfilling the university literacy and critical inquiry requirement if it is on the university-approved list.

Communication Requirement

One of the following courses is required for all undergraduate majors: COM 100, 225, 230, 241, or 259. It may be included within the university General Studies requirements, the College of Public Programs requirements, or department/school 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/school degree program where appropriate.

Foreign Language Requirement

The School 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 School 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.

College Course Requirements

In addition to the university General Studies requirements, the College of Public Programs requires the following:

Humanities and Fine Arts. Zero to three (0-3) semester hours minimum for a total of nine (9) semester hours when combined with university General Studies.

Architecture:

Architectural Philosophy and History, APH
Architectural Communication, AVC

Art:

Art History, ARS
Studio Art, ART

Communication:

COM 210, 222, 225, 241, 243, 271, 274, 341,
344, 421, 422, 441, 442, 443, 444

Dance:

Dance History, DAH
Dance Performance, DAN

English:

ENG (other than First-Year Composition).
Reading courses from community colleges *not*
included.

Foreign Languages:

FLA, CHI, FRE, GER, GRK, ITA, JPN, LAT,
POR, RUS, SPA

Interdisciplinary Humanities:

Humanities, HUP, HUM
LIA 171, 172

Music:

General Music Electives, MUS
Music History and Literature, MHL
Music Theory and Composition, MTC
Music Performance, MUP

Philosophy: PHI, HPS

Religious Studies: REL

Theatre:

History, Literature and Theory, THE
Theatre Performance and Production, THP

Social and Behavioral Sciences. Nine to twelve (9-12) semester hours minimum for a total of eighteen (18) when combined with university General Studies.

Anthropology (Cultural): ASB

Business:

Administrative Services, GNB
 Advertising, ADV
 Decision and Information Systems, CIS
 Economics, ECN
 Finance, FIN
 Management, MGT
 Marketing, MKT
 Quantitative Business Analysis, QBA
 Transportation, TRA

Communication:

All communication courses *other* than listed above under humanities and fine arts requirements.

Design Sciences: DSC**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: JUS**Leisure Studies:** REC**Planning:** PUP**Political Science:** POS**Psychology:**

PGS (includes general introductory courses)

Sociology: SOC

To satisfy the above college course requirements, students may choose from the university General Studies list or supplement from courses listed above.

Students may not use courses from their major department/school to satisfy the above college course requirements.

General Studies Requirements

All undergraduate students in the College of Public Programs are required to complete the university General Studies requirements in order to be eligible for graduation in any of the undergraduate curricula offered by the college.

General Studies courses are regularly reviewed. To determine whether a course meets one or more General Studies course credit requirements, see the listing of courses by core and awareness area, pages 45-66. General Studies courses are also identified following course descriptions according to the following key:

**Key to General Studies
Credit Abbreviations**

- L1 Literacy and Critical Inquiry Core Courses (Intermediate level)
- L2 Literacy and Critical Inquiry Core Courses (Upper division)
- N1 Numeracy Core Courses (Mathematics)
- N2 Numeracy Core Courses (Statistics and Quantitative Reasoning)
- N3 Numeracy Core Courses (Computer Applications)
- HU Humanities and Fine Arts Core Courses
- SB Social and Behavioral Science Core Courses
- S1 Natural Science Core Courses (Introductory)
- S2 Natural Science Core Courses (Additional Courses)
- G Global Awareness Courses
- H Historical Awareness Courses

Department/School Course Requirements

Students should refer to their respective department/school for additional or more specific 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 3.00 or higher. In addition, permission to enroll must be given prior to registration and must be approved by the instructor of the course, the student's advisor, the department chair/school director 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 2.00 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 41 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.

Special Programs

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. Continuing 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.

Accelerated Degree Programs

Selected academic units within the College of Public Programs provide inter- and intradisciplinary programs leading to the completion of the baccalaureate degree and the master's degree within a five-year period. These are not new degree programs, but rather than articulation of required course work which will allow the student with exceptional ability to obtain both the undergraduate and graduate degree in a shorter than normal time frame. Completion of the master's degree should require two semesters and intermediate summer course work beyond the baccalaureate degree.

Admission Requirements. To be successful in this program, students must have graduated from a recognized high school and achieved one of the following: (1) graduated in the upper 5% of their high school graduating class, (2) attained an ACT composite score of 27 or higher, (3) a combined SAT score of 1250 or higher.

In addition, students are required to maintain a minimum cumulative grade point average of 3.25 in order to continue participation in an accelerated degree program option.

Students wishing to enter this program but not possessing the above requirements may choose to enter the program late during their undergraduate studies. Such students must have achieved and maintained a minimum grade point average of 3.40 at Arizona State University. These students must also recognize that they may require longer than the expected five years to complete both degrees.

Program Options. *Interdisciplinary* accelerated degree program options include but are not limited to:

- Bachelor's degree in Communication – Master of Mass Communication
- Bachelor's degree in Communication – Master of Public Administration
- Bachelor's degree in Journalism/Telecommunication – Master of Arts in Communication
- Bachelor's degree in Journalism/Telecommunication – Master of Science in Justice Studies
- Bachelor's degree in Journalism/Telecommunication – Master of Public Administration
- Bachelor's degree in Justice Studies – Master of Public Administration
- Bachelor's degree in Leisure Studies – Master of Public Administration

Accelerated *intradisciplinary* options are also available within the academic units of Communication, Journalism/Telecommunication, Justice Studies, and Leisure Studies.

Master's Degree Requirements. Participation in an accelerated degree program option in no way implies a guarantee of admission into any graduate degree program. The student must make application and meet all requirements for regular admission to the selected master's program as defined in the Arizona State University *Graduate Catalog* for the respective College of Public Programs discipline.

Interested students should consult the Arizona State University *General Catalog* and separate curriculum checksheets for individual department/school accelerated program requirements. For further information, students may call or write the College of Public Programs Student Services Office, Wilson Hall 203.

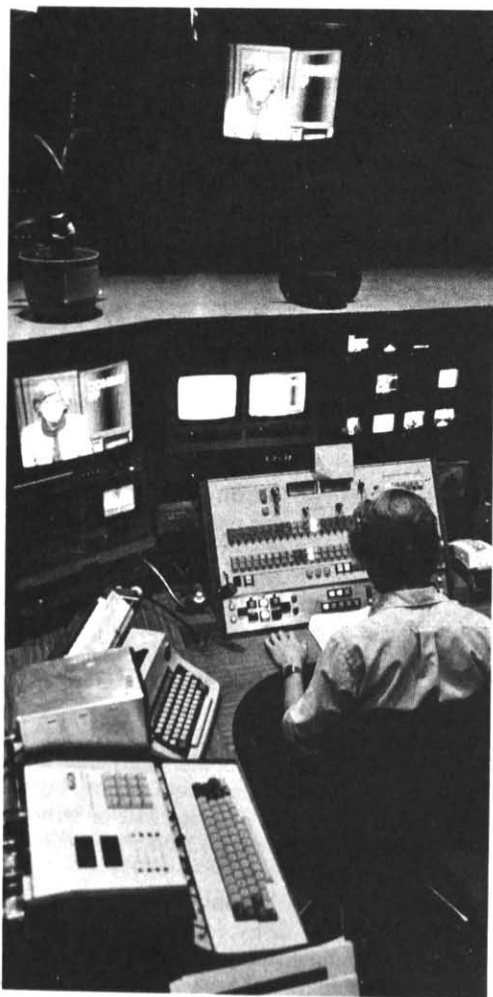
Graduation Requirements. Besides completing the regular university, college and departmental graduation requirements for the major, Honors students must complete at least 60 hours of resident

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.

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.



Communication

PROFESSORS:

GOYER (STAUF 412), ARNOLD, GUDYKUNST, JAIN, KASTENBAUM, PERRILL, K. VALENTINE

ASSOCIATE PROFESSORS:

BANTZ, BULEY, CRAWFORD, DAVEY, HECHT, MAYER, MERRILL, REINARD, TING-TOOMEY, C. VALENTINE

ASSISTANT PROFESSORS:

BANKS, COREY, CORMAN, GUNDERSEN (ASU WEST CAMPUS), PETRONIO, ROBBINS

LECTURERS:

OLSON (Director of Forensics), WILLIAMS (ASU WEST CAMPUS)

PROFESSORS EMERITI:

DAVIS, RICE, RICHARDS, STITES, WILLSON

General Information

The Department of Communication exists to advance the understanding, skills and evaluations associated with message-related human behavior, for the purpose of improving communicative interactions. Teaching, research and service are directed to the continued development of a knowledge base and application of principles of communication which impact human relationships in virtually every context and academic area. Courses of study are designed to provide students with relevant programs adapted to individual academic and professional goals. Curriculum checksheets are available in the departmental undergraduate advising office.

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 average of 2.50. 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 First-Year Composition requirements (see page 67) with a minimum grade of "C" in each.

3. Completion of all College of Public Programs course requirements (see pages 383-384) with a minimum grade of "C" in each.
4. Completion of 12 hours of Department of Communication core course requirements (COM 100, 207, 225, 308) with a minimum grade of "C" in each.

Degree Requirements

Bachelor of Arts and Bachelor of Science Degree Curricula

Of the minimum required 54 hours (12 hours of departmental core courses, plus the 42 hours noted below), at least 30 hours must be 300- to 400-level courses. In addition to university, college and department core course requirements, all majors must complete a combination of required and optional courses consisting of at least 42 hours as follows:

1. 18 hours consisting of three (3) pairs from the following list of five (5) pairs of courses:
 - COM 110 Elements of Interpersonal Communication
 - COM 410 Interpersonal Communication Theory and Research
 - COM 321 Rhetorical Theory and Research
 - COM 421 Public Address
 - COM 241 Introduction to Oral Interpretation
 - COM 443 Interpreter's Theatre: Theory and Practice
 - COM 250 Introduction to Organizational Communication
 - COM 450 Theory and Research in Organizational Communication
 - COM 263 Elements of Intercultural Communication
 - COM 363 Intercultural Communication Processes
2. A minimum of 24 additional hours of course credit in Interest Area courses, at least 12 hours of which must be in the Department of Communication. All courses outside the department must be at the 300- to 400-level. A minimum grade of "C" is required in each course, except for a maximum of 6 hours of "Y" credit available to qualified students in COM 281, 382 and/or COM 484.

In addition to the above listed requirements, students seeking the Bachelor of Arts or Bachelor of Science degree must satisfy the university General Studies requirements as noted:

	Bachelor of Arts	Bachelor of Science
I. Literacy and Critical Inquiry (6) ¹	6	6
(a) 200-level (3)		
(b) 300- 400-level (3): COM 308, 321 ²		
II. Numeracy (6) ¹	6	9 ³
(a) Mathematics (3)		
(b) Statistics/Quantitative Reasoning or Computer Applications (3): COM 408 ²		
III. Humanities and Fine Arts (6-9) ^{1,4}	9	9
IV. Social and Behavioral Sciences (6-9) ^{1,4}	18	18
V. Natural Science (8) ¹	8	8
VI. Awareness Areas (6) ¹	9	6
(a) Global (3): COM 263, ⁵ 371		
(b) Historical (3)		
Total	56	56

¹ University General Studies hourly requirements.
² May count toward major's semester hour requirements.
³ Must include 3 hours from each area (mathematics, statistics and computer applications).
⁴ Total minimum of 15 hours in III and IV combined.
⁵ Also satisfies core requirement in IV.

Consult your advisor 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

The Secondary Education curriculum *major* in Communication consists of a minimum of 40 hours in communication (including COM 480) and a minimum of 24 hours in a single additional approved academic minor. The student must complete all university, College of Public Programs and Department of Communication core courses, and two of the following 3 pairs of courses: COM 321 and 421, COM 110 and 410, COM 241 and 443; as well as COM 222, 325 and either COM 230 or 329. At least 18 hours of the major and at least 1 hour of COM 281 in either Forensics or Oral Interpretation must be completed. Students should consult the College of Education to ascertain the General Studies requirements for this degree.

Secondary Education curriculum *minor* in Communication consists of a minimum of 24 semester hours in communication, including COM 100, 110, 222, 225, 241, 480 and either COM 410 or 443. An additional 3 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 departmental 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 6 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 Catalog* for requirements.

COMMUNICATION

COM 100 Introduction to Human Communication. (3) F, S, SS

A topics-oriented introduction to basic theories, dimensions and concepts of human communicative interaction and behavior. [Satisfies General Studies Requirement: SB]

110 Elements of Interpersonal Communication. (3) F, S, SS

Demonstration and practice of communicative techniques in establishing and maintaining interpersonal relationships.

172 Introduction to American Sign Language. (3) F, S
Linguistic principles, expressive/receptive skills, terminology and sign systems of ASL.

200 Systems of Human Communication. (3) N

Human communicative processes and systems, major areas of theory and research and the scientific bases of human communicative 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. [Satisfies General Studies Requirement: L1]

210 Issues in Interpersonal 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. [Satisfies General Studies Requirement: L1]

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. [Satisfies General Studies Requirement: L1]

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. [Satisfies General Studies Requirement: SB]

241 Introduction to Oral Interpretation. (3) F, S, SS

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. [Satisfies General Studies Requirement: L1]

243 Interpreters Theatre Workshop. (3) S

Students will create and practice ensemble interpretation of literature using a variety of media in diverse settings.

250 Introduction to Organizational Communication. (3) F, S

Introduction to the study of communication in organizations, including identification of variables, roles and patterns influencing communication in organizations. Prerequisite: COM 207. [Satisfies General Studies Requirement: SB]

251 Interviewing. (3) F, S

Principles and techniques of interviewing, including practice through real and simulated interviews in informational, persuasive and employee-related situations. Not open to freshmen.

259 Communication in Business and the Professions.

(3) F, S, SS

Interpersonal, group and public communication in business and professional organizations. Not open to freshmen and not available for credit toward the major.

263 Elements of Intercultural Communication. (3) F, S

Basic concepts, principles and skills for improving communication between persons from different minority, racial, ethnic and cultural backgrounds. [Satisfies General Studies Requirements: SB, G]

271 Voice Improvement. (3) F, S

Intensive personal and group experience to improve normal vocal usage, including articulation and pronunciation.

272 Intermediate American Sign Language. (3) F, S

Emphasis on increasing vocabulary and speed; development of greater fluency in ASL, including finger-spelling and nonverbal communication. Survey of deafness. Prerequisite: COM 172.

274 General Semantics. (3) A

Analysis of relationship of 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. Not open to students with credit in COM 294: Beyond Words.

281 Communication Activities. (1-3) F, S, SS

Non-graded participation in forensics or interpretation cocurricular activities, or for students enrolled in SED 433 (maximum three semester hours each semester). Prerequisite: instructor approval.

294 Special Topics. (3) F, S, SS

Prerequisite: instructor approval.

308 Empirical Research Methods in Communication. (3) F, S

Examination of empirical research methods in communication, including experimental, survey, descriptive and other quantitative approaches. Prerequisite: COM 207. [Satisfies General Studies Requirements: L2, N2]

- 312 Communication, Conflict and Negotiation.** (3) A
Theories and strategies of communication relevant to the management of conflicts and the conduct of negotiations. Prerequisite: COM 100 or instructor approval.
- 316 Women and Communication.** (3) A
Introduction to gender-related communication. Verbal, non-verbal and paralinguistic differences and similarities are examined within social, psychological and historic perspectives.
- 320 Communication and Consumerism.** (3) F, S
Critical evaluation of messages designed for public consumption. Perceiving, evaluating and responding to political, social and commercial communication. [Satisfies General Studies Requirement: SB]
- 321 Rhetorical Theory and Research.** (3) F, S
Historical development of rhetorical theory and research in communication, from classical antiquity to the present. Prerequisite: COM 207. [Satisfies General Studies Requirements: L2, HU]
- 325 Advanced Public Speaking.** (3) F, S
Social and pragmatic aspects of public speaking as a communicative system: strategies of rhetorical theory and the presentation of forms of public communication. Prerequisite: COM 225 or instructor approval.
- 329 Persuasion.** (3) A
Variables which influence and modify attitudes and behaviors of message receivers, including analysis of theories, research and current problems. Prerequisite: COM 207 or instructor approval. [Satisfies General Studies Requirement: SB]
- 331 Large Group Decision-Making.** (3) F, S
Theory, methods and individual communicative behaviors relevant to large group interaction systems. Public discussion and parliamentary procedure in various types of public and deliberative assemblies. Prerequisite: COM 230 or instructor approval.
- 341 Interpretation in Social Contexts.** (3) N
Adaptation and performance of literature in situations of crisis and conflict, notably in prisons, mental hospitals and centers for the aged. Prerequisite: COM 241 or instructor approval.
- 344 Oral Traditions in Literature.** (3) N
Literary forms evolving from oral myths, legends, folk tales and fables. Prerequisite: COM 241 or instructor approval. [Satisfies General Studies Requirement: HU]
- 363 Intercultural Communication Processes.** (3) F, S
Processes and problems of communication between people from different racial, ethnic and cultural backgrounds in both domestic and international settings. Prerequisite: COM 263 or instructor approval. [Satisfies General Studies Requirement: SB]
- 371 Language, Culture, and Communication.** (3) A
Cultural influences of language on communication, including social functions of language, bilingualism, biculturalism and bidialectism. Prerequisite: COM 263 or instructor approval. [Satisfies General Studies Requirement: G]
- 372 Advanced American Sign Language.** (3) F, S
ASL and English concepts and idiomatic expressions; emphasis on ASL principles, cultural aspects and socio-educational trends. Prerequisite: COM 272.
- 382 Classroom Apprenticeship.** (1-3) F, S, SS
Non-graded credit for students extending their experience with a content area by assisting with classroom supervision in other COM courses (maximum three semester hours each semester). Prerequisite: instructor approval.
- 394 Special Topics.** (3) F, S, SS
Prerequisite: instructor approval.
- 408 Quantitative Methods in Communication Research.** (3) N
The use of descriptive and inferential statistics in communication research. Prerequisite: COM 308 or instructor approval. [Satisfies General Studies Requirement: N2]
- 410 Interpersonal Communication Theory and Research.** (3) A
Survey and analysis of major research topics, paradigms and theories dealing with message exchanges between and among social peers. Prerequisites: COM 110, 207; or instructor approval. [Satisfies General Studies Requirement: SB]
- 414 Crisis Communication.** (3) N
Role of communication in crisis development and intervention. Prerequisite: instructor approval.
- 417 Communication and Aging.** (3) N
Dynamics of aging as it relates to communication. Prerequisite: instructor approval.
- 421 Public Address.** (3) N
Critical study of significant speakers and speeches of the past and present. Prerequisite: COM 321 or instructor approval. [Satisfies General Studies Requirement: HU]
- 422 Advanced Argumentation.** (3) N
Advanced study of argumentation theories and research as applied to public forum, adversary, scholarly and legal settings. Prerequisite: COM 222 or instructor approval.
- 425 Legal Communication.** (3) N
The legal setting as a communicative event, featuring discussion of jury selection, legal interviewing, negotiations and jury behavior. Prerequisite: instructor approval.
- 430 Leadership in Group Communication.** (3) N
Theory and process of leadership in group communication, emphasizing philosophical foundations, contemporary research and applications to group situations. Prerequisite: COM 230, 331 or instructor approval. [Satisfies General Studies Requirement: SB]
- 441 Interpretation as Literary Criticism.** (3) N
Communication of literature through the medium of performance. Problems of content, structure and style in poetry, drama and prose. Prerequisite: COM 241 or instructor approval.
- 442 Interpretation and the Mass Media.** (3) N
The relationship of modern media (radio, TV and film) to oral interpretation and literature. Prerequisite: COM 241 or instructor approval.
- 443 Interpreters Theatre: Theory and Practice.** (3) N
Studies in visual perception, audience psychology, theory and criticism; practice in directing, analyzing, scripting and staging of literature. Prerequisite: COM 243 or instructor approval.
- 444 Interpretation of Shakespeare.** (3) N
Analysis and solo performance of scenes from Shakespeare. Emphasis on current trends in the criticism and interpretive performance of Shakespearean literature. Prerequisite: COM 241 or instructor approval.
- 445 Chamber Theatre.** (3) N
Theory and practice in analyzing, scripting and staging prose fiction as group performance. Prerequisite: COM 241 or instructor approval.
- 450 Theory and Research in Organizational Communication.** (3) F, S
Critical review and analysis of the dominant theories of organizational communication and their corollary research strategies. Prerequisites: COM 250, 308; or instructor approval. [Satisfies General Studies Requirement: SB]

451 Quality Circles Facilitation. (3) A
Principles, concepts and leadership for implementation of "Quality Circles" and similar employee involvement processes. Prerequisites: COM 230, 250; or instructor approval.

453 Communication Training and Development. (3) N
Examination of the procedures and types of communication training and development in business, industry and government. Prerequisites: COM 250, 308; or instructor approval.

456 Political Communication. (3) A
Theory and research related to political campaign communication. The persuasive process of political campaigning, the role of the media, the candidate and image creation. Prerequisites: COM 250, 308; or instructor approval. [*Satisfies General Studies Requirement: SB*]

457 Communication and Information Diffusion. (3) N
Role of communication in diffusion of innovations. Principles for effective use of communication for planned change in various social systems. Prerequisites: COM 250, 308; or instructor approval. [*Satisfies General Studies Requirement: SB*]

472 Development of Language as Communicative Behavior. (3) N
Development of language and interpersonal communicative behaviors of children through adolescence, including expressive and receptive competencies and interactions with others. Prerequisite: instructor approval. [*Satisfies General Studies Requirement: SB*]

480 Methods of Teaching Communication. (3) N
Analysis, organization and presentation of textual and other classroom materials. Prerequisite: instructor approval.

484 Communication Internship. (1-12) F, S, SS
Prerequisite: instructor approval.

500 Research Methods in Communication. (3) A
Critical analysis of systems of inquiry in communication, focusing on the identification of variables and approaches to conducting research in communication. Prerequisite: instructor approval.

504 Theories and Models in Communication. (3) A
Theory construction, metatheoretical concerns, models, construct definition and comparative analysis of current theories in communication. Prerequisite: instructor approval.

508 Quantitative Research Methods in Communication. (3) A
Empirical research designs, measurements and statistical strategies and techniques in analyzing and evaluating experimental and descriptive research in communication. Prerequisite: COM 500 or instructor approval.

509 Qualitative Research Methods in Communication. (3) A
Qualitative research methods, including interviewing, field methods and other non-quantitative techniques for analyzing communication. Prerequisite: COM 500 or instructor approval.

510 Interpersonal Communication Theory and Research. (3) N
Contemporary theories and research in interpersonal communication. Prerequisites: COM 500, 504; or instructor approval.

512 Death, Society and Human Experience. (3) N
Examines dying, death and bereavement, from both individual and socio-cultural perspectives in terms of options for communication and action.

521 Rhetorical Criticism of Oral Discourse. (3) N
History and significance of rhetorical theory and criticism in the analysis of oral discourse. Prerequisite: COM 500 or instructor approval.

529 Theories of Persuasion. (3) N
Analysis of representative theories and models of persuasive processes and their implications for communicative behavior. Prerequisites: COM 500, 504; or instructor approval.

531 Theories of Small Group Communication. (3) N
Theory and research in small group interaction and decision making, focusing on communicational variables which affect small group output. Prerequisites: COM 500, 504; or instructor approval.

541 Research Perspectives in Interpretation. (3) N
Supervised research in the historical and contemporary relationships between the interpreter, the text and the audience. Prerequisites: COM 500, 504; or instructor approval.

555 Communicative Processes in Organizations. (3) N
Systematic analysis of communicative interactions between organizational structure, information flow and human behaviors in the organizational setting. Prerequisites: COM 500, 504; or instructor approval.

563 Intercultural Communication. (3) N
Analysis of contemporary theory and research concerning the effects of a variety of cultural variables on communication between people. Prerequisites: COM 500, 504; or instructor approval.

575 Language and Message Systems. (3) N
Sign/symbol systems; personal, functional and contextual aspects of message systems; measurement of "meaning." Prerequisites: COM 500, 504; or instructor approval.

584 Communication Internship. (1-12) F, S, SS
Special Courses: COM 298, 492, 493, 498, 499, 500, 580, 590, 591, 592, 594, 598, 599. (See pages 36-37.)

Walter Cronkite School of Journalism and Telecommunication

PROFESSORS:

ANDERSON (STAUF A231B), BENNETT,
CRONKITE, MILNER

ASSOCIATE PROFESSORS:

CRAFT, ELLIS, HOY, LENTZ, SILVER,
SMITH, SYLVESTER

ASSISTANT PROFESSORS:

BRAMLETT-SOLOMON, FIELDING,
GALICIAN, LEIGH

PROFESSORS EMERITI:

BROWN, CROWDER, RANKIN

Major Requirements

All students enrolling in courses in the Walter Cronkite School of Journalism and Telecommunication 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 school courses beyond the 100 level.

All students intending to take school courses beyond the 100 level must complete an English proficiency exam with a passing score. The exam will be administered by the school.

To become 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. A 2.25 cumulative grade point average must be maintained in order to continue to enroll in courses in the school. The student must become a major (2.50 GPA) by the time 86 semester hours is reached, otherwise the student is disqualified from taking courses in this school.

Most upper-division courses in the school are not open to pre-majors. Pre-majors should check the *Catalog* listings to determine which 300- and 400-level courses they are eligible to take.

To ensure students receive a broad academic background, no more than 36 semester hours in courses in the major may apply to the 126 semester hours required for graduation. At least 18 hours of school 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 areas that may be used to fulfill the related field requirement are listed on the curriculum check sheets for each major available in the school. Courses elsewhere in the university which duplicate or are closely related to school subject matter may be restricted by the school.

Bachelor of Arts Degree Requirements

All students are required to complete 16 semester hours of a foreign language, or the equivalent to the intermediate level.

Broadcasting. Consists of 42 semester hours of which 30 must be in school courses and 12 in a related field. Students must take a required core of courses consisting of MCO 110 and 402 and TCM 200†, 201† and 235†. The student also must choose a major professional emphasis area.

These courses are in addition to other degree requirements. (See degree requirements, page 67.)

Journalism. Consists of 42 semester hours of which 30 must be in school courses and 12 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, 421† or JRN 412†. The student also must choose a major professional emphasis area.

These courses are in addition to other degree requirements. (See degree requirements, page 67.)

Bachelor of Science Degree Requirements

(The Bachelor of Science program is under review by the faculty and is not available as an option for students entering under this *Catalog*.)

Related Field. Each student is required to complete a 12 semester hour related field (or minor). This is to complement the courses taken in the major emphasis areas.

See the curriculum check sheets for each major for the full details and suggested related field areas.

Major Teaching Field Requirements

Bachelor of Arts in Education Degree Curriculum

Journalism. Consists of 48 semester hours. Courses MCO 110, 402†, JRN 201†, 301†, 313†, 351† and 480† are required. An additional 27 hours, including 15 hours in school course offerings, must be taken on approval by the advisor in consultation with the student. The remaining courses may be in closely related fields.

Minor Teaching Field Requirements

Journalism. Consists of 24 semester hours. 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 student should carefully check the university requirements on General Studies found on pages 42-66.

The School of Journalism and Telecommunication has certain requirements beyond the university General Studies which require the student to accumulate a total of 54 semester hours. The student is advised to review carefully the appropriate school curriculum check sheet to be sure courses taken will move the student toward graduation with the least amount of delay and difficulty.

In addition to the university General Studies requirements, the School of Journalism and Telecommunication requires the following:

Humanities and Fine Arts. Three to six (3-6) semester hours minimum for a total of twelve (12) semester hours when combined with university General Studies.

Social and Behavioral Sciences. Nine to twelve (9-12) semester hours minimum for a total of eighteen (18) when combined with university General Studies.

Science and Math. A minimum of fourteen (14) semester hours.

Additional courses may be taken in each of the groups and/or from the electives listed to complete the total of 54 semester hours required by the school.

Within the program there are specific course requirements. Students will be required to take one course in each of the following: political science (either POS 110 or 300), history, economics, communication (Applied Speech), computer science, two natural (physical) science lab courses, English composition (beyond freshman level), English literature, philosophy, psychology, mathematics (numeracy requirement) and statistics.

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 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. Prerequisite: complete first Freshman English course with "C" grade.

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. Designed for non-majors. [*Satisfies General Studies Requirement: SB*]

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. [*Satisfies General Studies Requirements: SB, H*]

402 Communications Law. (3) F, S, SS

Legal aspects of the rights, privileges and obligations of the press, radio and television.

421 News Problems. (3) S

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 instructor approval.

430 International Communication. (3) F, S

Comparative study of communication and media systems. Information gathering and dissemination under different political and cultural systems. [*Satisfies General Studies Requirement: G*]

450 Visual Communication. (3) N

Theory and tradition of communication through the visual media with emphasis on the continuity of traditions common to modern visual media. [*Satisfies General Studies Requirement: HU*]

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 construction. Attention to survey, historical, content analysis, experimental, legal research methods.

520 Mass Communication Theories and Process. (3) F Analysis of various theoretic models of mass communication with emphasis on the applications of these theories to various professional communication needs.

522 Mass Media and Society. (3) S

Mass media as social institutions, particularly interaction with government and public. Emphasis on criticism, normative statements.

530 Media Ethics. (3) S

Ethical conventions and practices of print and electronic media as they relate to the government and private sectors of the society.

Special Courses: MCO 394, 484, 492, 493, 494, 497, 500, 580, 584, 590, 591, 592, 593, 598. (See pages 36-37.)

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; demonstrated typing ability of 30 words per minute.

301 Reporting. (3) F, S*

Fundamentals of news gathering, interviewing and in-depth reporting. Prerequisites: JRN 201†; major.

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 instructor approval.

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 instructor approval.

401 Public Relations Techniques. (3) F, S*

Theory and practice of publicity, public relations and related techniques and procedures. Prerequisites: JRN 301†; TCM 315; major.

412 Editorial Interpretation. (3) N

The press as an influence on public opinion. The role of the editorial in analyzing and interpreting current events. Prerequisite: JRN 301†.

413 Advanced Editing. (3) F, S

Theory and practice of newspaper editing, layout and design, picture and story selection. Prerequisite: JRN 313†.

414 Business and Industrial Publications. (3) S

Theory and practice of layout, typography and design for magazines, brochures and industrial publications. Prerequisite: JRN 401†.

415 Writing for Public Relations. (3) F, S

Development of specific writing techniques for the practitioner in public relations agencies and divisions of major organizations. Prerequisite: JRN 401†.

420 Reporting Public Affairs. (3) F, S
Instruction and assignments in reporting the courts, schools, government, city hall, social problems and other areas involving public issues. Prerequisite: JRN 301†.

422 Business Reporting. (3) N
Analyzing and reporting economic and consumer affairs. Prerequisites: three hours of economics, JRN 301†.

451 Photojournalism II. (3) F, S
Theory and practice of photojournalism with emphasis on shooting, lighting and layout for the media. Prerequisite: JRN 351†.

452 Photojournalism III. (3) F, S
Advanced theory and practice of photojournalism with emphasis on the photo essay and illustrations in black and white and color. 2 lectures, 2 hour lab. Prerequisite: JRN 451†.

460 Print Media Management. (3) F, S
Problems and functions involved in the management and marketing of a newspaper or magazine. Interaction of management with the organization and community. Prerequisite: JRN 201† or instructor approval.

490 Methods of Teaching Journalism. (3) F
Methods of instruction, organization and presentation of appropriate content in journalism. Prerequisite: six hours of journalism at 300-level and above or instructor approval.

Special Courses: JRN 484, 494, 499, 584. (See pages 36-37.)

TELECOMMUNICATION

TCM 200 Fundamentals of Radio-Television. (3) F, S, SS
Structure of telecommunications in the U.S.: history, regulation, organization, with emphasis on broadcasting. Relationship to advertising, research and government agencies. Prerequisite: MCO 110 or 120.

201 Broadcast News Writing. (3) F, S, SS
Writing for electronic media, news and continuity. Prerequisites: MCO 110 or 120; successful completion of English proficiency requirement; demonstrated typing ability of 30 words per minute.

235 Studio Techniques. (3) F, S
Introduction to the theory, techniques and operation of telecommunication production equipment, audio and video. 1 lecture, 4 hours studio. Prerequisite: TCM 200†.

300 Videography. (3) F, S*
Basics of video continuity as used in telecommunication news and information. Prerequisite: TCM 315.

315 Broadcast News Reporting. (3) F, S*
News and information practices of networks, stations and industry. Advanced practice in writing, reporting and editing. Prerequisites: TCM 201†, 235†.

332 Broadcast Programming. (3) F, S, SS
Programming theory and evaluation, regulation, ethics and responsibilities and basics of audience psychographics and effects. Prerequisite: TCM 200†.

336 Television Production. (3) F, S*
Planning and analyzing the television production process. 1 lecture, 4 hours studio. Prerequisites: TCM 235†.

343 Broadcast Announcing. (3) F, S
Techniques of radio and television announcing. Prerequisites: TCM 201†, 235†.

431 Advanced Writing for Telecommunication. (3) F, S
Technique and practice in non-news writing for telecommunication, including broadcast, industrial and educational areas. Prerequisite: TCM 201†.

433 Broadcast Station Operations. (3) F, S
Operational procedures in the departments of a radio or television station. May be repeated for credit. Prerequisites: TCM 332†.

435 Cable TV and Emerging Telecommunication Systems. (3) F, S
Structures and utilization of cable, industrial and instructional television, satellite and videocassettes. Prerequisite: TCM 200.

437 Television Directing. (3) S
Aesthetics of video directing for broadcast, cable, industry and education. 1 lecture, 4 hours studio. Prerequisite: TCM 336†.

472 Broadcast Station Management. (3) S
Management principles and practices, including organization, procedures, policies, personnel problems and financial aspects of station management. Prerequisite: TCM 332†.

Special Courses: TCM 484, 499, 584. (See pages 36-37.)

* Majors only.

School of Justice Studies

John R. Hepburn, Ph.D., Director

PROFESSORS:

HEPBURN (WILSON 323), ALTHEIDE, HAYNES, JOHNSON, KELLY, KENNEDY, LAUDERDALE, MUSHENO, PALUMBO

ASSOCIATE PROFESSORS:

BORTNER, BRUNS, CAVENDER, DATESMAN, HERNANDEZ, JURIK, SCHADE (ASU WEST CAMPUS), SHUMAN

ASSISTANT PROFESSORS:

FERRARO, LUJAN, MELICHAR, ZATZ

Purpose and Philosophy

The school provides an interdisciplinary setting for studying justice from a social science perspective: the just distribution among people of benefits and burdens, including rights, desserts and needs. The curriculum focuses on criminal, juvenile, civil and administrative regulations; and 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 interdisciplinary, social science courses relevant to law and justice for stu-

dents working in the justice field, those anticipating justice-related careers (including the legal profession) and interested nonmajors.

Master of Science

The faculty in the School of Justice Studies offer a program leading to the Master of Science degree with a major in Justice Studies. The study of justice is an interdisciplinary problem-oriented field of scholarship, research and teaching, embracing those aspects of social and behavioral sciences relevant to an understanding of law, justice, crime and social deviance, and entailing a critical examination of the systems which have evolved for handling attendant problems. The Master of Science degree has been designed to prepare students for professional positions in justice-related agencies, for teaching in community colleges and for further study and research in the justice field. Information on the Master of Science with a major in Justice Studies is detailed in the *Graduate Catalog*.

Concurrent M.A. Anthropology/ M.S. Justice Studies

Graduate students in the School of Justice Studies and the Department of Anthropology are able to receive a concurrent Master of Science degree in Justice Studies and Master of Arts in Sociocultural Anthropology. The principal purpose of the program is to prepare individuals with combined and complementary knowledge and skills for basic and applied research and administrative and educational activities related to justice studies and anthropology.

Students will have to be admitted separately to each program, following the guidelines set forth by the Graduate College, Department of Anthropology and School of Justice Studies. Additional information on the M.A. in Sociocultural Anthropology and the M.S. in Justice Studies may be obtained from each department.

Doctor of Philosophy in Justice Studies

Studies reflect a law and society perspective and integrate philosophical, legal and ethical approaches with social science and policy science methodologies. The central focus of the program is the conceptualization and implementation of law and justice in society. The Ph.D. degree program aims to prepare scholars for placement in the growing number of colleges and universities with interdisciplinary, justice-related programs (e.g., law and society, criminal justice, women's studies). The program is interdisciplinary in nature and administered by a university committee. Specifically, participating faculty are appointed by the dean of

the Graduate College to serve as members of ASU's Committee on Law and Social Sciences and its Executive Committee. Students may develop an individualized area of substantive specialization through consultation with their program committee and/or choose from the areas of concentration identified with the program. The areas of concentration are:

- Criminal and Juvenile Justice
- Dispute Resolution
- Law, Policy and Evaluation
- Law, Justice and Minority Populations
- Women, Law and Justice

Information on the Ph.D. in Justice Studies is detailed in the *Graduate Catalog*.

Doctor of Public Administration

Justice Studies is an area of concentration within the Doctor of Public Administration (D.P.A.) degree program, an interdisciplinary program offered by faculty from various academic units. The Justice Studies concentration is designed to prepare skilled professionals for high-level positions in justice agencies. 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. program in the *Graduate Catalog*.

Admission to Undergraduate Program

The Bachelor of Science in Justice Studies is an upper-division program. Upon admission to the university, Justice Studies students will be classified as pre-majors. Major status is required for graduation and pre-majors are not allowed to take 400-level JUS courses. Justice Studies students may earn major status by:

1. Earning a minimum of 56 semester hours;
2. Earning a minimum cumulative grade point average of 2.50 (calculated on semester hours earned at Arizona State University);
3. Completing, with a grade of "C" or better, the following courses: ENG 101 and 102 (or ENG 105); JUS 100, 200, 301, 302, 303; and the College of Public Programs writing competence requirement.

Upon completion of these requirements, the School of Justice Studies will administratively assign the pre-major to major status.

Academic Advisement. Justice Studies students admitted as pre-majors are advised by the school's academic advisor. All students are encouraged to seek advisement in order to formulate an appropriate educational plan. Justice Studies majors may also be advised by the school's faculty.

A comprehensive discussion of degree requirements for the Bachelor of Science in Justice Studies is contained in the school's *Undergraduate Advisement Guide*, available in Wilson 342 and via requests by mail or phone (602/965-7727). Every Justice Studies undergraduate receives the *Advisement Guide* as well as an evaluation of transfer work, if any, by the school's advisement staff upon admission to the university.

Degree Requirements

The School of Justice Studies awards a Bachelor of Science upon the successful completion of a curriculum consisting of a minimum of 126 semester hours including university General Studies requirements, College of Public Programs requirements, justice studies courses and electives. Additionally, the student must fulfill the following:

1. Earn major status;
2. Earn a minimum of 50 semester hours of upper-division courses;
3. Complete a minimum of 30 semester hours, including 24 in justice studies courses, at Arizona State University;
4. Earn a grade of "C" or better in all justice studies courses taken at Arizona State University;
5. Meet the university's residency and scholarship requirements.

A comprehensive discussion of degree requirements for the B.S. in Justice Studies is contained in the school's *Undergraduate Advisement Guide*. (See "Academic Advisement.")

General Studies Program. To assure breadth and depth of their education, all Justice Studies undergraduates must complete the university General Studies requirements and additional fundamental requirements prescribed by the College of Public Programs and the School of Justice Studies. For descriptive information on these requirements, refer to:

University General Studies, pages 42-66, this *Catalog*

College requirements, pages 383-384, this *Catalog*

School requirements, *Undergraduate Advisement Guide* (see "Academic Advisement")

Justice Studies Program. The required Justice Studies component consists of 54 semester hours, of which 15 must be taken in a related field approved by the school. JUS 100, 200, 301, 302 and 303 are required for all degree candidates. Through advisement, a group of justice studies courses may be recommended to ensure a comprehensive exposure appropriate to the student's interests. For specific

information in this area, refer to the *Undergraduate Advisement Guide*. (See "Academic Advisement.")

Electives. Students are encouraged to utilize the unique opportunities afforded by the university to pursue personal educational interests, whether in the form of a broad sampling of other disciplines, or the deeper probing of a single field.

Transfer of Community College Credits. Credits transferred from accredited community colleges will be accepted as lower-division credits up to a maximum of 64 semester hours. The acceptance of credits will be determined by the director of Admissions, and the applicability of credits toward degree requirements will be determined by the School of Justice Studies.

Special Program Option. Justice Studies participates in the accelerated degree program of the College of Public Programs, by which eligible students may complete the bachelor's and master's degrees on an accelerated schedule. See the description provided by the College of Public Programs (page 385).

JUSTICE STUDIES

JUS 100 The Justice System. (3) F, S, SS

Overview of the justice system. Roles of law enforcement personnel, the courts and correctional agencies. Philosophical and theoretical views in historical perspective. [Satisfies General Studies Requirement: SB]

200 Concepts and Issues of Justice. (3) F, S, SS

Issues relating to justice policies, perspectives, techniques, roles, institutional arrangements, management, uses of research and innovative patterns. [Satisfies General Studies Requirement: SB]

301 Research in Justice Studies. (3) F, S, SS

Focus is on developing and evaluating research designs, data collection and the relationship between validity and reliability. Methods for conducting research is also stressed. Prerequisite: JUS 100, 200 or instructor approval.

302 Basic Statistical Analysis in Justice Studies. (3) F, S, SS

Introduction to the fundamentals and application of descriptive and inferential statistics, with emphasis in the justice area. Prerequisite: JUS 100 or 200; MAT 106; or instructor approval. [Satisfies General Studies Requirement: N2]

303 Justice Theory. (3) F, S, SS

An examination of classic and contemporary philosophies and theories of justice including legal, social and criminal justice. Prerequisite: JUS 100, 200 or instructor approval.

306 The Police Function. (3) F, S, SS

Alternative objectives, strategies, programs, institutional arrangements, roles, perspectives and interagency relationships of the police. Prerequisite: JUS 100, 200 or instructor approval.

308 The Adjudication Function. (3) F, S, SS

History and development of Courts, trial by jury and other dispute resolution mechanisms; selection and removal of judges and juries; organization, structure and jurisdiction of Courts; trial and non-trial processes of the judiciary. Prerequisite: JUS 100, 200 or instructor approval.

310 The Correctional Function. (3) F, S, SS

Alternative correctional objectives, strategies, programs, institutional arrangements, roles, perspectives and inter-agency relationships. Prerequisite: JUS 100, 200 or instructor approval.

311 Prevention of Delinquent and Criminal Behavior. (3) F, S, SS

Theories of prevention, individual, group and community approaches: intervention at appropriate stages; contemporary law enforcement and corrections practices. Prerequisite: JUS 100, 200 or instructor approval.

320 Community Relations in the Justice System. (3) F, S

Focus on developing an informed plan and policy for incorporating research findings about the surrounding community within various justice services and agencies. Topics include social stratification, minority groups and victimology. Prerequisite: JUS 100, 200 or instructor approval.

329 Domestic Violence. (3) F, S, SS

Legal aspects of domestic violence in context of historical, theoretical and treatment aspects of domestic violence, including: child abuse, women battering, incest, marital rape and elderly abuse. Prerequisite: JUS 100, 200 or instructor approval.

335 Organized Crime. (3) F, S

The nature of organized crime and its illegal activities, theories of containment and efforts by justice agencies to counter its dominance in society. Prerequisite: JUS 100 or 200; or instructor approval.

340 Juvenile Justice. (3) F, S, SS

A critical examination of the history and development of the juvenile court and the juvenile justice system. Prerequisite: JUS 100, 200 or instructor approval.

360 Law and Social Control. (3) F, S, SS

Resolution of social issues through the application of law as an agent of social control. Nature, sanctions and limits of law. Categories of law and schools of jurisprudence. Prerequisite: JUS 100, 200 or instructor approval. [Satisfies General Studies Requirement: SB]

394 Special Topics. (1-3) F, S, SS

Topics chosen from various fields of justice studies. Prerequisite: JUS 100, 200 or instructor approval.

404 Imperatives of Proof in the Justice System. (3) F, S, SS

Problems and means of establishing identity and fact in relation to arrest, detention, adjudication, sentencing and correctional case management. Prerequisite: JUS 100, 200 or instructor approval.

422 Women and Crime. (3) F, S, SS

Theoretical, empirical and legal analyses of women as officers and victims of crime. Particular attention to the nature of social control with respect to women. Prerequisite: JUS 100, 200 or instructor approval.

435 White Collar Crime. (3) F, S, SS

Overview of major issues in business, professional and official rule violations. Includes: consumer fraud, securities violations, unethical professionalism, political corruption. Prerequisite: JUS 100, 200 or instructor approval.

440 Organization and Administration of the Justice System. (3) F, S, SS

Introduction to basic research theories and their application to criminal justice management. Emphasis on supervisory and middle management theory and policy development. Prerequisite: JUS 100, 200 or instructor approval.

461 Substantive Criminal Law. (3) F, S, SS

Criminal liability. Crimes against persons, property and society. Governmental sanctions of individual conduct as

formulated by legislatures and the courts. Prerequisite: JUS 100, 200 or instructor approval.

462 Procedural Criminal Law. (3) F, S, SS

The criminal process. Constitutional and legal problems associated with arrest, search and seizure and due process of law. Prerequisite: JUS 100, 200 or instructor approval.

463 Discretionary Justice. (3) F, S, SS

Use and abuse of discretion in all phases of the justice system and society. Key issues and manifestations of discretion. Theoretical and empirical linkages between discretion and discrimination. Prerequisite: JUS 100, 200 or instructor approval. [Satisfies General Studies Requirements: L2, SB]

469 Political Deviance and the Law. (3) F, S, SS

An examination of the controversies created by political and deviant behavior; including a critical view of law as an agent of social control. Prerequisite: JUS 100, 200 or instructor approval. [Satisfies General Studies Requirement: SB]

474 Legislation of Morality. (3) F, S, SS

Understanding basic questions and contemporary issues related to law and morality. Process of creating and enforcing morality statutes (e.g., prostitution). Prerequisite: JUS 100, 200 or instructor approval.

484 Internship. (3 or 6) F, S, SS

Assignments in a justice agency designed to further the student's integration of theory and practice. Placements are arranged through consultation with students and agencies. May be taken for a total of up to 12 hours credit, of which a maximum of 6 shall be applied to the major. Prerequisites: JUS 100, 200; major status.

494 Special Topics. (1-3) F, S, SS

Topics chosen from various fields of justice studies. Prerequisite: JUS 100, 200 or instructor approval.

498 Pro-Seminar. (1-3) F, S, SS

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. Prerequisites: JUS 100, 200; major status; minimum cumulative GPA of 3.00; instructor approval.

499 Independent Study. (1-3) F, S, SS

Original study or investigation in the advanced student's field of interest under the supervision of a faculty member. May be repeated for credit up to a maximum of six hours, all applicable to the major. Prerequisites: JUS 100, 200; senior standing; minimum cumulative GPA of 3.00; minimum GPA in JUS courses of 3.00; instructor approval.

500 Justice Research Methods. (3) F, S, SS

Theories and methods of research with emphasis on development of designs most relevant to justice data and problems.

501 Justice System, Theory and Issues. (3) F, S

Analysis of the justice structure and process within various theoretical frameworks. Issues such as discretion, diversion and plea negotiations.

502 Primary Management in Justice Agencies. (3) S

Concepts of modern management and their application to justice-related agency supervision and management.

503 Crime and Social Causation. (3) S

Theories of deviance and crime as they relate to social policies and specific response of the justice complex.

509 Statistical Problems in Justice Research. (3) F, S
Methodological problems of research design and statistical methods specific to justice studies.

510 Understanding the Offender. (3) F

Survey of learning, personality and biological theories of causation and their relevance to understanding criminal and delinquent behavior.

514 Justice Policy. (3) F

Assessment of the politics of justice policy as well as an understanding of the basic tools available to social scientists for analyzing the formulation, implementation and evaluation of justice policy.

520 Qualitative Theory and Data Collection. (3) F

The basic theoretical rationale and perspectives for justice related qualitative research, e. g., symbolic interactionism. Techniques for data collection, e.g., ethnography, depth interviewing.

521 Qualitative Data Analysis and Evaluation. (3) S

Analysis of a qualitative data, e.g., field notes, depth interview transcripts, document analysis, coding and retrieval with a microcomputer; qualitative evaluation.

530 Justice Education. (3) F

Development and philosophy of justice education and training. Problems of curriculum development and evaluation. Examination and evaluation of teaching methodologies and instructional aids.

540 Justice Administration. (3) S

Administrative policies and practices used in justice agencies and their application to the various facets of the justice administrative process.

541 Justice Planning: Innovation and Change. (3) S

Normative factors in planning for standards and goals in the justice system. Application of innovation and change techniques in an interdependent system.

550 Survey Research in the Public Sector. (3) S

Design and implementation of survey research methods with an emphasis on public sector applications.

560 Women and Crime. (3) F

Nature and extent of female crime, causation theories and the treatment of females in the law and justice system.

570 Juvenile Delinquency. (3) F

Study of delinquency, including causation theories. Alternative definitions of delinquency, official statistics and the critique and analysis of the interaction between social institutions and youth.

571 Juvenile Justice System. (3) S

Graduate-level introduction to juvenile justice system, including: historical development, philosophical orientation, organizational structure and contemporary controversies.

579 Political Deviance. (3) F

The seminar examines the politics of deviance by integrating the study of conflict with aspects of social organization, especially state formation.

584 Internship. (3 or 6) F, S, SS

Assignments in a justice agency designed to further the student's integration of theory and practice. Placements are arranged through consultation with students and agencies.

591 Seminar. (1-3) F, S, SS

Topics chosen from various fields of justice studies. May be repeated for credit.

610 Law and the Social Sciences. (3) S

Normative conceptualizations of law; law and the administrative state; impacts of law on society; discretion, street-level bureaucrats and the living law.

620 Justice Research and Methods. (3) F

Concept development, research design, data collection strategies, legal research and building computer data bases relevant to the study of justice.

630 Data Analysis for Justice Research. (3) F

Bivariate and multivariate techniques of data analysis and hypothesis testing for justice-related research and use of information and statistical programs.

640 Theoretical Perspectives on Justice. (3) F

Analysis of philosophical perspectives of justice; linkages between social science theory and justice constructs; application of justice to social issues.

Special Courses: JUS 492, 493, 497, 584, 590, 591, 592, 593, 594, 598, 599, 691, 790, 791, 792, 799. (See pages 36-37.)

Leisure Studies

PROFESSORS:

HALEY (GHALL 204), CHEATHAM

ASSOCIATE PROFESSORS:

ALLISON, KNOPF (ASU WEST CAMPUS)

ASSISTANT PROFESSORS:

DIFFENDERFER, TEYE, VIRDEN

PROFESSOR EMERITUS:

GREEY

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 minimum 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 the university General Studies requirements and the College of Public Programs course requirements in addition to major requirements. 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 69-74 semester hours of course work including related studies. The following courses are core major courses required of all undergraduate majors:

		<i>Semester Hours</i>
REC 120	Social Psychology 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 must be taken in sequence and may not be taken concurrently.

The remaining courses will be reflective of the professional emphasis area selected by the student in consultation with his/her assigned departmental advisor. The five (5) professional emphasis areas in the department follow:

Outdoor Recreation. This area of emphasis prepares students for the planning and management responsibilities in agencies which have as their primary mission the provision of outdoor recreation opportunities. Students are provided a basic understanding of human behavior, environmental concerns and policy issues which impact outdoor recreation systems. Students are prepared for employment in various regional, county and state park agencies. In addition, federal agencies such as the U.S. Forest Service, the Bureau of Land Management, the National Park Service and private outdoor recreation organizations offer potential employment for outdoor recreation students.

Therapeutic Recreation. This area of emphasis is designed to prepare students for work with groups exhibiting special societal needs. These special populations include youth and adult criminal offenders, substance abusers, the mentally retarded, mentally ill, physically handicapped or physically disabled groups. Career placement in this area typically include the following: school settings, urban park and recreation departments, correctional facilities, rehabilitation programs and gerontological and adult development centers.

Tourism and Commercial Recreation. This emphasis provides a broad-based academic approach to the travel and tourism field that features economic, social, environmental and policy issues at the state, regional, national and international levels. Commercial recreation delivery is also examined from a variety of conceptual and applied perspectives. Furthermore, by addressing the practical aspects of the tourism industry, as well as conceptual foundations, this emphasis endeavors to familiarize the student with current professional problems and opportunities. National and interna-

tional career placements and settings include state and national offices of tourism, visitors and convention bureaus, airlines, hotels and resorts, commercial recreation agencies, tour operators and travel agencies, transportation services and tourism consulting establishments.

Urban Recreation. This area of emphasis is designed to provide the student with competencies necessary to function in leadership, supervisory or administrative positions within a variety of community, leisure and human service agencies. Agency settings include park and recreation departments, public human service agencies, regional and county park and recreation departments and quasi-public service agencies.

Youth Agency Administration/American Humanics. This concentration prepares students to serve with professionals in the field of voluntary youth and human service agency management. This includes agencies such as Boy Scouts of America, Girl Scouts of the USA, Big Brothers/Big Sisters, 4-H, Camp Fire, Boys Clubs of America, Girls Clubs of America, United Way, YMCA, YWCA, Junior Achievement, American Red Cross and numerous other youth and human service agencies. Academic course work in the areas of fund-raising, volunteerism, agency management and administration is supplemented with a co-curricular program. This program is aided by current agency professionals who offer workshops, seminars, field trips and cooperative education experiences. This emphasis is one of 14 nationally select youth agency administration programs affiliated with American Humanics, Inc., the nation's largest not-for-profit educational organization committed to the training and job placement of students within this career field. The Arizona State University American humanics program is annually ranked among the top three of the fourteen programs in the United States. Successful completion of the program results in national certification for qualified students.

Additional Department Requirements. 200 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 Social Psychology of Play. (3) F, S

An introduction to the psychological, social and cultural foundations of play and leisure behavior. [*Satisfies General Studies Requirement: SB*]

150 Outdoor Pursuits. (3) F, S

Theories and practical applications related to outdoor recreation pursuits. Interdisciplinary approach to wilderness issues and philosophies, culminating in an outdoor experience. Field trip required.

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. [*Satisfies General Studies Requirement: SB*]

210 Urban Leisure Systems. (3) F, S

Systematic overview of interrelated public, private and commercial urban leisure services. Prerequisites: REC 160; leisure studies major.

300 Fund Raising. (3) F

Methods, techniques and directed experience in fund raising for voluntary youth and human services agencies. Budget control and accountability.

305 Introduction to Travel and Tourism. (3) F, S, SS

An examination of the components of the travel and tourism industry at the state, national and global levels.

310 Volunteerism. (3) F

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: instructor approval.

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 210†; leisure studies major.

340 Outdoor Survival. (3) F, S

Interdisciplinary approach to outdoor survival, including attitudes, psychological stress, physiological stress, preparation, hypothermia, navigation, flora and wildlife. Field trips 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 Recreation Resource Management and Policy. (3) S

Management and decision-making in recreation resource agencies. Policy analysis and use conflicts. Prerequisite: leisure studies major.

364 Recreation for Special Populations. (3) F, S

Concepts, methods, settings involving recreational services as applied to special groups in American society; e.g., youthful and adult offenders, alcoholics, drug addicts, mentally retarded, mentally ill and physically handicapped. May include field experience.

370 Outdoor Recreation Systems. (3) F

Introduction to outdoor recreation resource delivery systems; history of wilderness and outdoor recreation resources; the role of outdoor recreation in society; outdoor recreation agencies; related environmental issues. Prerequisite: junior standing or instructor approval.

372 Tourism Destination Development. (3) F

Application of economic and regional development concepts/theories to destination product development. Prerequisite: leisure studies major.

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

Principles, practices of program development, evaluations, professional roles and support services related to therapeutic recreation service. Off-campus labs. Prerequisites: REC 364†; leisure studies major.

420 American Humanics Institute. (1) F, S

Mini-intensive national management institute for voluntary youth and human service agency personnel. Out-of-state conference required. Prerequisite: instructor approval.

430 Youth Agency Administration. (3) S

Analysis of administrative structure, decision-making and program delivery within voluntary youth and human service agencies.

440 Areas and Facilities. (3) S

Public, private and commercial recreation areas and facilities. Survey of design, function, aesthetics and relationships.

450 Recreation and Aging. (3) F

Organized recreation services and facilities for the aged. Socioeconomic considerations affecting delivery of comprehensive leisure services to the elderly. Off-campus laboratory. Prerequisite: instructor approval.

458 International Tourism. (3) F, S

A global examination of international tourism and its significance as a vehicle for social and economic development. [*Satisfies General Studies Requirement: GJ*]

460 Issues in Therapeutic Recreation. (3) S

Contemporary problems/issues confronting the therapeutic recreation field-professional development, programs and services, legislation, philosophical and research issues. Off-campus laboratories. Prerequisites: REC 364; leisure studies major.

462 Administration of Leisure Services. (3) F, S

Basic principles of administration and their application to successful administration practices. Analysis of administrative function, structure and policies. Prerequisites: REC 330†; leisure studies major.

463 Senior Internship. (6 or 12) F, S, SS

Supervised guided experience in selected agencies. Prerequisites: REC 462†; senior standing; leisure studies major.

470 Camp Organization and Administration. (3) F

Organization and administration of camps. Preparation for camp management; consideration of budget, campsite and personnel.

500 Research Methods. (3) S

Introduction to recreation research methods with emphasis on methodological questions, research issues and techniques relevant to contemporary social research.

540 Recreation Services for the Aged. (3) S

An applied orientation to the social/psychological theories of recreation and the aged.

552 Philosophical and Current Issues in Leisure. (3) F

An analysis of fundamental philosophical concepts and contemporary issues and problems confronting the leisure services profession.

555 Social and Psychological Aspects of Leisure Behavior. (3) F
An empirical and theoretical analysis of social, cultural and psychological foundations of leisure behavior.

558 Integrative Seminar. (3) F, S
Advanced exploration and assessment of current trends within the leisure studies' field. This course has variable topics including, but not limited to: cross-cultural analysis of leisure, urban recreation, planning and resources, sociocultural dimensions of tourism development, wilderness management. Prerequisite: REC 552.

569 Commercial Recreation and Tourism. (3) F
Procedures in determining public needs, initiating enterprises, promoting activity and evaluating the total project in terms of both proprietor and the public.

570 Outdoor Recreation Planning. (3) S
Planning for administrative duties in varied recreation settings. Prerequisite: REC 370 or equivalent.

Special Courses: REC 294, 298, 484, 492, 493, 494, 497, 498, 499, 500, 580, 584, 590, 591, 592, 593, 598, 599, 691. (See pages 36-37.)

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.

Center for Urban Studies

The Center for Urban Studies (CUS) is an interdisciplinary research and service unit of the School of Public Affairs 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 workshops 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), 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.

Division of Field Research. The Phoenix urban area is a virtual laboratory of public programs and issues. This division applies 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

School of Public Affairs

PROFESSORS:

(WILSON 206), BECKER, CAYER, DANEKE, KARNIG, MUSHENO, MUSHKATEL, PERRY, WESCHLER, WIGAND

ASSOCIATE PROFESSORS:

BROWN, MANKIN, McCLAIN, NIGG, PIJAWKA, WILSON

ASSISTANT PROFESSOR:

HERZIK

LECTURERS:

DeBOLSKE, FERRALL

PROFESSOR EMERITUS:

SACKTON

The faculty in the School of Public Affairs offer a graduate program leading to the professional degree, Master of Public Administration (M.P.A.). The M.P.A. 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 Catalog* for information about these programs. The basic aims of the school are:

1. To offer professional education programs leading to graduate degrees in Public Administration and to encourage mid-career education for public administrators by offering evening course work at the Arizona State University main campus, the ASU Downtown Center and the state government complex;

on 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

Created by a grant from Marvin and June Morrison in 1981, the institute acts as a liaison among government officials, university faculty and the private sector to identify and provide analysis of timely public policy issues. In fulfilling this role, Morrison Institute conducts descriptive and original research, conferences, consultations and produces publications on a wide range of topics including urban growth, natural resources, education, government systems, health care, social services, the quality of life and economic development. The institute also sponsors a Legislator's Institute annually and is active in providing research for city and state Town Hall projects.

Office of Hazards Studies

This unit conducts hazards research in the social and policy sciences. Its goal is to encourage interdisciplinary research in the hazards field in the social, biological, physical and engineering sciences.

Activities include working with public agencies to identify needs in hazards management and provide technical assistance. The unit has also established a working paper and technical report series to be made available to researchers and public sector users.

Publications Division

The division is a resource unit created to encourage faculty research on current topics of public interest through its publications program. Its purpose is the dissemination of research on public policy and public administration to academics, public managers, officials and concerned citizens, with a focus on issues of special importance to Arizona.

The program publishes policy, research and management papers and a semiannual newsletter on the activities of the School of Public Affairs. The

division also supports the other research units of the school by publishing their work or providing technical assistance.

PUBLIC AFFAIRS

PAF 500 Research Methods I. (3) F, S

Presentation of multivariate statistics, computer applications and introduction to major research design issues. Prerequisite: an approved course in statistics.

500 Research Methods II. (3) F, S

Advanced treatment of design and measurement issues with emphasis on applied research projects by students. Prerequisite: PAF 500 I.

501 Statistics in Administration. (3) F, S

Application of statistical methods to problems in finance, personnel, survey and planning.

502 Computers in Administration. (3) N

Experience in use of computer technology for public administration problem solving.

503 Organization Theory. (3) N

Organization theories and current research emphasis with application to public administrative organizations.

504 Comparative Administration. (3) N

Literature on comparative public administration theory. Bureaucracies and their impact on the political development process. Selected nations will be studied.

505 Intergovernmental Relations. (3) N

Evolution, growth, present status and characteristics of the U.S. federal system of government. Federal-state relations, state-local relations, regionalism, councils of government, interstate cooperation, grants-in-aid and revenue sharing.

506 Regional Cooperation, Programs and Associations. (3) N

Inter- and intrastate regional political and administrative cooperative devices and bodies.

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 administration concepts applied to management situations including personnel, finance, budgeting, decision-making and implementation.

509 Organization Change and Development. (3) N

Exploring the nature and management of change and development as a tool to achieve organizational goals; effecting planned change.

510 Governmental Budgeting. (3) F, S

Legal, social, economic and political nature of governmental budgets and the budgetary process. Theories and social consequences of budget decision-making and practices of budget control.

511 Governmental Finance Management. (3) A

Sources of funding, management of funds and debts and general pattern of expenditures, in states, counties, cities and districts. Prerequisite: PAF 510.

512 Public Affairs Economics. (3) A

Role of economics in public affairs with examples from transportation, urban form, Rio Salado project, housing land use, flood control, growth and aspects of energy economics.

520 Public Management. (3) A

The management process in government and public agencies, with emphasis on the executive leadership within the public sector.

402 SCHOOL OF PUBLIC AFFAIRS

521 Public Personnel Management. (3) A

History of the civil service, recruitment, selection, position and wage classification, motivational analysis, productivity, public unionism and ethics in the public service.

522 Public Labor Relations. (3) A

Rise of public unionism, managerial policy toward unionism, conflict resolution, impact of unionism on budgets, personnel policies and public policy.

523 Public Information Systems. (3) N

Systems analysis concepts and theory as applied to administration. Alternative modes of information organization and their impact on public decision-making.

524 Community Conflict Resolution. (3) N

Interdisciplinary approach to understanding the dynamics of community conflict. Strategic considerations in policy design and advocacy, potential reaction to conflict. Relevant models and research findings generated by both case studies and comparative methods.

525 Public Program Management. (3) A

Governmental service programming: formulating, financing, operating, evaluating and reporting. Analysis of interagency relationships and the role and conduct of research in the programming process.

526 Public Sector Human Resource Development. (3) A

Concepts and techniques of organizational development in the public sector, including staffing, supervisor training, executive development, resource planning and employee training.

530 Management of Urban Government. (3) A

Administrative practices and behavior within the urban political administrative environment. Functional areas such as citizen participation, urban planning, urban transportation and the conflicts between urban politics and administrative efficiency.

531 Comparative Urban Administration. (3) N

Development of urban governments within different cultural, social and political milieu. Cities within developing countries as well as in the developed countries of Europe and North America.

532 Urban Planning Administration. (3) A

Historical and present day uses of urban planning and procedures for its implementation. Basic principles and practices.

533 Politics of Urban Planning. (3) A

Urban planning policy issues frequently faced by local, state and federal government. Consideration of the relationships between the political leader, the professional planner and the citizen.

535 The City and County Manager. (3) A

The manager's role and resources in the differing forms of administrative, legislative and community sectors.

540 Public Policy Analysis. (3) A

Theories which attempt to explain public policy formulation. Application of social science to policy issues.

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) Education Policy
- (d) Environmental Public Policy
- (e) Health
- (f) National Public Policy
- (g) Public Safety
- (h) Recreation
- (i) Transportation
- (j) Welfare

542 Science, Technology and Public Affairs. (3) N

The influence of science and technology on governmental policy-making, scientists as administrators and advisors, governmental policy-making for science and technology, government as a sponsor of research and development.

543 Public Management of Land. (3) N

Description and analysis of urbanization processes. An emphasis is placed on the application of urban theories to developing urban centers, with a focus on Maricopa County.

544 Preparation of Reports in Public Administration. (3) N

Intensive practice in written and oral presentation of reports to conferences covered with problems in public administration. Visual aid techniques.

545 Research Data Management. (3) N

Techniques and problems associated with data management in a research environment. Data base management systems, security and integrity, accessibility and cost.

546 Data Base Management Systems in Public Administration. (3) N

Concept and use of modern data base management systems in an administrative organization. Advantages and disadvantages of this approach.

547 Program Evaluation. (3) N

Various methodologies available for the evaluation of public policies and programs.

548 Women, Politics, and Public Policy. (3) N

Explores how political philosophy, politics and public policy affect and are affected by women.

550 Survey Research in the Public Sector. (3) N

Design and implementation of survey research methods with an emphasis on public sector applications. Cross-listed as JUS 550. Prerequisites: PAF 500 and 501; or JUS 500 and 509, or equivalent; or instructor approval.

551 Urban Planning Evaluation. (3) N

Concepts, principles and methods employed by public planners in the analysis of urban problems involving multiple criteria decisions. Prerequisite: formal graduate level course work in statistics and planning.

552 Urban Housing Policy. (3) N

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.

560 Information Management. (3) N

Concepts and theory of information and information technology in public sector organizations.

570 Advanced Public Policy Analysis. (3) A

Course emphasizes the structure of policy problems, forecasting policy alternatives, optimizing resources and reducing uncertainty in policy making. Prerequisite: PAF 540.

591 Seminar. (1-3) 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
- (f) Information Management
- (g) Business and Government

593 Planning Workshop. (3) N

Practical team research and field experience. Emphasis on the synthesis of public sector planning methodologies, concepts and techniques applied to a local planning problem.

600 Research Design and Methods. (3) F

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) S

Normative and conceptual issues of policy formulation, implementation and evaluation; empirical approaches and methods of program evaluation and policy analysis.

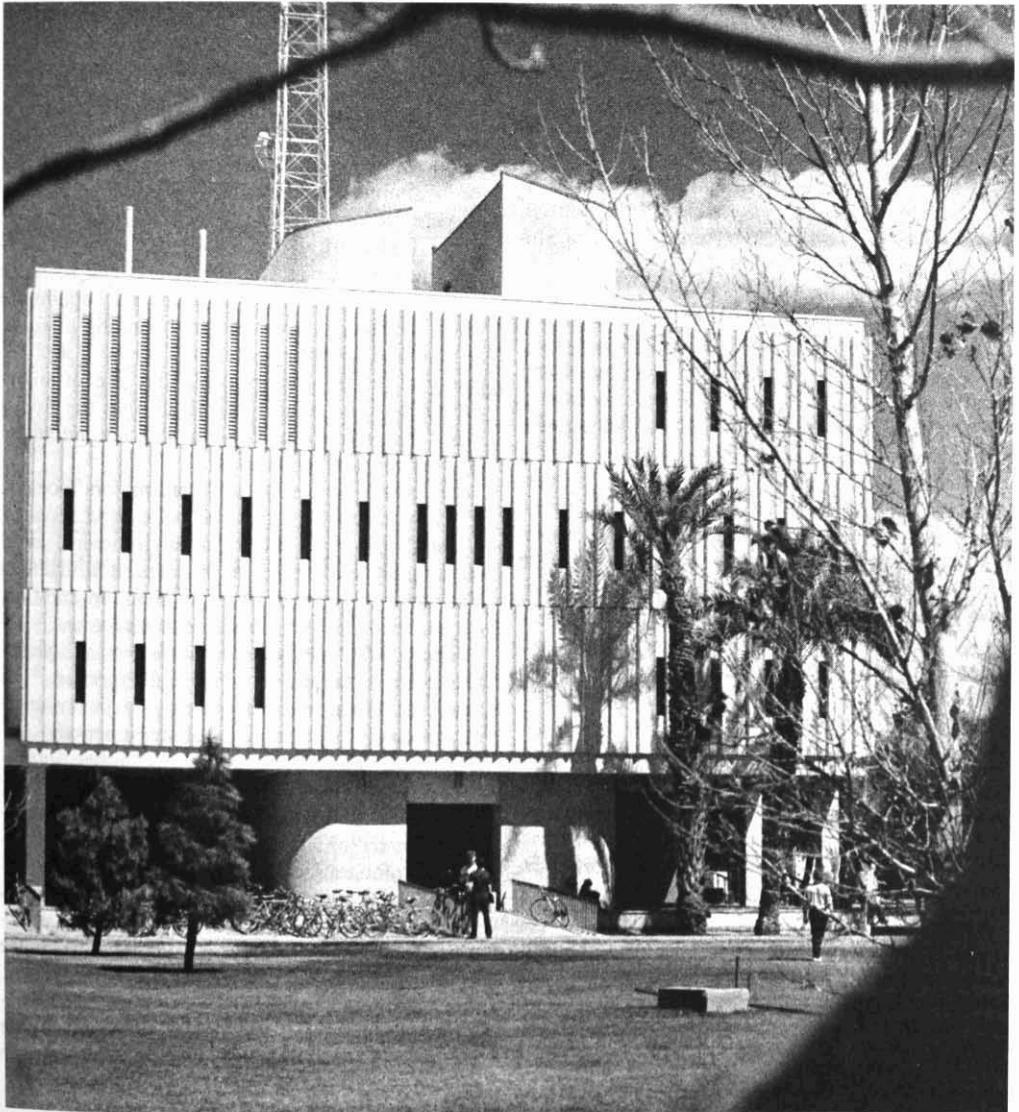
602 Seminar: Foundation of Public Administration. (3) F

Ethical, social, legal and philosophical foundations of public administration.

603 Seminar: Organization and Behavior in the Public Sector. (3) S

Structure, organization, conduct and performance of public sector institutions in the administration of public policy. Prerequisite: PAF 602.

Special Courses: PAF 580, 584, 590, 592, 594, 598, 599, 691, 780, 783, 784, 790, 791, 792, 799. (See pages 36-37.)



School of Social Work

Jesse F. McClure, Ph. D.

Dean

Purpose

The purpose of the School of Social Work at Arizona State University is to prepare professional social work practitioners who are committed to understanding and serving those most in need of help, who are willing to devote their careers to finding the most effective methods of intervention, who place the highest values on excellence, and who take pride in their practice.

The mission of the School of Social Work is the preparation of professional social workers for clinical, administrative and community practice focused on those populations who are most oppressed and most in need of the services social workers have to offer. A special emphasis is placed on working with ethnic minorities of the Southwest.

The school is totally committed to the university's mission to be competitive with the best public research universities in the country. Faculty members have active research agendas underway which venture into a wide variety of topics, including work with children, with drug and alcohol abusers, with the developmentally disabled, in human services planning, and many other areas of interest.

Organization

The School of Social Work has no separate departments or units. Generally speaking, curriculum planning, faculty teaching areas and student advising tend to cluster around four programmatic areas: the Bachelor of Social Work (B.S.W.) program, the Master of Social Work-Direct Practice (M.S.W.-DP) concentration, the Master of Social Work-Planning, Administration and Community Practice (M.S.W.-PAC) concentration, and the Doctor of Social Work (D.S.W.) program. Some faculty teach in more than one of these programmatic areas.

Degrees

Bachelor of Social Work

The school's undergraduate curriculum leads to a Bachelor of Social Work (B.S.W.). 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 and sciences students. During the freshman and sophomore years, students concentrate on obtaining a strong background in liberal arts and sciences 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 and services, human behavior in the social environment, social work direct practice, social work research, and field instruction in community agencies. In addition, majors take elective courses in related areas.

The B.S.W.-level practitioner is seen as a generalist with certain areas of special expertise. The curriculum focuses on such roles as advocacy, referral, casework and problem-solving functions.

Master of Social Work

The Master of Social Work program prepares professional social workers for advanced direct practice, administrative and community practice positions. The program puts major emphasis on preparing social workers capable of responding effectively to the needs of the special populations in the Southwest—the ethnic minority groups of the region, the aged, urban and rural poor, dependent and neglected children, the disabled, and women who are victims of poverty, discrimination and violence—in its curriculum and its practicum assignments.

The M.S.W. program is a two-year, sixty-hour program which includes a foundation year and a concentration year. In the foundation year, all students complete the same course work and field education requirements. In the concentration year, students select either direct practice (DP) or planning, administration and community practice (PAC).

Doctor of Social Work

The doctoral program of the School of Social Work prepares students to contribute to the field of social welfare and the profession of social work through research, teaching and other scholarly activities.

The program seeks to broaden the student's knowledge of the whole field of social welfare and the supporting social/behavioral sciences, to deepen the student's understanding of his/her area of specialization, and to enable him/her to make a contribution to that area through scholarship and research.

Most students specialize in theory and research in social development, social treatment, or some combination of both. Social development includes social administration, social planning, social policy and community development. Social treatment includes direct practice with individuals, families or small groups.

Students may construct programs which combine social development and social treatment, and may develop specializations in various specialization areas, e.g., child welfare, aging, mental health, medical care.

Admission

Bachelor of Social Work

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 22 and 25 of this *Catalog*. Students transferring from another college within the university must obtain a "Change of College" form from the School of Social Work Student Services Office, Room 137, West Hall.

Admission Procedure for Social Work Majors. (Students having 54 semester hours or more and SWU 271, 291 and 301 or 331.) 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 54 semester hours and the required social work courses 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 may obtain Social Work major application packets at the School of Social Work Student Services 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 receive their acceptance. All other application material (i.e., application form, additional statement and two letters of reference) must be returned to the School of Social Work Student Services Office, Arizona State University, Tempe, AZ 85287-1802 by November 1 for spring admission or February 1 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 future plans.

Criteria for Admission. Admissions are based on the following criteria:

1. Overall GPA (Grade Point Average). A minimum 2.00 cumulative grade point average is required.
2. A 2.75 cumulative GPA in core social work courses (SWU 271, 291, 310 and 301 or 331).
3. Applicant's educational and career goal's compatibility with the educational objectives of the school.
4. Prior to admission to the major it is recommended that students have had social work

experience for a minimum of 240 hours in social work related settings. Personal life experience may be substituted.

5. Two references are required for each applicant. These references should be from two persons who have known the applicant in a professional capacity.

Leave of Absence. Occasionally, for health or personal reasons, B.S.W. majors find it necessary to interrupt their studies. Students considering such requests meet with the advisor to look at alternatives and then meet with the director of Admissions to process the request and a feasible educational plan. A student may request a leave of absence from the Social Work program for a period of one year. (This applies only to the Social Work program and not to the university. There are no leaves of absence granted from the university.) Requests for a leave of absence must be made in writing. Except when recommended by the Committee on Academic and Professional Standards, the student must be in good standing in the program at the time the request is made. Students should be aware that non-attendance at the university for one or more semesters requires reapplication to the university. Failure to request a leave of absence by B.S.W. majors will result in removal from the program.

Readmission. Undergraduate students (pre-major and major) who have previously attended ASU but have not been enrolled at this institution for one semester or more are required to apply for readmission following university procedures as outlined in page 67. Students who were previously B.S.W. majors may, in addition, be required to reapply for major status.

Transfer Credit. 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 credits earned 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 the

Student Services Office, West Hall 137. 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.

Direct transfer of courses from other accredited institutions to the School of Social Work will be subject to the existence of parallel and equal courses in the school's curriculum. Transfer credit is not given for courses in which the lowest passing grade ("D") or a failure grade ("F") was received. Credit for "life experience" is not given in lieu of course requirements. A minimum of 30 semester hours earned in resident credit courses at Arizona State University is required.

Master of Social Work

Applications to the M.S.W. program are accepted from November 1 to April 1 preceding the fall semester to which the applicant is seeking admission. All applicants are reviewed for admission for the fall semester only.

Regular Admission. Applicants must be acceptable to both the Graduate College and the School of Social Work. Among other considerations for acceptance by the Graduate College, the applicant must have a grade point average of 3.00 (4.00 = A) in the last two years of work leading to the bachelor's degree. The applicant's score on the aptitude examination—the Graduate Record Examination or Miller Analogies Test—may also be considered in making decisions regarding admission.

Provisional Admission. Applicants may be granted provisional admission to the Graduate College if the Graduate College or the School of Social Work requires additional evidence of their qualifications for admission to 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. This classification usually applies only to the first semester. A decision is made prior to the end of the first semester regarding the student's progress. Provisional students do not enter the field until the provisional status has been removed. Otherwise, they carry the same academic load as regularly admitted students and are expected to meet the same standards for continuation in the program.

Application Procedure. The following should be submitted to the Admissions Office, Graduate College, Arizona State University, Tempe, AZ 85287-1003: 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 85287-1802: (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 nine graduate semester hours earned as an unclassified student in the ASU School of Social Work may be transferred. Up to six semester hours of prior graduate work in another ASU program or another university may transfer as elective credit if approved by the program director. 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.

Work offered toward a master's degree must be completed within six consecutive years. The six years begin with the first course included on a student's approved program of study.

Waiver Exams. The number of hours required to complete the M.S.W. degree ranges from 40 to 60 semester hours, with 60 hours 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 hours 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 hours of course work, the student will replace waived required courses with elective course work to complete the requisite 40 hours.

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 accordance with the plan developed. At least one academic year must be taken on a full-time basis. A maximum of one year of field education can be done by special arrangement in the agency where the student is employed.

Doctor of Social Work

In general, an applicant to the program should hold a Master of Social 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 85287-1003: 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 85287-1802: (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) three letters of reference. The reference letter forms provided by the School of Social Work must be used.

Advisement

Bachelor of Social Work

Students are responsible for meeting the degree requirements and seeking advisement regarding their program status and progress. Upon entrance to the School of Social Work each student is assigned an advisor. The advisor assists students with program planning, registration, preparation of needed petitions, verification of graduation requirements, referrals to university and/or community resources and assistance with career planning. Advisor signatures are required on university registration forms.

Master of Social Work

A faculty advisor is assigned to each enrolled student at the beginning of his/her first semester of graduate work. Faculty advisors are available to help students prepare a program of study, to advise on academic and career decisions, and to refer to university and/or community resources to meet special needs. It is the student's responsibility to keep the faculty advisor informed on all issues which may require advisor involvement. In the absence of an advisor, questions should be directed to the Student Services Office of the School of Social Work.

Doctor of Social Work

At the time of matriculation, each student is assigned an advising team of two (2) faculty members. These members will be members of the Doctoral Advisory Committee and will be appointed by the dean of the School of Social Work.

The advising team has the following duties:

1. Educational planning: In light of the student's objectives, the advising team will assist in the development of the general educational plan.
2. Referral to other faculty members: The advising team will discuss research interests with the student and will refer the student to those faculty members who seem best qualified in the substantive field in which the student has an interest. Students are expected to use their own initiative in developing relationships with faculty at the School of Social Work and the university at large who share their theoretical and research interests.

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.

Course Load. A normal course load per semester is 15-16 semester hours. The maximum number of hours for which a student can register is 18 semester hours unless an overload petition has been filed and approved by the director of the Undergraduate Program.

Overload petitions are not ordinarily granted to students who have a cumulative grade point average of less than 3.00 and do not state valid reasons for the need to register for the credits. Students who register for semester hours in excess of 18 and do not have an approved overload petition on file will have courses randomly removed through an "administrative drop" action.

English Proficiency. Students must demonstrate reasonable proficiency in written English 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 Student Services Office in the School of Social Work, West Hall, Room 137, to assure completion of this requirement.

Undergraduate Student Enrollment in Graduate Classes. Undergraduate students at Arizona State University in their senior year may enroll in a maximum of six graduate credits in the School of Social Work, providing they have an overall GPA of 3.00 or higher at the time of enrollment and have secured the required signatures for approval. 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 non-degree graduate student.

Field Instruction. Field Instruction for the B.S.W. program is offered concurrently with classroom study. Students are assigned to a social service agency and work under the supervision of an experienced professional. The vital interaction reinforces the student's learning. It permits testing theory in practice and gives experience base to class discussions. Qualified agencies in several Arizona communities are utilized for field instruction increasing the range and variety of settings available. The field instructor is generally a professional staff member of the agency who is interested in social work education and is willing to devote time to the educational program.

B.S.W. students do a full year in one placement. In assigning the placement, the school takes into account the student's educational needs and career goals. Professional social workers need to be familiar with the methods of working with individuals,

families and groups, as well as in organizations and communities and with all ages and ethnic groups. The faculty is committed to establishing the capabilities necessary for high-quality social work practice.

B.S.W. field instruction agencies are located primarily in the Phoenix metropolitan area. Specially arranged, more distance placements may require up to a two-hour drive. Although car pools are possible, personal transportation is strongly recommended while attending school.

Bachelor of Social Work

Requirements for the Bachelor of Social Work degree:

	<i>Semester Hours</i>
Communication Requirement	6
General Studies Requirement	47
Social Work Core Requirement	45
Related Social Work Requirement	16
Electives	12
 Total	 126

Communication Requirement

ENG 101-3 semester hours

ENG 102-3 semester hours

or

ENG 105*-3 semester hours (See "University English Proficiency Requirement," page 33.)

* Those students taking ENG 105 must complete 3 additional hours in any subject to total 126 semester hours for graduation.

Social Work Core Requirement

*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	Social Work Practice I	3
SWU 331	Social Policy and Services I	3
SWU 402	Human Behavior in the Social Environment II	3
* SWU 410	Social Work Practice II	3
* SWU 411	Social Work Practice III	3
SWU 412	Field Instruction I	5
* SWU 413	Field Instruction Seminar I	1
* SWU 414	Field Instruction II	5
* SWU 415	Field Instruction Seminar II	1
SWU 420	Practice-Oriented Research	3
SWU 432	Social Policy and Services II	3
SWU 474	Ethnic/Cultural Variables in Social Work	3
 Total		 45

SWU 412 and 414 each require 16 hours weekly per semester in the field. Students must file an application for field work before registration 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."

Related Areas 16 semester hours

Although the practice model of the program is a social work generalist, related areas and electives offer students opportunity to pursue their interests in special areas of service. Students are urged to consult their advisors for specific course suggestions.



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Electives 12 semester hours

In order to fulfill the university requirement of 126 semester hours for graduation, the student may take the 12 semester 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, psychology and sociology are only a few of the academic units offering a specialized knowledge of value to the professional social work practitioner.

General Studies Requirements. 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 47 semester hours of General Studies courses with the designated minimum semester hours in each of the following General Studies core areas. Students may choose the requirements for the catalog under which they entered the university or the following:

	<i>Semester Hours</i>
* <i>Literacy and Critical Inquiry</i>	6
* <i>Numeracy</i>	6
Required: A course in statistical analysis.	
* <i>Humanities and Fine Arts</i>	6
* <i>Social and Behavioral Sciences</i>	21
Required:	
SOC 101 Introductory Sociology	3
or SOC 301 Principles of Sociology (3)	
SOC 341 Modern Social Problems	3
POS 110 Government and Politics	3
or POS 300 American National Government (3)	
ECN 111 Macroeconomic Principles	3
or ECN 112 Microeconomic Principles (3) or FAS 354 Consumer Economics (3)	
PGS 100 Introduction to Psychology	3
HIS (topical, indigenous series)	3
(e.g., 362, 364, 367, 368, 369, 370, 371, 380, 422, 424, 425, 426, 428, 430)	
FAS 331 Family Relationships	3
* <i>Natural Sciences</i>	8
Total	47

* For requirements in this area see pages 42-45, "General Studies Requirement."

General Studies courses are regularly reviewed. To determine whether a course meets one or more General Studies course credit requirements, see the listing of courses by core and awareness area, pages 45-66.

Global/Historical Awareness. A minimum of one course must be taken for each awareness area. Course may concurrently satisfy a requirement in the General Studies core area. For a complete listing of courses which satisfy this area, contact Student Services, West Hall, Room 137.

Key to General Studies Credit Abbreviations

- L1 Literacy and Critical Inquiry Core Courses (Intermediate level)
- L2 Literacy and Critical Inquiry Core Courses (Upper division)
- N1 Numeracy Core Courses (Mathematics)
- N2 Numeracy Core Courses (Statistics and Quantitative Reasoning)
- N3 Numeracy Core Courses (Computer Applications)
- HU Humanities and Fine Arts Core Courses
- SB Social and Behavioral Science Core Courses
- S1 Natural Science Core Courses (Introductory)
- S2 Natural Science Core Courses (Additional Courses)
- G Global Awareness Courses
- H Historical Awareness Courses

Master of Social Work

The standard program consists of 60 hours including both classroom instruction and field practicum. It is divided into a foundation year (core curriculum) and a concentration 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 concentration year. The following are the required foundation courses:

	<i>Semester Hours</i>
SWG 501, 502 Human Behavior in the Social Environment I, II	6
SWG 510, 511 Direct Practice I, II	6
SWG 520 Practice-Oriented Research	3
SWG 531 Social Policy and Services I	3
SWG 533 Ethnic Minorities and Social Work	3
SWG 541, 542 Field Practicum I, II	6
SWG 580 Community and Organizational Change	3
Total	30

In the second year students concentrate in either direct practice or planning, administration and community practice. Six to nine hours of electives are available for students either to take additional hours in their concentration or to increase knowl-

edge and skill in such areas as health, mental health, family and child welfare, or aging.

The following are required concentration courses:

Direct Practice	<i>Semester Hours</i>
SWG 606 Psychopathology	3
Two of the following three courses	6
SWG 610 Social Work with Individuals	3
SWG 611 Social Work with Families	3
SWG 612 Social Work with Groups	3
SWG 620 Research Methods in Social Work	3
SWG 621 Integrative Seminar	3
SWG 632 Social Policy and Services II	3
SWG 641, 642 Advanced Practicum/Direct Practice	6
Electives	6
Total	30

Planning, Administration and Community Practice	<i>Semester Hours</i>
SWG 622 Community Research	3
SWG 623 Agency Research	3
SWG 632 Social Policy and Services II	3
SWG 643, 644 Advanced Practicum/Planning/ Administration and Community Practice I, II	6
SWG 680 Program Planning in Social Services	3
SWG 681 Social Work Administration	3
or SWG 682 Community Practice (3)	
Electives	9
Total	30

Electives may be selected from offerings at the School of Social Work or courses offered through other departments with the approval of student's advisor. The total semester hours for each concentration equals 30.

Field Education. Every student is assigned to a field education placement in both the foundation and concentration years. Field education requirements include sixteen hours per week for a total of 240 per semester under the supervision of an experienced and certified social work professional. Field experiences are designed to be consistent with course work at the foundation and concentration levels.

Field education placements are made in what is considered to be the best educational interests of the student and may require a considerable amount of travel. For this reason, it is necessary that M.S.W. students have a car available for use for their field placement.

Doctor of Social Work

Completion of the program will require at least 39 semester hours of course work beyond the master's degree and a minimum of 15 semester 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 Doctoral Advisory 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:

	<i>Semester Hours</i>
SWG 720 Research Methods in Social Policy and Administration	3
SWG 721 Survey Research and Selected Research Issues in Social Policy and Administration	3
SWG 722 Organizational and Evaluative Research in Social Policy and Administration	3
SWG 730 Social Policy Issues in Social Welfare	3
SWG 731 Social Welfare Policy Analysis and Development	3
SWG 732 Social Welfare Policy: Economic and Political Analyses	3
SWG 740 Theory and Practice of Social Work Administration	3
SWG 741 Social Work Administration in a Systems Context	3
SWG 742 System Redesign for Social Change	3
Total	27

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 within the university.

Graduation Requirements

Social Work majors must file an undergraduate Program of Study for graduation within the semester they earn their 87th credit. A minimum of 126 semester hours, a minimum of 50 semester hours in upper-division courses, a minimum of 480 hours in field education and a minimum grade point average of 2.00 are required for graduation with a Bachelor of Social Work degree. To be acceptable as graduation credit, all course/field work in the major must show an earned grade of "C" (2.00) or higher.

In order to qualify for graduation from the M.S.W. or D.S.W. program, a student must have an overall grade point average of 3.00, with no grade below a "C" in any required course.

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 of Social Work, prior to graduation.

Academic Standards

In order to remain in good academic standing, the student must maintain an overall GPA of 2.00 (B.S.W.) and 3.00 (M.S.W.) at the end of each semester. Most courses in the program are sequential; successful completion of the prior course in the sequence is required to enroll in the following course. Students may not enroll in any second year required courses until all foundation courses have been successfully completed.

Retention and Disqualification

The following policies govern retention and disqualification:

1. A student must maintain a cumulative grade point average of 2.00 (B.S.W.) and 3.00 (M.S.W.) overall. A student is placed on probationary status automatically when:
 - a. the GPA is less than the minimum at the end of any semester;
 - b. a grade is "D" or "E" in any major core requirement, regardless of GPA.

Students may also be put on probation for reasons other than grades.

Probationary status for M.S.W. students shall require completion of a plan—written and signed by student and advisor—with copies for student, advisor, program director, field director and file which indicates when and how deficiencies will be made up. This plan must contain a provision to bring the GPA up to minimum standards by the end of the succeeding semester, or at completion of 12 hours of letter-graded course work, whichever comes last. Probationary students may be denied registration in the absence of such a plan.

Once a social work student is on academic probation, he/she remains in that status until the grade point index reaches the retention level (2.00 [B.S.W.] and 3.00 [M.S.W.] overall) or until he/she is disqualified from the university.

2. A student shall be terminated from the program under any one of the following circumstances:

- a. failure to carry out the plan developed during a probationary semester;
- b. an "E" grade (failure) in field practicum;
- c. lack of acceptance of/acceptance by three or more field agencies if, in the judgment of faculty and field staff, the placements can provide appropriate field experiences without undue inconvenience to the student;
- d. lack of adherence to professional expectations and standards (see University Code of Conduct, NASW Code of Ethics, and CSWE Curriculum Policy Statement);
- e. a student who appears to lack the degree of physical and mental health necessary to function successfully as a social worker may be required to take a medical examination and make the results available to the Committee on Academic and Professional Standards of the School of Social Work. The responsibility for reviewing and determining the qualification of students whose behavior and/or performance are in question is vested in the Standards Committee. The committee's decision may require the dismissal or disqualification of a student from the program.

3. A disqualified student who desires to be reinstated may submit an application for reinstatement. A disqualified student normally will not be reinstated until at least one semester has elapsed from the date of disqualification. The burden of establishing fitness is on the disqualified student, who may be required to take aptitude tests and submit to other examinations before being readmitted.
4. While students are subject to the general retention policy, they are evaluated in the school on broader criteria than mere academic average. Students are reviewed for evidence of competency for social work and are continuously evaluated as they progress in the program. Prospective social work candidates who do not meet the established criteria are guided toward a program that is compatible with their interests and abilities.

Appeal Procedures

Students who feel they have been unjustly treated in academic or other matters relating to their career as students may appeal by following the guidelines set forth in the *Policy and Procedures Manual* for the School of Social Work, available in the Student Services Office, West Hall 137.

Special Programs

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.

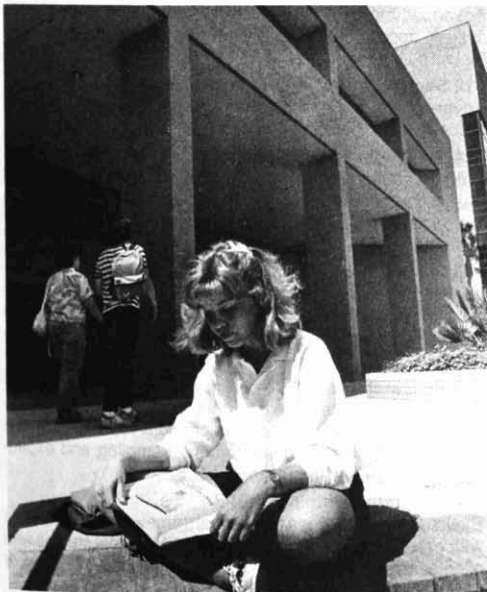
Tucson Component. The School of Social Work offers the full foundation year (30 hours) and some concentration year courses in Tucson. Students are required to commute to Tempe during both semesters of their concentration year. Every effort is made to schedule courses so that only one day per week is required for travel, but it is possible that two days of travel may be required to meet specialized student requests or needs.

Student Responsibilities

Students are expected to support and maintain the highest professional standards as spelled out in the Arizona State University Code of Conduct and the National Association of Social Workers Code of Ethics.

Regular attendance is expected in all classes and in field education and is a critical factor in evaluation of performance.

Students' rights are protected through appeal to the Committee on Academic and Professional Standards or through consultation with the departmental ombudsman.



Social Work

PROFESSORS:

McCLURE (WEST HALL), COUDROGLOU,
DALEY, HUDSON, KETTNER, LEWIS,
MACEACHRON, MONTIEL, MORONEY, WONG

ASSOCIATE PROFESSORS:

ENGELHARDT, FAUSEL, LEYBA,
MAGEL, MONTERO, NICHOLS,
RED HORSE, WOODMAN

ASSISTANT PROFESSORS:

ANGULO, APPLEWHITE, ASHFORD, JORQUEZ,
LeCROY, LIE, McMURTRY, NETTING,
NICHOLS-CASEBOLT, SCHILIT, WILSON

PROFESSORS EMERITI:

ALDRIDGE, BRAND, CRANMER, HARWARD,
HILL, 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. Prerequisites: PGS 100; SOC 101.

291 Community Resources. (3) F, S
Purpose, structure and delivery system of community welfare agencies. Includes 40 hours observational experience in local agencies. Pre- or corequisite: SWU 271.

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: PGS 100; SOC 101. [Satisfies General Studies Requirement: SB]

310 Social Work Practice I. (3) F, S
Introduction to social work methods, emphasizing communicative skills: role-playing, video training, cross-cultural interviewing, communication patterns and recording. Prerequisites: SWU 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; SWU 291. [Satisfies General Studies Requirement: H]

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; SWU 301. [Satisfies General Studies Requirement: SB]

410 Social Work Practice II. (3) F, S
Introduction to social work methods; major areas of knowledge values and skills basic to the Social Work helping process focused on individuals, small groups and community. Prerequisites: Social Work major; SWU 310. Corequisites: SWU 412, 413.

411 Social Work Practice III. (3) F, S
Applications of theoretical frameworks to social work practice at individual, family, group and community levels. Pre-

414 SCHOOL OF SOCIAL WORK

requisites: Social Work major; SWU 410. Corequisites: SWU 414, 415.

412 Field Instruction I. (5) F, S

Sixteen hours a week of supervised practice in an approved placement and 1½ hours a week field seminar. Prerequisites: Social Work major; SWU 310. Corequisites: SWU 410, 413.

413 Field Instruction Seminar I. (1) F, S

Field-focused seminar, 1½ hours a week. Corequisites: SWU 410, 412.

414 Field Instruction II. (5) F, S

Sixteen hours a week of supervised practice in an approved placement and 1½ hours a week field seminar. Prerequisites: Social Work major; SWU 410, 412, 413. Corequisites: SWU 411, 415.

415 Field Instruction Seminar II. (1) F, S

Field-focused seminar, 1½ hours a week. Corequisites: SWU 411, 414.

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. Corequisite: SWU 412, 414 or instructor approval.

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 development of social welfare policies and programs. Prerequisites: senior standing; SWU 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 36-37.)

SOCIAL WORK (SWG)

SWG 501 Human Behavior in the Social Environment I. (3) F

Examines human development through the life span and the behavior of individuals and families in transactions with their environments.

502 Human Behavior in the Social Environment II. (3) S

A study of the major theoretical approaches to the understanding of individual development within a diverse socio-cultural environment. Prerequisite: SWG 501.

510 Direct Practice I. (3) F

Basic social work methods with an emphasis on the problem-solving process as it pertains to individuals, families and small groups.

511 Direct Practice II. (3) S

Continuation of interventive techniques with individuals, families and small groups. Prerequisite: SWG 510.

520 Practice-Oriented Research. (3) S

Accelerated course in application of scientific principles to field practice, problem formulation, intervention procedures and impact assessment. Prerequisites: Social Work major; an approved course in statistics.

531 Social Policy and Services I. (3) F

Conceptual, analytical and historical perspectives on the social welfare institution. Emphasis on poverty and inequality. Principles of policy analysis.

533 Ethnic Minorities and Social Work. (3) S

Explores ethnic/cultural variables significant to Southwestern ethnic minority populations and ways in which these factors affect social work practice.

541, 542 Field Practicum I, II. (3) F, S

Two consecutive semesters (480 hours) of supervised social work practice in an approved placement. Pre- or corequisite: SWG 511.

580 Community and Organizational Change. (3) F

Examines communities and human service organizations as social systems. Introduces strategies for initiating planned change.

591 Seminar. (1-3) F, S

Courses offered in specialized areas.

605 Substance Abuse. (3) N

Psychological and socio-cultural determinants of substance abuse. Overview of social policies and treatment approaches. Prerequisite: SWG 502 or instructor approval.

606 Psychopathology. (3) N

Theories and concepts of mental health and illness. Attention to the development of environmental, interpersonal, psycho-social, stress factors in human behavioral dynamics. Prerequisite: SWG 501 or instructor approval.

607 Social Work and Women's Development. (3) N

Impact of sexism on growth and development process, possible outcomes. Human pathology/interpersonal/intrapersonal dynamics. Systems supporting mental health or contributing to mental illness. Prerequisite: SWG 501 or instructor approval.

608 Cross Cultural Aspects of Aging. (3) N

Aging in context of culture and ethnicity, comparative analysis selected modern and traditional populations. Implications for practice with minority aged. Prerequisite: SWG 502 or instructor approval.

609 Health Aspects of Aging. (3) N

The aging process and health of the aged; chronic illness and adaptation, prevention, control of chronic disease, disability, assessment, intervention. Prerequisite: SWG 502 or instructor approval.

610 Social Work with Individuals. (3) F, S

Advanced theory and practice applications of knowledge and skill to social work with individuals. Prerequisite: SWG 511.

611 Social Work with Families. (3) F, S

Advanced theory and practice applications of major family system approaches to changing or preventing family dysfunction. Prerequisite: SWG 511.

612 Social Work with Groups. (3) S

Advanced theory and practice applications of knowledge and skill to social work with groups. Prerequisite: SWG 511.

614 Social Work With Reconstituted Families. (3) N

Analyzes the psycho-social dynamics of families disrupted by divorce, separation, or death of a parent. Offers differential social work interventions. Prerequisite: SWG 511 or instructor approval.

615 Group Process In Social Work. (3) N

Application of small group theory/group dynamics knowledge to social work practice. Understanding and application of small group theory in worker/group member roles. Prerequisite: SWG 511 or instructor approval.

620 Research Methods in Social Work. (3) F

Conceptual foundations and methods of nomothetic research in social work. Includes problem identification, hypothesis formulation, measurement, sampling and experimental design. Prerequisite: SWG 520.

621 Integrative Seminar. (3) S

Explores the fit between theoretical frameworks and practice with clients. Requires presentation of empirical studies with clients. Prerequisite: SWG 620. Corequisite: SWG 641 or 642.

622 Community Research in Social Work. (3) F

Application of research design techniques to assessing need and measuring efficiency and effectiveness of community-wide programs. Prerequisite: SWG 520. Corequisite: SWG 680.

623 Agency Research in Social Work. (3) S

Application of research design techniques to data collection in human service agencies, including use of statistical analysis for program evaluation. Prerequisite: SWG 622.

624 Program Evaluation in the Human Services. (3) N

Development of understanding and skill in the conduct of program and project evaluation. Prerequisite: SWG 620 or instructor approval.

632 Social Policy and Services II. (3) S

Development of advanced knowledge and skills in social welfare policy analysis, policy formulation, and advocacy and intervention for policy change.

633 Ethical Dilemmas in Social Work. (3) N

Ethical dilemmas in social work practice. Philosophical aspects of critical social welfare issues and the ethics guiding professional action. Prerequisite: SWG 531 or instructor approval.

634 Child Welfare Law. (3) N

Provides social workers with knowledge of basic legal principles and procedures with emphasis on family related issues and children's rights. Prerequisite: SWG 531 or instructor approval.

635 Community Mental Health. (3) N

The seminar examines theory development in community mental health practice with individuals, groups and communities as well as the linkages among these elements. Prerequisite: SWG 531 or instructor approval.

641, 642 Advanced Practicum: Direct Practice I, II. (3) F, S

Two consecutive semesters (480 hours) of supervised social work practice in an approved placement related to the student's career goal. Prerequisites: SWG 541, 542. Pre- or corequisite for 641: SWG 610, 611 or 612. Pre- or corequisite for 642: SWG 610, 611 or 612.

643, 644 Advanced Practicum: Planning, Social Work Administration and Community Practice I, II. (3) F, S

Two consecutive semesters (480 hours) in social work practice in an approved placement related to the student's career goal. Pre- or corequisites for 643: SWG 541, 542, 680. Pre- or corequisite for 644: SWG 681 or 682.

680 Program Planning in Social Services. (3) F

The social services planning process includes needs assessment, goals and objectives, program design, budgeting, management information systems and program evaluation. Prerequisite: SWG 580.

681 Social Work Administration. (3) S

Administrative skill building and theory application within human service non-profit social work settings. Prerequisite: SWG 680.

682 Community Practice. (3) S

Community practice entails specific skill areas including program evaluation, task oriented group technology, citizen/consumer participation and bargaining/negotiating. Prerequisite: SWG 680.

683 Grantsmanship/Proposal Development. (3) N

Student groups develop proposals in collaboration with human service agencies or community groups. Identification of potential funding sources, technical and interpersonal/political aspects of proposal development. Prerequisite: SWG 580 or instructor approval.

684 Contract Administration in Social Work. (3) N

Fundamentals of contracting from initial conceptualization of the service need through development, negotiation, administration and monitoring of contracts.

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 690, 700, 780, 783, 784, 790, 791, 792, 799. (See pages 36-37.)

Arizona State University West Campus

B. Dell Felder, Ph.D.

Dean of Faculty

Applied Sciences, Engineering and Technology

Academic Director (Acting)

PROFESSORS: ERIBES, SMITH
ASSOCIATE PROFESSOR: WILSON

Arts and Sciences

Charles W. Connell, Ph.D.

Academic Director (Acting)

PROFESSORS: IVERSON, SHIRREFFS
ASSOCIATE PROFESSOR: PYNE **ASSISTANT PROFESSORS:** BURT-WAY,
CARDENAS, METZ, MUELLER, NOVAK, VAUGHAN

Business and Administrative Services

Otis W. Baskin, Ph.D.

Academic Director

PROFESSORS: BASKIN, SCHABACKER
ASSISTANT PROFESSORS: EDER, MALEKZADEH, NAHAVANDI

Education and Human Services

George G. Garver, Ed.D.

Academic Director (Acting), Education

Sharon L. Davids, M.S.

Academic Director (Acting), Human Services

PROFESSORS: FELDER, SVOBODA
ASSOCIATE PROFESSORS: HALADYNA, KNOPF, SCHADE
ASSISTANT PROFESSORS: GUNDERSEN, HAAS, NOLEN
LECTURER: WILLIAMS

Purpose

Arizona State University West Campus is the Phoenix-based satellite campus of Arizona State University. It was established in 1984 by the Arizona Legislature to serve the educational needs of residents in western Maricopa County. The West Campus provides upper-level and graduate courses leading to baccalaureate and master's degrees. Programs and services are designed to respond to the needs of working adults and community college transfer students who are pursuing a degree, seeking career growth or furthering their knowledge.

ASU West Campus, as part of the Arizona State University system, shares the common goal of excellence. Its partnership with the main campus is characterized by an institution-wide faculty, a unified academic policy, one degree and one administration. Because the two campuses are unified academically, admission and degree requirements are the same. Arizona State University is accredited by the North Central Association of Colleges and Secondary Schools. Professional programs in the various academic units are also accredited by national boards, commissions and councils.

As a key element in fulfilling Arizona State University's urban mission, West Campus will develop and maintain strong partnerships in all areas to include business and commerce, the Maricopa County Community College District, and the main campus in ways that meet the needs of the people of western Maricopa County.

Organization

Management of the West Campus is the responsibility of the vice president for ASU West Campus. The division of Academic Affairs is administered by dean of the faculty. It is comprised of four multidisciplinary units administered by academic directors for:

- Applied Sciences, Engineering and Technology
- Arts and Sciences
- Business and Administrative Services
- Education and Human Services

Degree Programs

Presently, the following degree and certification programs are authorized by the Board of Regents:

Applied Sciences, Engineering and Technology

- B.S.E.: Special Studies
- B.S.: Industrial Technology

For specific information for degree requirements, refer to the College of Engineering and Applied Sciences section in this *Catalog*.

Arts and Sciences

- B.A.: English
- B.A.: History
- B.A.: Political Science
- B.S.: Political Science
- B.A.: Sociology
- B.S.: Sociology
- B.A.: Spanish
- B.A.: Communication
- B.S.: Communication
- B.A.: Art
- B.F.A.: Art
- B.A.: Music
- M.M.: Choral Music

For specific information for degree requirements, refer to the College of Liberal Arts and Sciences and College of Fine Arts sections in this *Catalog*.

Business and Administrative Services

- B.S.: General Business
- M.B.A.: Master of Business Administration

For specific information for degree requirements, refer to the College of Business section in this *Catalog*.

Education and Human Services

- B.S.: Nursing
- M.S.: Nursing
- B.S.: Justice Studies
- B.S.: Recreation
- B.S.: Bachelor of Social Work
- Certificate of Gerontology
- B.A.Ed.: Elementary Education
- M.Ed.: Elementary Education
- B.A.Ed.: Secondary Education
- M.Ed.: Secondary Education
- B.A.Ed.: Special Education
- M.Ed.: Special Education
- M.Ed.: Educational Administration and Supervision

For specific information for degree requirements, refer to the College of Education, College of Nursing, College of Public Programs and the School of Social Work sections in this *Catalog*.

Facilities

Construction of the permanent campus began in 1986 on a 300 acre site bounded by Thunderbird and Sweetwater Roads and 43rd and 51st Avenues in Phoenix. The first phase of the campus is projected for completion in the 1990s with the capacity to serve 10,000 students. The first building, the library, is expected to be in use by the spring of 1988. While the new campus is under construction, classes and services are offered at three facilities:

ASU West Campus Alhambra
4510 North 37th Avenue
Phoenix, AZ 85019
602/279-5775

ASU West Campus Montebello
2636 West Montebello Avenue
Phoenix, AZ 85017
602/246-6060

ASU West Campus at
The American Graduate School of
International Management
59th Avenue and Greenway
Glendale, AZ 85306
602/978-7760

Student Services

Student Services programs augment and support the academic programs offered at West Campus. The focus of Student Services is on the quality of non-residential campus life for all students and, in particular, special needs groups such as working adults, community college transfer students, minorities, commuters, re-entry students and the disabled. The offices of Student Services are located at the Montebello facility and currently offer programs for:

- Re-entry
- Admission and orientation
- Academic advisement
- Registration
- Financial aid
- Student employment
- Career services
- Counseling
- Disabled student resources

Additional services will be added as the West Campus develops.

For assistance in determining eligibility, or for assistance in admission and registration, as well as advisement and other services, call, write or visit:

Student Services
ASU West Campus Montebello
2636 West Montebello Avenue
Phoenix, AZ 85017
602/279-5484

Library

The West Campus Library provides an on-site collection of books and journals selected to complement course offerings and degree programs. Electronic access to information and to the resources of other libraries is also provided. Highly skilled librarians are available for assistance in obtaining specialized research materials. A feature of the library is the daily delivery of materials from other ASU libraries and west valley libraries. The West Campus library collection will contain about 330,000 volumes when complete.

For more library information, call, write or visit:

ASU West Campus Library
4701 West Thunderbird Road
Glendale, AZ 85306
602/279-5775

Faculty Offices

ASU West Campus is committed to excellence in scholarship, instruction and student performance. The faculty and administrators have been chosen for their outstanding achievements and backgrounds. They are highly qualified to understand and meet the needs of West Campus students through administration, instruction, research and advisement.

Faculty and administrative offices are located at the Montebello facility. To contact officers or faculty, call, write or visit:

ASU West Campus Montebello
2636 West Montebello Avenue
Phoenix, AZ 85017
602/249-4002

For a complete list of ASU West Campus resident faculty and professional staff, see page 505-506.



Graduate College

Brian L. Foster, Ph.D.

Dean

The Graduate College at Arizona State University provides students with opportunities to study beyond the bachelor's degree in a wide variety of academic disciplines and professions. ASU offers more than 40 doctoral and nearly 90 master's degree programs. The Graduate College fosters an atmosphere of academic excellence and a spirit of scholarship, research, and artistic accomplishment. Its objectives are to educate future leaders in the arts, in the creation of new knowledge, and in the application of our accumulated knowledge to human affairs.

Graduate Degrees and Majors

The Graduate College enrolls students in programs leading to both professional and research-oriented advanced degrees. The Master of Arts, Master of Science and Doctor of Philosophy degrees are awarded to students completing programs that culminate in research. The Doctor of Philosophy degree is the highest university award, conferred on candidates who have proven their ability as scholars and original researchers.

Professional graduate programs emphasize training that leads to professional practice. In these degree programs, students develop a high-order mastery of a comprehensive body of knowledge and the ability to organize and carry out significant investigations in their professional field. Professional degrees usually are named Master of (Professional Field) and Doctor of (Professional Field). The professional doctoral degree is the highest university award to candidates completing academic preparation for professional practice. Professional degrees offered through ASU's Graduate College include:

- 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 Laws
- Master of Mass Communication
- Master of Music
- Master of Natural Science
- Master of Public Administration
- Master of Science in Engineering
- Master of Social Work
- Master of Taxation
- Master of Technology
- Education Specialist
- Doctor of Education
- Doctor of Musical Arts
- Doctor of Public Administration
- Doctor of Social Work

Faculty members offering a specific graduate degree program may be members of a single academic unit (such as a department, school or college), or they may form an interdisciplinary committee consisting of faculty from various academic units. The Graduate College awards degrees upon the recommendation of the faculty offering the graduate degree programs.

Admission to the Graduate College

Eligibility

Anyone who holds a bachelor's (or equivalent) or graduate degree from a college/university of recognized standing is eligible to apply for admission to the Graduate College. Undergraduate deficiencies may be assigned if the undergraduate degree is based on credits not accepted by Arizona State University, such as life experience or noncredit workshops and seminars.

Graduate College Requirements

Generally, an applicant must have a grade point average of 3.00 (4.00 = A scale), or the equivalent, in the last two years of work leading to the bachelor's degree. A student who enters a graduate degree program is expected to have undergraduate educational experiences, including general education studies, that are similar to those required for the baccalaureate degree at Arizona State University.

Requirements of the Academic Unit

Academic units, departments or colleges, may have admission requirements in addition to those of the Graduate College. For example, many graduate programs require scores from an academic aptitude test such as the Graduate Record Examination (GRE), Graduate Management Admission Test (GMAT), or the Miller Analogies Test (MAT). Some programs require the submission of a portfolio, letters of recommendation, and/or a statement of goals. Applicants should contact the academic unit regarding specific admission and application requirements.

Submission of an Application

All applicants must submit a completed Application for Admission form. Applicants to a degree program must submit two official transcripts of all postsecondary academic work completed or in progress. Although courses from one school may appear on the transcript of another school, the Graduate Admissions Office requires separate transcripts from each school attended. Applicants should allow sufficient time in asking the schools concerned to process and mail the transcripts directly to the Graduate Admissions Office, Arizona State University, Tempe, AZ 85287-1003 (602/965-6113). The process of providing the Graduate College with the necessary records may take up to two months.

The submission of aptitude test scores is strongly recommended for all degree applicants and is required for admission to some graduate programs. The scores, as well as the Application for Admission and the transcripts, should be sent directly to the Graduate Admissions Office. It should be noted that it could take up to eight weeks for test scores to be announced. Portfolios, letters of recommendation and statements of goals should be sent directly to the academic unit.

Application Fee

Each application for entry to ASU's graduate programs must be accompanied by a non-refundable application fee. The fee is \$25.00 to apply for

admission to a degree program and \$10.00 to apply for nondegree studies.

For details concerning re-entry, multiple applications, and other matters relating to the application fee, see the *Graduate Catalog*.

International Applicants

U.S. law defines as international students those students who hold non-immigrant visas or who have had immigrant or refugee status in the U.S. for less than two years. International students may enroll at ASU only if they have been admitted to a degree program and therefore may not pursue nondegree study.

International applicants must meet the requirements of the Graduate College as well as those of the degree programs to which they apply. Applicants from outside the U.S. are also required to submit additional materials and should follow the procedures described in the Graduate College brochure, *Admission Information for New International Students*. International applicants should read this brochure carefully in order to become familiar with all the requirements they must meet. Applicants should also consult ASU's listings in *Peterson's Graduate Education Directory* and in the *Directory of Graduate Programs* (published by the Educational Testing Service).

All applicants whose native language is not English must submit a score from the Test of English as a Foreign Language (TOEFL). All international applicants who do not speak English as a primary language, and who wish to apply for teaching assistantships, must pass an examination which certifies their skill in speaking English—either the Test of Spoken English (TSE), which may be taken in the student's home country, or the SPEAK test, which is administered at ASU. Some degree programs also require TSE or SPEAK scores of all applicants whose native language is not English. For specific information about TSE requirements, contact directly the chairperson of the academic unit.

International applicants must also verify that they have the financial resources to cover their expenses during graduate study at ASU, as required by the U.S. Immigration and Naturalization Service. The Graduate Admissions Office provides the Financial Guarantee form to international applicants, who then must see that the form is completed, verified by a bank or sponsoring organization, and returned to Graduate Admissions. The I-20 or the IAP66 (documents needed to obtain a student visa) are issued only after the completed, properly verified Guarantee form has arrived.

The Graduate College encourages international applicants to submit the Preliminary Application form distributed by the Graduate Admissions Office, or similar forms available from the international offices of the United States Information Agency, the Institute of International Education, the Foundation for Scholarly Exchange, the Fulbright Commission, and the U.S. Educational Foundation.

To apply formally, international applicants should submit all materials before January 31 in order to begin study the following fall semester, and before September 30 in order to begin study the following spring semester. An application fee of \$25 (in U.S. funds) must accompany the formal application, which otherwise will not be evaluated. (For details concerning multiple applications and other matters relating to the application fee, see the *Graduate Catalog*.)

Application Deadlines

The Graduate Admissions Office should receive the Application for Admission, the transcripts, and the applicable test scores at least two months before the applicant intends to enroll. Many academic units have specific and earlier deadlines; applicants are urged to contact them regarding deadlines.

Application Procedures

When the Graduate Admissions Office has a complete file for an applicant, one copy is forwarded to the academic unit. A second copy is kept in the Graduate College. Academic units review the file and the supporting materials (such as academic test scores, portfolios, and letters of recommendation) and, following admission policies established by the Graduate College and the faculty of the academic unit, make a recommendation (regular admission, regular admission with deficiencies, provisional admission, or denial) to the Graduate College. All recommendations are reviewed and approved by admissions officers in the Graduate College.

If there are questions about the likelihood of a student succeeding in the designated program, the Graduate College admissions officers will communicate with the academic unit, perhaps suggesting a provisional admission or arranging for the student in question to have a special faculty advisor or an advanced graduate student assigned as a mentor. Other times they may suggest that the student take some preliminary courses as a nondegree student.

Academic units, which must indicate their willingness to admit applicants, frequently set higher standards than those established by the Graduate College. Denial decisions may be based on the limi-

tations of departmental resources as well as on the relative qualifications of those competing for admission in a particular semester.

Notice of Admission Decisions

Only the dean of the Graduate College can make formal offers of admission. The Graduate College notifies all applicants in writing of the admission decision.

All documents received by the university in connection with an application for admission become the property of Arizona State University. If the applicant does not enroll in the university within one year, the admission documents may be destroyed.

Admission Classifications

Regular Admission. Applicants who fulfill all requirements for admission and are acceptable to both the academic unit and the Graduate College are granted regular admission.

Regular Admission with Deficiencies. A student whose grades and test scores are at an acceptable level but who does not have the undergraduate background expected by the academic unit and the university may be assigned deficiency courses. The letter of admission will specify the deficiencies which must be completed before the student will be awarded a graduate degree. Deficiency courses are taken in addition to those normally required for a degree.

Provisional Admission. A student who does not meet minimum academic standards but has counterbalancing evidence to suggest the potential for success may be admitted on a provisional basis. Provisional admission provides an academic unit with more evidence on which to base its decision. Normally, the academic unit will review the student's status following completion of 12 semester hours of approved graduate study. At that time, the academic unit will recommend to the Graduate College a change in status to either regular admission or withdrawal from the program. When students have completed their provisional requirements, they should check with their advisors to make sure that the change of status has been recommended. A provisional student may also be assigned deficiencies.

Nondegree or Unclassified Admission. A student not interested in earning a degree or not yet ready to apply to a particular degree program may enroll as an unclassified or nondegree student. The application process is streamlined, does not require submission of transcripts or test scores, and can be completed during a single visit to the Graduate

Admissions Office. This process may also be completed by mail. A maximum of nine hours taken while in this category may be applied toward a graduate degree if appropriate for the student's program of study.

Recognition of a Degree

Recognition of a degree is acknowledgment that the program leading to the degree is equivalent to a program offered by Arizona State University or is an acceptable program for the proposed graduate major at Arizona State University. A student who enters a graduate degree program at Arizona State University is expected to have undergraduate educational experiences, including general education studies, that are appropriate for the program.

Definition of a Unit of Credit

The Arizona Board of Regents has defined (May 26, 1979) a unit of credit for the institutions under its jurisdiction. A minimum of 45 hours of work by each student is required for each unit of credit. An hour of work is the equivalent of 50 minutes of class time (often called a "contact hour") or 60 minutes of independent study work. For lecture-discussion courses, this requirement equates to at least 15 contact hours and a minimum of 30 hours of work outside of the classroom for each unit of credit. Even though the values of 15 and 30 may vary for different modes of instruction, the minimum total of 45 hours of work for each unit of credit is a constant. Since the unit of credit as defined by the Arizona Board of Regents is the cornerstone of academic degree programs at Arizona State University, degrees that are recognized should be based on a similar unit of credit.

Graduate College Procedures

Change in Graduate Degree Program

A change from one graduate degree program to another requires a new application to the Graduate College. The usual admission procedures are followed. For details on matters relating to the application fee, see the *Graduate Catalog*.

Re-Entry to the Graduate College

Any former graduate student who has not been in attendance at the university for one or more semesters must submit an application for re-entry to the Graduate Admissions Office. The application should be submitted at least one month prior to the beginning of the semester in which the student plans to re-enter. For details on re-entry and other matters relating to the application fee, see the *Graduate Catalog*.

Determination of Catalog Requirements

The *Graduate Catalog* is published annually. Requirements for an academic unit or college, or the university as a whole, may change and are often upgraded.

In determining graduation requirements, a student may use only one Catalog.

A student whose attendance at the university has not been interrupted will graduate under the curriculum, course requirements, and regulations for graduation in effect at the time of admission to the university. A student may choose to graduate under any subsequent *Catalog* issued while the student is in continuous attendance.

A student who has been readmitted will graduate under the curriculum, course requirements, and regulations for graduation as stated in the *Catalog* at the time of readmission or thereafter while in continuous attendance.

All other university policies and procedures not related to curriculum or graduation requirements which are currently in effect, or which may subsequently change, are applicable to all students regardless of the *Catalog* under which the student elects to be graduated. These policies and procedures may appear in the *Catalog* or in other university publications.

Registration

Graduate students, like all university students, register during the intervals indicated in the *Schedule of Classes* issued by the Office of the Registrar. Details regarding registration and course drop-add procedures are also provided 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.

Audit Enrollment

Graduate students may register as auditors in one or more courses with the approval of the supervisory committee chair and the consent of the instructor involved. The student must be registered properly and pay the fees for the course. An audited course is counted in the student's maximum course load. It does not count for students who must take a minimum number of credits, e.g., teaching assistants or students receiving financial assistance. The mark of "X" will be recorded for completion of an audited course, unless the instructor determines that the student's participation or attendance has been inadequate, in which case a "W" may be recorded.

Enrollment Verification

General guidelines on page 34 of this *Catalog* are used only to verify enrollment for the purpose of loan deferments and eligibility. The registrar is responsible for such verifications.

Course Withdrawal

During the first four weeks of a semester, a student may withdraw with a mark of "W." From the fifth week to the end of the tenth week of a semester, a student may withdraw with a mark of "W" only from courses in which the instructor certifies the student is passing at the time of withdrawal.

Failure to withdraw officially from a course will result in a grade of "E," which is used in the computation of the grade point average. The *Schedule of Classes* lists the procedures for withdrawal.

An instructor may withdraw a student from a class with a mark of "W" or a grade of "E" for disruptive classroom behavior. A student may appeal an instructor-initiated withdrawal to the standards committee of the college in which the course is offered. The decision of the committee is final.

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 semesters, six semester hours during each five-week summer session, or nine semester hours of credit during an eight-week summer session.

All graduate assistants and associates must enroll for a minimum of six semester hours during each semester of their appointment. The six hours cannot include audit enrollment. A half-time (50%) graduate assistant or associate working 20 clock hours per week may not register for more than 12 hours of course work each semester; a third-time (33%) assistant or associate for more than 13 hours; and a quarter-time (25%) assistant or associate for more than 15 hours.

During the summer sessions, graduate assistants employed 25% time may enroll for a maximum of six semester hours during a five-week session or nine hours during the eight-week session; those employed 50% time may enroll for a maximum of five hours during a five-week session or seven hours during the eight-week session; and those employed 100% time may enroll for a maximum of three hours during a five-week session or four hours during the eight-week session.

Graduate College Degree Requirements

Graduate Advisement

Advising is much more than technical support; it is an integral part of graduate education. Students' programs of study are generally tailored to meet individual needs, and students should seek advice from faculty or advisors as they plan their course work, examinations, and other degree requirements.

Graduate College Advising Office. The Graduate College provides advising service to prospective and enrolled students. Information is provided concerning Graduate College admissions, nondegree status, programs of study, and policies and procedures. Academic and professional advisement is available to nondegree students. Advisors assist nondegree or prospective students in contacting appropriate faculty and advisors. Students may call for an appointment (602/965-3521) or stop by Wilson Hall.

Grading

A - Excellent (4.00)	W - Withdrawal*
B - Good (3.00)	I - Incomplete
C - Passing (2.00)	X - Audit
D - No Graduate Credit (1.00)**	Y - Satisfactory
E - Failure (0.00)**	Z - Course in Progress***

* This grade is given whenever a student officially withdraws from a class.

** This grade cannot be applied toward a graduate degree but is included in the calculation of a grade point average.

*** This grade is usually given pending completion of courses such as thesis, dissertation, and practicum. It may also be given in lieu of an "I" for other graduate courses where the incomplete work may take in excess of one year to complete.

A grade of "P" (pass) in a 400-level course may not appear on a program of study. Grades of "D" and "E" cannot be used to meet the requirements for a graduate degree, although they are used to compute the grade point averages. A student receiving a grade of "D" or "E" must repeat the course in a regularly scheduled (not an independent study) class if it is to be included in the program of study. However, both the "D" or "E" and the new grade are used to compute the grade point averages. Grades on transfer work will not be included in computing grade point averages.

Graduate course work (other than research, applied project, practicum, thesis, and dissertation), reported as "I" (incomplete) must be completed within one year. If a grade of "I" (incomplete) is not

removed within one year of the official ending of the course, it will automatically be changed to an "E" (failure). For more information regarding university policies on incompletes, see page 39 of this *Catalog*.

Scholarship

To be eligible for a degree in the Graduate College, a student must achieve two grade point averages of "B" (3.00) or better. The first grade point average is based on all courses numbered 500 or higher which appear on the transcript. (Courses noted as deficiencies in the original letter of admission are not included.) The second grade point average is based on all courses that appear on the program of study.

Academic excellence is expected of students doing graduate work. Upon recommendation from the head of the academic unit, the dean of the Graduate College can withdraw a student who is not progressing satisfactorily.

Graduate Credit Courses

Courses at the 500, 600, and 700 levels are graduate credit courses. Courses at the 400 level will apply to graduate degree requirements when appearing on an approved program of study. However, 400 level courses are not graduate courses by definition and cannot be certified as such for purposes of employment or transferring to other institutions.

Reserving of Course Credit by Undergraduates. Seniors at Arizona State University within 12 semester hours of graduation may enroll in a 400-level or graduate course and reserve the credit for possible use in a future graduate program. The course cannot be used to meet a baccalaureate graduation requirement. Prior to registration in the course, the student must submit a Graduate College Petition form requesting credit reservation; the form must be signed by the student's advisor, head of the academic unit, and the dean of the Graduate College.

Permission to reserve a course does not guarantee admission to a graduate degree program or that the course may be used toward graduate degree requirements. A maximum of nine hours of credit may be reserved, and only courses with an "A" or "B" grade are applicable. Reserved credit earned prior to admission to a graduate degree program is classified as nondegree credit. The maximum course load for a student enrolled in a reserved course is 15 semester hours during a regular semester and six hours during a summer session.

Transfer Credit. Transfer of credit is the acceptance of credit from another institution for inclusion in a program of study leading to a degree awarded by

Arizona State University. The number of hours transferred from other institutions may not exceed 20 percent of the total minimum semester hours required for a master's degree unless stated otherwise for a specific degree program.

Transfer credit taken prior to admission to a graduate degree program at Arizona State University is nondegree credit. Nondegree credit taken at Arizona State University combined with nondegree credit taken at another institution may not exceed nine hours on the master's program of study. The nine-hour limit does not apply to the doctoral programs.

Transfer credits must be acceptable toward graduate degrees at the institution where the courses were completed. Certain types of graduate credits cannot be transferred to Arizona State University, including (1) credits awarded by postsecondary institutions in the United States that lack candidate status or accreditation by a regional accrediting association; (2) credits awarded by postsecondary institutions for life experience; (3) credits awarded by postsecondary institutions for courses taken at noncollegiate institutions (e.g., government agencies, corporations, and industrial firms); (4) credits awarded by postsecondary institutions for noncredit courses, workshops, and seminars offered by other postsecondary institutions as part of continuing education programs; and (5) credits given for extension courses.

Acceptable academic credits earned at other institutions that are based on a different unit of credit than the ones prescribed by the Arizona Board of Regents are subject to conversion before being transferred to Arizona State University.

Only resident graduate courses with an "A" or "B" grade may be transferred. A course with the grade of pass, credit, or satisfactory may not be transferred.

Official transcripts of any transfer credit to be used on a program of study must be sent directly to the Graduate Admissions Office from the office of the registrar at the institution where the credit was earned.

Correspondence and Extension Courses.

Correspondence and extension courses cannot be used to meet the requirements for a graduate degree.

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 chair and other resident faculty members. The number of members serving on this committee depends on 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 must 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.

Foreign Language Requirements

A graduate degree program may require proficiency in foreign language. If a foreign language is required, students must demonstrate at least a reading knowledge in the area of study required by the supervisory committee and consistent with the requirements for the graduate degree program. Normally, the language is selected from French, German, Russian, or Spanish, although other languages may be recommended when there is adequate justification.

Students must pass a foreign language examination specific to their particular graduate programs. The examinations are administered three times each year by the Department of Foreign Languages, which certifies language competency. Students planning to take the examination must register in the Graduate College at least one month in advance of the examination date. The chair of the student's supervisory committee is responsible for providing the Department of Foreign Languages with materials from which the examination will be prepared. The chair should submit or recommend relevant books and/or journals of approximately 200 pages in length in the desired foreign language.

A student must pass the examination in no more than three attempts.

Theses and Dissertations

Candidates for the master of arts and master of science degrees must submit a thesis or equivalent which demonstrates an introduction to research. All doctoral degree candidates must submit a dissertation, with the exception of the doctor of musical arts in solo performance, which requires three recitals and a research paper. The doctor of philosophy 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.

The Graduate College must review the final copy of the master's thesis and doctoral dissertation for format. Copies of the *Guide to Preparation of the Master's Thesis or Doctoral Dissertation* are available in the Graduate College. The student should submit a complete copy of the thesis or dissertation for format review 12 working days (two weeks plus two days) before 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 allows maximum flexibility in the format of the manuscript, but certain Graduate College and library guidelines must be followed.

The student must submit two final copies of a thesis or dissertation to the Arizona State University Bookstore for binding. Bound copies are placed in the University Library and Archives. Doctoral candidates should also submit one copy of the title page and one copy of the abstract (which must not exceed 350 words). The student is responsible for the binding fees; in addition, doctoral students must pay to have their dissertations microfilmed by University Microfilms International (UMI). The fee covers the expense of having the document sent to UMI, where it is microfilmed and catalogued. Information on the dissertation will appear in various publications, such as *Dissertation Abstracts International* and the annual supplement of the *Comprehensive Dissertation Index*.

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 refile fee.

Withdrawal from the University

Students who find it necessary to withdraw from the university should obtain and complete an official withdrawal form from the Student Life Office. Until officially withdrawn, the student is registered in all courses and will at the end of the semester receive grades appropriate for the performance in each course. A student who officially withdraws from the university during the first four weeks of a semester receives the mark of "W" in all courses registered. A student who officially withdraws from the university later than the fourth week will

receive a mark of "W" or "E," depending upon the quality of work at the time of official withdrawal. No student will be permitted to withdraw during or after the last two weeks of the semester (the last week of classes and final examination week).

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 Director 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.

Student Responsibility

It is the responsibility of the graduate student to know and observe all procedures and requirements of the Graduate College as defined in the *Graduate Catalog*, the *Schedule of Classes*, and the *Guide to Preparation of the Master's Thesis or Doctoral Dissertation*.

Students should also be informed about the requirements concerning their degree program and any special requirements within the academic unit. Students are expected, as part of their obligations, to be familiar with the *Code of Conduct*, which is available in the Office of Student Affairs. Violations of the *Code of Conduct* or instances of academic dishonesty, specifically cheating in examinations, laboratory work, written work (plagiarism), and forging or altering university records (i.e., 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 College Policies and Procedures.

For more detailed information on Graduate College policies and procedures of particular interest to students, please refer to the current *Graduate Catalog*.

Policies and Procedures of the Graduate Council Appeals Board

The Appeals Board of the Graduate Council acts as the appeals body for graduate students seeking redress on academic decisions regarding their graduate program. The board is composed of five members of the Graduate Council, excluding ex-

officio Council members who hold administrative positions in the Graduate College. The membership and chair of the board are appointed by the dean of the Graduate College.

An appeal by a student previously admitted to a graduate degree program may result from an academic decision the student considers adverse. Decisions involving Graduate College policy as stated in the *Graduate Catalog* are within the jurisdiction of the appeals board. Decisions involving policies of the academic unit (center, department, school, or college) are not normally heard by the Graduate Council Appeals Board.

A student may seek redress by writing a letter to the dean of the Graduate College or the chair of the Appeals Board of the Graduate Council. Upon receipt of the letter, the dean or chair will inform the student as to whether the appeal concerns a Graduate College policy, and is therefore within the jurisdiction of the board, or is a policy of the academic unit.

A student may request an opportunity to appear before the appeals board or waive this right. The board may choose to interview faculty members and administrators involved in the case and review the student's complete academic record and all documents pertaining to the case. Such reviews are primarily concerned with the observance of stated procedures and policies, but may consider extenuating circumstances as related to policy.

In the event a member of the appeals board has been involved in a case as a member of the student's committee or as a member of the faculty offering the graduate program, that member will be replaced for the duration of the case, and the dean of the Graduate College or chair of the appeals board may select an alternate member from the remaining membership of the Graduate Council. A member of the appeals board may request to be excused from a case, or may be temporarily replaced, whenever there is a potential for conflict of interest. The presence of three members of the board at a meeting is considered a quorum.

Verbatim transcripts of the board's proceedings are not kept. Only summary notes are kept. All written documentation presented in each case is retained in the board's files for a period of one year. Such files are available only to the complainant and respondent in the hearing and do not become part of the student's official university file. The decision of the appeals board is reported to members of the Graduate Council for their information. The decision is then communicated to the student in writing by the dean of the Graduate College, and a copy sent to each member of the appeals board.

Summer Sessions

Leon W. Kemper, Ph.D.

Acting Director

The summer sessions provide an opportunity for students to pursue academic work on a year-round basis. Degree candidates, both graduate and undergraduate, as well as those seeking to enhance or to refresh their subject matter interests, will find a broad selection of courses available. All campus classes are held in air-conditioned classrooms or laboratories. Limited offerings are available in off-campus locations during the summer sessions.

The opportunity for international travel and study is also available during the summer. These programs are directed by regular faculty members and permit students to earn graduate or undergraduate university credit. All international study programs have been approved by the involved academic department and college.

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.

Admission to Summer Sessions. Admission to the university is a requirement for enrollment in summer sessions. However, transient students—those already admitted to other colleges and universities—are admitted as unclassified undergraduates or non-degree graduates. The submission of transcripts or test scores are not required for this status. However, some courses may require specific prerequisites. (*See appropriate college policies.*)

Conditional admission prior to graduation from high school may be granted. (*See conditional admission prior to graduation from high school, page 25.*)

Summer session courses are equivalent to the regular semester courses in content, credit awarded and expected standard of performance. As a general rule, summer session courses are taught by regular members of the Arizona State University faculty. The *Summer Session Bulletin*, a schedule of

courses, is available in late February and may be obtained by writing or calling the Office of Summer Sessions.

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 prior to registering. (*See undergraduate admission, pages 22-27.*)

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 undergraduate admission, pages 22-27.*)

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 admission to the Graduate College, pages 419-422, and the Graduate Catalog.*)

Fees and Expenses. Summer sessions students pay only for the actual number of hours enrolled. The per semester hour fee is set by the Arizona Board of Regents and is consistent with the fee

assessed unclassified students enrolling for 1-6 semester hours during the academic year. The summer sessions semester hour fee includes the student activity fee. Out-of-state tuition is waived for all students during the summer sessions. See the current *Summer Sessions Bulletin* for fee structure.

For summer housing arrangements, contact the Office of Residence Life at Arizona State University. **Information.** Requests for the summer sessions *Schedule of Classes* or for other information should be addressed to the Office of Summer Sessions at Arizona State University, Tempe, AZ 85287-3003.



International Programs

Richard S. Olson, Ph.D.

Director

Arizona State University recognizes that in a highly inter-dependent world, knowledge and appreciation of other nations and cultures are essential. This international commitment is reflected by a variety of activities in teaching, research, and service. Arizona State University is especially active in Europe, Latin America and Asia.

The Office of International Programs

Located within the Office of the Vice President for Academic Affairs, the Office of International Programs is responsible for promoting, facilitating, and in some instances administering university programs with an international emphasis. The activities include establishing university relationships with governments, foundations, and funding agencies; securing research, teaching, and service opportunities for faculty; and facilitating study abroad and exchange possibilities for students. The Office of International Programs also works with community and state organizations to increase international awareness.

Area Studies

Special area studies programs are coordinated through the Center for Asian Studies (page 85), the Center for Latin American Studies, and the Russian and East European Studies Consortium (page 86). These groups publish journals, research reports, scholarly monographs, and books in addition to coordinating educational programs within the university and abroad.

American Language and Culture Program

The American Language and Culture Program (ALCP) 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 per-

sonal reasons. Applicants must be 18 years of age and must possess a high school diploma or its equivalent. All conditions of the United States Immigration and Naturalization laws pertaining to full-time study in the United States must be met by all applicants. Beginning students are required to take an English placement test prior to the beginning of classes. Certificates of achievement are awarded on completion of the course. Admission to the program does not constitute regular admission to Arizona State University.

Beginning, intermediate, and advanced level courses provide instruction in grammar, pronunciation and speaking, listening comprehension, writing and composition, and reading and vocabulary. Academic advising and orientation to Arizona and the United States are integral parts of the program.

Program-wide social activities each term include a major field trip, a dinner, a picnic, a cultural activity, visits to museums, historical places, and musical presentations.

Advanced level ALCP students may be permitted to concurrently enroll in up to two ASU credit classes with the approval of the Director. Several special classes are offered through the ALCP. Classes in conversation and the Test of English as a Foreign Language (TOEFL) are offered alternate terms. Also, the ALCP offers a credit-bearing class in the second cycle of each semester.

The fall and spring semesters are divided into two 8-week cycles. Students may enroll for one or more cycles. An 8-week summer session of study is also offered. Inquiries concerning admission requirements, enrollment and fee schedules should be sent to the ALCP, Irish Hall, Arizona State University, Tempe, Arizona 85287-3106.

In addition to its intensive English program, the American Language and Culture Program administers the international teaching assistant program and conducts special projects funded by the USIA and other agencies.

International Academic Programs

ASU Programs. Arizona State University provides extensive opportunities for study abroad and student exchange. Programs are operated by various units within the university and in partnership with other universities and agencies. Currently, semester and/or full-year programs are available in England, Wales, France, Germany, Italy, Spain, Yugoslavia, Mexico, Bolivia, Canada, China and Japan. In addition, special summer study programs are available each year. Success overseas depends on careful advanced planning. Many programs require the ability to speak a foreign language. Students should consult their academic advisor to determine how courses taken overseas will apply to their program of study. Generally, students who participate in Arizona State University programs may apply their financial aid for overseas study, receive resident credit, and achieve the most cost-effective overseas educational experience. General information about ASU's international academic

program offerings is available from the Office of International Programs which will direct students to the appropriate program directors.

Non-ASU Programs. At times, continuing ASU students independently attend or participate in international academic programs sponsored by other universities and unaffiliated agencies. Students are urged to discuss plans with their academic advisors prior to beginning their studies. Questions of the foreign university's accreditation, the application of foreign courses to the program of study, the ability to apply financial aid, and the transferability of credits should be discussed. Students will be subject to readmission requirements and transfer credit evaluation policies. An official English translation of all academic documents is required. Students should contact the Office of International Programs upon their return. Working with appropriate academic and admission offices, the Office of International Programs will assist the student to facilitate evaluation of overseas course work.



Off-Campus Academic Services

John L. Edwards, Ed.D.

Executive Director

The Office of Off-Campus Academic Services is the academic service arm of the university in providing the opportunity for off-campus credit and non-credit courses. The following services and programs are available: off-campus courses for academic credit, correspondence study, non-credit courses, instructional television, Elderhostel Program, ASU Sun Cities 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 in the metropolitan area and various locations in the eastern half of Maricopa County.

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 \$63.00 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 page 17). Full-time students who have paid registration fees and tuition

(7 or more semester hours) *must also pay additional fees* if they enroll in off-campus credit courses that commence after the 21st calendar day of the start of each semester.

Correspondence Study

College credit correspondence courses offered by Arizona State University are specifically designed for the student unable to attend classes in person. They are offered for those who are seeking to fulfill degree objectives as well as for those who wish to increase their occupational, professional and intellectual skills.

Persons desiring to enroll in correspondence study should write to the Correspondence Study Office, Off-Campus Academic Services, for an enrollment form and a brochure listing the courses available. Students who have been admitted to the university and are intending to register for a correspondence study course must first obtain the approval of their advisor and the dean of the College in which they are enrolled. This approval is required of any continuing student whether he or she is or is not enrolled for courses during the summer sessions or the vacation periods. Unclassified undergraduate or graduate students are not required to obtain this approval. *Correspondence study courses* may not be utilized for repeating courses in which the student previously received a grade of "D," "E," or "I."

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 to prepare 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.

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Students are limited to one correspondence study course initially, with the expectation of completing that 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 \$33.00 per semester hour of credit and is payable at the time of registration. This fee is required of all students, including full-time students who have paid registration fees and tuition on campus. Tuition waivers do not apply to correspondence study fees.

Admission to Off-Campus and Correspondence Course 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 25.)

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 Off-Campus Academic Services, 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 Off-Campus Academic Services provides operating assistance, encourages program

development and coordinates all continuing education activities sponsored by university administrative units and departments.

Elderhostel

Elderhostel at Arizona State University is a residential Continuing Education Special Program which brings a small group (30-40) of older citizens to the university campus for one or more weeks. It is a new learning opportunity for persons over the age of 60. Courses unique to Arizona and the great Southwest specially designed for the participants will be offered on a non-credit basis with no homework or testing. The courses do not pre-suppose previous knowledge of the subject and because of the concentrated one week format, it permits hostellers to move on to other universities within the national network. The courses at Arizona State University are taught by regular faculty and outstanding community leaders. Some local elders may participate as commuters, but the program spirit is based on the combined residential and academic experiences. A wide variety of extracurricular activities which take advantage of on-campus opportunities will be made available to hostellers and commuters alike.

Arizona State University Sun Cities

The ASU Sun Cities educational facility is located at the Bell Plaza Professional Building South, 17220 Boswell Boulevard, Sun City, Arizona, in the nation's largest retirement community. The courses offered are predominantly non-credit and include a curriculum tailored specifically to the interests of the retirement community. Each year more than 150 courses from approximately 30 disciplines are taught. A variety of weekly lectures also are available throughout the year.

Occasionally credit classes are offered when the demand is warranted. The credit classes are taught by ASU faculty, some local Sun Cities retired educators, retired professionals, foreign service officials and currently employed community educators.

The ASU On Wheels Educational Tours program provides more than 30 single-day trips and six or more multiple-day tours each year. Travels are made throughout the state of Arizona and bordering states with courses in Southwest history, geology, sociology and economy offered enroute. Multiple day tours include stays at Lake Powell, Canyon de Chelly, northern Arizona/southern Utah areas, southern Arizona, New Mexico and Durango, Colorado.

Trailblazers of the Southwest is an outreach of the ASU On Wheels, a program tailored for the special physical needs and limitations of those living in life-

care centers or private homes. Shorter trips are made (within a 40-50 mile radius of the Sun Cities) and minimal walking is required at sites visited.

ASU Sun Cities has developed a Women's Studies Program designed for mature women in areas such as self-actualization, self-confidence, self-image and self-knowledge. Upon completion of two core courses and six elective courses, a certificate to Women's Studies is awarded.

Some special educational programs are offered including a two-week educational study trip to Cuernavaca, Mexico, where students stay in local residents' homes and study Spanish five hours per day in The Center for Bilingual Multicultural Studies School. This high concentration of Spanish enables the student to absorb the language at a faster pace as they apply Spanish to their daily use.

University Conference Services

The Office of University Conference Services coordinates on-and-off campus conferences, seminars and workshops sponsored by any administrative unit or academic department within the university. Working closely with each of the university's colleges, complete conference services and assistance to any campus group desirous of conducting an educational program or professional meeting are offered. Services include, but are not limited to, general conference planning, budgeting, site selection, promotion and publicity, hotel/motel liaison, and overall logistical support for any and all phases of the conference. The office also aids in the development of guidelines, checklists and general operating procedures which serve to ensure coordination and smooth operation of continuing education activities sponsored by the various campus departments.



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

Evan Mecham *Governor of Arizona*
C. Diane Bishop, B.S., M.Ed., M.S. *Superintendent of Public Instruction*

Appointed

To January 1990

A.J. Pfister, B.S., LL.B.
Donald G. Shropshire

To January 1992

Edith S. Auslander, B.A., M.A.
Herman Chanen

To January 1994

Esther N. Capin, B.A., M.A.
Donald Pitt, B.S., LL.B.

To January 1996

Two to be appointed

Student Regent

To June 1988
Joseph P. Mikitish

Jacqueline Schneider, J.D. *Counsel to the Board*
Molly Corbett Broad, B.A., M.A. *Executive Director and Chief Executive Officer*

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

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

Brent W. Brown *Vice President for University Relations; Associate Professor of Public Affairs*
B.A., Brigham Young University; M.A., Arizona State University; Ph.D., University of Illinois

C. R. Haden *Vice President for Academic Affairs; Professor of Engineering*
B.S., University of Texas, Arlington; M.S., California Institute of Technology; Ph.D., University of Texas, Austin

Henry C. Reeves *Vice President for Research; Professor of Microbiology*
B.S., Franklin and Marshall College; M.A., Ph.D., Vanderbilt University

Victor M. Zafra *Vice President for Business Affairs*
B.S., F.S., Georgetown University; M.P.A., Woodrow Wilson School, Princeton University

..... *Vice President for ASU West Campus*

Lawrence D. Mankin *Assistant to the President for Administration; Associate Professor of Public Affairs*
B.B.A., City College of New York; Ph.D., University of Illinois

Ann E. Bergin *Assistant to the President*
B.S., Northwestern University; M.A., Arizona State University

Jacqueline Weatherby *Assistant to the President for Equal Employment Opportunity in Affirmative Action*
B.S., Arizona State University

Colleges, Schools and Libraries

- John Meunier *Dean, College of Architecture and Environmental Design; Professor of Architecture*
B.Arch., University of Liverpool, England; M.Arch., Harvard University; M.A., Cambridge University
- B. Dell Felder *Dean of Faculty, ASU West Campus; Professor of Education*
B.S., M.S., Ph.D., University of Texas, Austin
- John Kraft *Dean, College of Business; Professor of Finance*
B.S., Saint Bonaventure University; M.A., Ph.D., University of Pittsburgh
- Gladys Styles Johnston *Dean, College of Education; Professor of Educational Administration and Supervision*
B.S., Cheyney State College; M.Ed. Temple University; Ph.D., Cornell University
- George C. Beakley, Jr. *Dean, College of Engineering and Applied Sciences; Professor of Engineering*
B.S.M.E., Texas Tech University; M.S.M.E., University of Texas; Ph.D., Oklahoma State University; P.E.
- Seymour Rosen *Dean, College of Fine Arts; Professor of Music*
B.S., The Julliard School
- Paul Bender *Dean, College of Law; Professor of Law*
A.B., LL.B., Harvard University
- Samuel A. Kirkpatrick *Dean, College of Liberal Arts and Sciences; Professor of Political Science*
B.S., Shippensburg State College; M.A., Ph.D., Pennsylvania State University
- Janelle Krueger *Dean, College of Nursing; Professor of Nursing*
B.S., M.S., Ph.D., University of Colorado
- Louis F. Weschler *Acting Dean, College of Public Programs; Professor of Public Affairs*
B.A., California State University; M.A., Ph.D., University of California, Los Angeles
- Jesse F. McClure *Dean, School of Social Work; Professor of Social Work*
A.B., M.S.E., University of Michigan; Ph.D., Brandeis University
- Brian Foster *Dean, Graduate College; Professor of Anthropology*
B.A., Northern Illinois University; A.M., Ph.D., University of Michigan
- Donald E. Riggs *University Librarian*
B.A., Glenville State College; M.A., West Virginia University; M.L.S., University of Pittsburgh;
Ed.D., Virginia Polytechnic Institute and State University

Resident Faculty

- Aannestad, Per (1975) *Associate Professor of Physics/Astronomy*
B.S., University of Oslo; Ph.D., University of California, Berkeley
- Aberle, Ezra (1986) *Assistant Professor of Technology*
B.S., University of Illinois; M.S., University of Arizona
- Acevedo, Roberto M. (1964) *Assistant Professor Emeritus 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, Donna (1983) *Instructor of Nursing*
B.S.N., University of Missouri; M.S.N., Arizona State University
- Adams, Karen L. (1984) *Assistant Professor of English*
B.A., M.A., Ph.D., University of Michigan
- Adelson, Roger D. (1974) *Associate Professor of History*
B.A., George Washington University; B.Litt., Oxford University; M.A., Ph.D., Washington University
- Aguilar, John L. (1976) *Associate Professor of Anthropology*
B.A., University of California, Los Angeles; M.A., California State University, 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)

436 RESIDENT FACULTY

- Aiken, Jane H. (1985) *Associate Professor of Law*
 B.A., Hollins College; J.D., New York University; LL.M., Georgetown University
- Aiken, Leona S. (1985) *Professor of Psychology; Associate Dean, Research,
 College of Liberal Arts and Sciences*
 B.S., Virginia Commonwealth University; M.S., Ph.D., Purdue University
- Akers, Lex A. (1980) *Professor of Engineering*
 B.S.E.E., M.S.E.E., Ph.D., Texas Tech University
- Akins, William H. (1975) *Professor of Theatre; Director, Theatre*
 B.A., Duke University; M.A., Ph.D., University of Denver
- Alarcón, Justo S. (1968) *Professor of Spanish*
 B.A., M.A., Serafica (Spain); M.A., Laval University (Canada); M.A., 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 Emeritus of Social Work*
 B.A., M.A., M.S.W., University of Toronto; Ph.D., University of Michigan
- Alexander, Robert J. (1975) *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 Emeritus of Engineering*
 B.S.M.E., M.S.M.E., Texas A&M University
- Allison, Jenene J. (1986) *Assistant Professor of French*
 B.A., University of California, San Diego; M.A., Ph.D., Yale University
- Allison, Maria T. (1984) *Associate Professor of Leisure Studies*
 B.S., M.S., University of New Mexico; Ph.D., University of Illinois
- Alquist, Lewis R. (1984) *Associate Professor of Art*
 B.F.A., Florida Atlantic University; M.F.A., Cranbrook Academy of Art
- Altheide, David L. (1973) *Professor of Justice Studies*
 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; J.L.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
- Andersen, Sylvia (1983) *Instructor of Nursing*
 B.S., M.S., Brigham Young University
- Anderson, John C. (1987) *Assistant Professor of Accountancy*
 B.S., M.S., University of Missouri, Kansas City; Ph.D., University of Tennessee
- Anderson, Bruce A. (1966) *Professor of Mathematics*
 B.A., M.S., Ph.D., University of Iowa
- Anderson, Douglas A. (1979) *Professor of Journalism and Telecommunication;
 Director, Walter Cronkite School of
 Journalism and Telecommunication*
 B.A., Hastings College; M.S., Kearney State College;
 Ph.D., Southern Illinois University
- Anderson, Gary (1975) *Professor of Reading and Library Science*
 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 Finance*
 B.S., M.S., Oklahoma State University; Ed.D., University of Arkansas
- Andress, Barbara L. (1972) *Professor of Music*
 B.A., M.A., Arizona State University

- Angulo, Julio (1981) *Assistant Professor of Social Work*
B.A., University of Houston, Texas; M.S.W., University of California, Los Angeles; Ph.D., Kansas State University
- Appleton, Nicholas R. (1972) *Professor of Social and Philosophical Foundations;*
B.A., San Francisco State University; *Director, Division of Educational Leadership and Policy Studies*
M.A., California State University, Northridge; Ed.D., University of Massachusetts, Amherst
- Applewhite, Steven (1985) *Assistant Professor of Social Work*
B.A., University of Texas, Austin; M.S.W., Ph.D., University of Michigan
- Aranda, Luis (1975) *Associate Professor of General Business*
B.M., M.Ed., University of Arizona; J.D., Arizona State University
- Arciniega, G. Miguel (1979) *Associate Professor of Counseling Psychology;*
B.S., M.A., New Mexico State University; *Acting Director, Center for Bilingual and Bicultural Education*
Ph.D., University of Arizona
- Armstrong, Robert L. (1967) *Professor Emeritus of Secondary Education*
B.A., State Teachers College of Iowa; M.S., University of Iowa; Ed.D., University of Arizona
- Amer, Douglas G. (1959) *Professor Emeritus 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 Counseling; Vice President for Student Affairs*
B.A., Eastern Kentucky University; M.A., Western Kentucky University; Ed.D., University of Cincinnati
- Ashford, Jose (1984) *Assistant Professor of Social Work*
B.A., Loyola University; M.S.W., Ohio State University; Ph.D., Bowling Green State University
- 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) *Professor of Agribusiness and Environmental Resources*
B.S., University of Cairo; M.S., University of California, Davis; Ph.D., University of Wisconsin, Madison
- 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 of Music; M.M., University of Michigan
- Autore, Donald D. (1959) *Professor Emeritus of Technology*
B.S.E., University of Michigan; M.S.E., Arizona State University
- Avery, James P. (1960) *Professor Emeritus of Engineering*
B.S.M.E., M.S.M.E., 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 Emeritus 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) *Professor of Agribusiness and Environmental Resources*
B.S., Rutgers, The State University; M.S., Ph.D., University of California, Davis
- Backus, Charles E. (1968) *Professor of Engineering;*
B.S.M.E., Ohio University; *Assistant Dean, College of Engineering and Applied Sciences*
M.S., Ph.D., University of Arizona

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- Badger, William (1985) *Associate Professor of Construction; Chair, Department of Construction*
B.S.M.E., Auburn University; M.S.C.E., Oklahoma State University; Ph.D., Iowa State University
- 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 Family Resources and Human Development*
B.S., Marygrove College; M.S., Ohio State University; Ph.D., Michigan State University
- Balanis, Constantine (1983) *Professor of Engineering*
B.S.E.E., Virginia Polytechnic Institute; M.S.E., University of Virginia; Ph.D., Ohio State University
- Balasubramanian, Krishnan (1983) *Associate Professor of Chemistry*
M.Sc., Birla Institute of Technology Science, India; M.A., Ph.D., Johns Hopkins University
- Baldini, Pier Raimondo (1978) *Associate Professor of Italian*
B.A., San Francisco State University; M.A., University of British Columbia; Ph.D., University of California, Los Angeles
- Balling, Robert C. (1987) *Assistant Professor of Geography; Assistant Director, Laboratory of Climatology*
A.B., Wittenberg University; M.A., Bowling Green State University; Ph.D., University of Oklahoma
- Banks, Stephan P. (1987) *Assistant Professor of Communication*
B.A., University of Washington; M.A., Ph.D., University of Southern California
- Bantz, Charles R. (1986) *Associate Professor of Communication*
M.A., University of Minnesota; Ph.D., Ohio State University
- 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
- Barker, David (1983) *Assistant Professor of Theatre*
B.S.E., Duquesne University; M.F.A., Rutgers, The State University
- Barkley, Margaret V. (1963) *Professor Emeritus of Family Resources and Human Development*
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
- Barnhill, Robert (1986) *Professor of Computer Science; Chair, Department of Computer Science*
B.A., University of Kansas; M.A., Ph.D., University of Wisconsin, Madison
- Barona, Andres (1986) *Assistant Professor of Education*
B.S., M.Ed., Texas A&M University; Ph.D., University of Texas, Austin
- 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; Director, Clinical Psychology Center*
B.S., University of Wisconsin, Eau Claire; M.A., Ph.D., University of Oregon
- Barrett, Thomas W. (1950) *Professor Emeritus of Agribusiness and Environmental Resources*
B.S., Brigham Young University; M.S., Ph.D., Cornell University
- Barroll, Rayna (1980) *Associate Professor of Music*
B.M., University of Texas; D.M.A., University of Maryland
- Bartels, Robert D. (1981) *Professor of Law*
B.A., University of Michigan; J.D., Stanford University
- Bartz, Donna R. (1968) *Associate Professor of Theatre*
B.F.A., M.A., University of Colorado

- Bassford, Gerald (1969) *Associate Professor of Management*
 B.S., M.S., University of Wyoming; D.B.A., Indiana University
- Bataille, Gretchen M. (1988) *Professor of English; Chair, Department of English*
- Bataiden, Stephen K. (1976) *Associate Professor of History*
 B.A., Augsburg College; M.A., Ph.D., University of Minnesota
- Batchelor, Harold W. (1943) *Professor Emeritus of Library Science*
 B.A., University of Oregon; B.S. in L.S., M.S., University of Illinois
- Baty, Wayne M. (1962) *Professor Emeritus of General Business*
 B.S. in Ed., Southwest Missouri State College; M.A., Northwestern University; Ph.D., University of Southern California
- Baxter, Harry R. (1984) *Assistant Professor of Technology*
 B.A., New York University; M.B.A., Fairleigh Dickinson University; M.Tech., Arizona State University
- Beakley, George C. Jr. (1956) *Professor of Engineering;*
 B.S.M.E., Texas Tech University; *Dean, College of Engineering and Applied Sciences;*
 M.S.M.E., University of Texas; Ph.D., Oklahoma State University; P.E. *Director, School of Engineering*
- Beck, Lasca (1984) *Instructor of Nursing*
 B.S.N., Texas Woman's University; M.Ed., East Texas State University
- Becker, R. James (1965) *Professor of Public Affairs*
 B.S., M.A., Bradley University; Ph.D., University of Illinois
- Beckman, James R. (1980) *Associate Professor of Engineering*
 B.S., M.S., University of Wisconsin; Ph.D., University of Arizona
- Bedient, Jack D. (1963) *Associate Professor of Mathematics*
 A.B., Albion College; M.B.S., Ed.D., University of Colorado
- Bedworth, David D. (1963) *Professor of Engineering*
 B.S.I.E., Lamar College of Technology; M.S.I.E., Ph.D., Purdue University
- Bell, James W. (1966) *Professor of Secondary Education*
 A.B., Washburn University; M.Ed., Ed.D., University of Kansas
- Bell, John E. (1965) *Professor of Secondary Education*
 B.S., University of Nebraska; M.A., Ed.D., University of Wyoming
- Bell, Mary E. (1970) *Associate Professor Emeritus of Education*
 B.S., Indiana State Teachers College; M.S., Butler University; Ed.D., Indiana University
- Bellamy, Lynn (1976) *Associate Professor of Engineering*
 B.S., Texas A&M; M.S., Ph.D., Tulane University
- Belok, Michael V. (1959) *Professor of Social and Philosophical Foundations*
 B.S., Indiana University; M.A., Arizona State University; Ph.D., University of Southern California
- Beltramini, Richard F. (1980) *Associate Professor of Marketing and Advertising*
 B.S., M.S., University of Illinois; Ph.D., University of Texas, Austin
- Bender, Bert A. (1971) *Associate Professor of English*
 B.A., University of Washington; Ph.D., University of California, Irvine
- Bender, Gordon L. (1953) *Professor Emeritus of Zoology*
 B.S., Iowa State College; M.S., University of Wisconsin; Ph.D., University of Illinois
- Bender, Paul (1984) *Professor of Law; Dean, College of Law*
 A.B., LL.B., Harvard University
- Benedict, Joel A. (1946) *Professor Emeritus of Education*
 B.A., M.A., Arizona State University; Ed.D., Stanford University
- Benin, David B. (1970) *Associate Professor of Physics*
 A.B., Cornell University; M.A., Ph.D., University of Rochester
- Benin, Mary B. (1979) *Associate Professor of Sociology*
 B.A., Vanderbilt University; M.A., Ph.D., University of Nebraska, Lincoln
- Bennett, ElDean (1970) *Professor of Journalism and Telecommunication*
 B.A., Brigham Young University; M.A., Ph.D., Michigan State University
- Bennett, Peter A. (1984) *Assistant Professor of Physics*
 B.A., University of Minnesota; Ph.D., University of Wisconsin

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- Benzinger, Robert P. (1970) *Associate Professor Emeritus of Design*
 B.S.M.E., University of Wisconsin; M.A.E., Chrysler Institute of Engineering
- Berch, Michael A. (1969) *Professor of Law; Associate Dean, College of Law*
 B.A., J.D., Columbia University
- Berliner, David C. (1987) *Professor of Elementary Education and Educational Psychology*
 B.A., University of California, Los Angeles; M.A., Los Angeles State College; Ph.D., Stanford University
- Berman, David R. (1966) *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
- Bernal, Martha E. (1986) *Professor of Psychology*
 B.A., University of Texas, El Paso; M.A., Syracuse University; Ph.D., Indiana University
- Bernhisel-Osborn, Kristin (1986) *Assistant Professor of Art*
 B.F.A., University of Utah; Kunstgewerbeschule, School of Design (Switzerland)
- Bernstein, Bianca L. (1987) *Professor of Counseling Psychology;*
 B.A., University of California, Berkeley; *Associate Dean, Graduate Programs and Research*, College of Education
 M.Ed., Ph.D., University of California, Santa Barbara
- Bertelsen, Wendle R. (1964) *Assistant Professor of Architecture*
 B.Arch., University of Michigan, M.Arch., University of Arizona
- Bessom, Richard M. (1968) *Associate Professor Emeritus of Marketing*
 A.B., Cornell University; M.B.A., Stanford University; Ph.D., University of Washington
- Betz, M. Austin (1974) *Associate 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 *Director, Center of Advanced Research in Transportation*
- Bezanson, Llewellyn W. (1983) *Assistant Professor of Engineering*
 B.S., University of Florida; M.S., Clarkson College of Technology; Ph.D., Clarkson 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
- Bilimoria, Karl D. (1987) *Assistant Professor of Engineering*
 B.Tech., Kanpur, India; M.S., Ph.D., Virginia Polytechnic Institute and State University
- Bininger, Robert J. (1962) *Professor Emeritus of Spanish*
 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
- Bitner, Mary J. (1987) *Assistant Professor of Marketing*
 B.A., M.B.A., Ph.D., University of Washington
- Bitter, Gary G. (1970) *Professor of Educational Media and Computers;*
 B.S., Kansas State University; *Program Coordinator, Educational Media and Computers*
 M.A., Kansas State Teachers College; Ph.D., University of Denver
- Bjork, Robert E. (1983) *Associate Professor of English*
 B.A., Pomona College; M.A., Ph.D., University of California, Los Angeles
- 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 Emeritus of Counselor Education*
 B.S., M.S., Utah State University; Ph.D., Cornell University

- Blackledge, Vernon O. (1969) *Professor of Computer Science*
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) *Associate Professor of Economics*
B.S., M.A., University of Detroit; Ph.D., Southern Illinois University
- Blankenship, Robert E. (1985) *Associate Professor of Chemistry*
B.S., Nebraska Wesleyan University; Ph.D., University of California, Berkeley
- Blasko, Vincent J. (1980) *Associate Professor of Advertising*
B.S., M.B.A., Arizona State University; Ph.D., University of Texas, Austin
- Blaze, Douglas A. (1986) *Associate Professor of Law*
B.S., Dickinson College; J.D., Georgetown University
- Blechschtmidt, James (1986) *Assistant Professor of Engineering*
B.S., M.S., Ph.D., University of Wisconsin, Madison
- Boatsman, James R. (1986) *Peat Marwick Professor of Accountancy*
B.S., M.S., Oklahoma State University; Ph.D., University of Texas, Austin
- Boetto, Laurel B. (1956) *Assistant Professor Emeritus of Education*
B.A. in Ed., M.A. in Ed., Arizona State University
- Bogart, Quentin J. (1970) *Associate Professor of Higher Education*
B.A., M.S., Fort Hays State College; Ph.D., University of Texas, Austin
- Boggs, Lohne J. (1959-65; 1966) *Professor of General Business; Chair, Department of General Business*
B.S., M.A., Ph.D., Ohio State University
- Bohlander, George W. (1977) *Professor of Management*
B.A., San Francisco State College; M.B.A., University of Southern California; Ph.D., University of California, Los Angeles
- Bohlman, Herbert M. (1964) *Associate Professor of General Business*
B.S., B.A., Drake University; M.B.A., J.D., Indiana University
- Boissoneau, Robert (1980) *Professor of Health Administration and Policy*
B.A., Eastern Michigan University; M.H.A., Medical College of Virginia; Ph.D., Ohio State University
- Bontrager, O. R. (1962) *Professor Emeritus of Education*
B.S., M.A., Ph.D., State University of Iowa
- Booth, James R. (1980) *Associate Professor of Finance*
B.S., M.A., Ph.D., University of Alabama
- Borgo, Philip E. (1967) *Associate Professor Emeritus of Engineering*
B.S.C.E., University of Cincinnati; M.S., Ohio State University
- Bortner, M.A. (1979) *Associate Professor of Justice Studies*
B.A., Edinboro State College; M.A., Ohio University; Ph.D., Washington University, St. Louis
- Bose, Anjan (1981) *Professor of Engineering*
B.Tech., Indiana Institute of Technology; M.S.E.E., University of California; Ph.D.F.E.E., Iowa State University
- Boswell, Jacquelyn (1982) *Professor of Music*
B.M.E., Murray State University; M.M.E., Louisiana State University; Ed.D., University of Illinois
- Bowers, Charles O. (1948) *Professor Emeritus of Music*
B.S. in Ed., Southeast Missouri State College; M.M., D.M.A., Eastman School of Music
- Bowers, Deloss H. (1984) *Associate Professor of Technology*
B.A., Ohio State University; M.S., Purdue University
- Bowman, Russell K. (1956) *Professor Emeritus of Romance Languages*
A.B., A.M., Ph.D., Columbia University
- Boyd, Gertrude A. (1958) *Professor Emeritus of Education*
A.B., M.S., Florida State University; Ed.D., Colorado State College
- Boyd, James H. (1976) *Professor of Accountancy*
B.B.A., Texas Christian University; M.S., Northeastern University; Ph.D., University of Texas, Austin; C.P.A., Texas

442 RESIDENT FACULTY

- Boyer, Jay M. (1976) *Associate Professor of English*
B.A., St. Louis University; M.A., Ph.D., State University of New York, Buffalo
- Boyes, William J. (1974) *Professor of Economics; Chair, Department of Economics*
B.S., Idaho State University; Ph.D., Claremont Graduate School
- Boyle, Bernard M. (1969) *Professor of Architecture*
B.Arch., University of Sydney (Australia); M.Arch., M.A., Ph.D., Yale University
- Brack, O M Jr. (1973) *Professor of English*
B.A., M.A., Baylor University; Ph.D., University of Texas, Austin
- Brada, Josef C. (1978) *Professor of Economics*
B.S., M.A., Tufts University; Ph.D., University of Minnesota
- Brady, Ward W. (1973) *Associate Professor of Agribusiness and Environmental Resources*
B.S., M.S., Ph.D., Colorado State University
- Bramlett-Solomon, Sharon (1986) *Assistant Professor of Journalism and Telecommunication*
B.A., M.A., Memphis State University; Ph.D., Indiana University
- Brand, Mark (1968) *Associate Professor Emeritus of Social Work*
B.A., M.A., University of Arizona; M.S.W., University of California, Berkeley
- Brandt, Elizabeth A. (1974) *Associate Professor of Anthropology*
B.A., Florida State University; M.A., Ph.D., Southern Methodist University
- Brandt, Beverly K. (1987) *Assistant Professor of Design*
B.F.A., University of Michigan; M.A., Michigan State University; Ph.D., Boston University
- Branstetter, Ellamae (1967) *Professor of Nursing*
B.S., St. Louis University; M.P.H., University of Minnesota; Ph.D., University of Chicago
- Braun, J. Jay (1973) *Professor of Psychology*
B.A., University of Oregon; M.A., Ph.D., Ohio State University
- Braver, Sanford L. (1970) *Associate Professor of Psychology*
B.A., Wayne State University; Ph.D., University of Michigan
- Brazel, Anthony J. (1974) *Professor of Geography; Director, Laboratory of Climatology*
B.A., M.A., Rutgers, The State University; Ph.D., University of Michigan
- Breckenridge, Jack D. (1962) *Professor of Art*
B.S., University of Wisconsin, Milwaukee; M.F.A., University of Iowa
- Bremner, Andrew (1984) *Associate Professor of Mathematics*
B.A., M.A., Oxford University; Ph.D., Cambridge University
- Brenenstuhl, Daniel C. (1978) *Associate Professor of Management*
B.S., M.B.A., Ohio University; M.S., St. Bonaventure University; D.B.A., Indiana University
- Bresina, Bertha M. (1960) *Professor Emeritus of Family Resources and Human Development*
B.S., M.S., Stout State University; Ph.D., Iowa State University
- Brink, Daniel T. (1976) *Associate Professor of English*
B.A., Lawrence University; M.A., Ph.D., University of Wisconsin, Madison
- Brink, Jeanie R. (1974) *Professor of English; Director, Arizona Center for Medieval and Renaissance Studies*
B.A., Northwestern University; M.A., Harvard University; Ph.D., University of Wisconsin, Madison
- Britton, Daniel R. (1976) *Associate Professor of Art*
B.F.A., M.F.A., University of Colorado
- Britton, Mervin W. (1956) *Professor of Music*
B.S., M.S., University of Illinois
- Broadley, Hugh T. (1969) *Professor Emeritus of Art*
A.B., Park College; M.A., Yale University; Ph.D., New York University
- Brock, John H. (1977) *Associate Professor of Agribusiness and Environmental Resources*
B.S., M.S., Fort Hays State University; Ph.D., Texas A&M University
- Broerman, Nancy (1983) *Instructor of Nursing*
B.S.N., Loyola University; M.S., Arizona State University

- Brook, Weston L. (1966) *Associate Professor Emeritus of Education*
B.A., M.A., Ed.D., University of Wyoming
- Brooks, Daniel G. (1977) *Associate Professor of Statistics*
B.S., M.S., Colorado School of Mines; M.B.A., D.B.A., Indiana University
- Brose, Marianna F. (1963) *Assistant Professor of English*
B.A., College of William and Mary; M.A., Arizona State University
- Brown, Alan R. (1968) *Associate Professor of Counseling*
B.A., M.A., Los Angeles State College; Ph.D., University of Texas, Austin
- Brown, Brent W. (1972) *Associate Professor of Public Affairs; Vice President for University Relations*
B.A., Brigham Young University; M.A., Arizona State University; Ph.D., University of Illinois
- Brown, Donald E. (1963) *Professor Emeritus of Journalism and Telecommunication*
B.A., M.A., University of Iowa
- Brown, Duane (1950) *Professor Emeritus of Chemistry*
B.S., Brigham Young University; Ph.D., Cornell University
- Brown, Eddie F. (1986) *Associate Professor of Social Work; Director, Community Relations*
B.S., Brigham Young University; M.S.W., D.S.W., University of Utah, Salt Lake City
- Brown, Richard L. (1982) *Professor of Law; Director, Law Library*
B.A., University of California, Los Angeles; J.D., Indiana University; M.L.L., University of Washington
- Brown, Stephen W. (1974) *Professor of Marketing*
B.S., M.B.A., Ph.D., Arizona State University
- Brown, Theodore M. (1963) *Professor of Chemistry*
B.S., M.S., University of Toledo; Ph.D., Iowa State University
- Brown, Walter C. (1966) *Professor Emeritus of Technology*
B.S., Northwest Missouri State University; M.Ed., Ed.D., University of Missouri, Columbia
- Bruner, May I. (1961) *Associate Professor of Nursing*
B.S., University of Hawaii; M.S., University of Colorado
- Bruns, Gilbert H. (1974) *Associate Professor of Justice Studies*
B.S., M.Ed., South Dakota State University; Ed.D., Arizona State University
- Bryant, Fred O. (1950) *Associate Professor Emeritus of Physical Education*
B.S., Springfield College; M.S., University of Illinois; Ed.D., Arizona State University
- Buckingham, Willis J. (1969) *Associate Professor of English*
A.B., Harvard University; M.S., University of Wisconsin, Madison; Ph.D., Indiana University
- Buley, Jerry L. (1973) *Associate Professor of Communication*
B.A., University of Colorado; M.A., Michigan State University; Ph.D., Florida State University
- Burdette, Walter E. (1956) *Professor Emeritus of Technology*
B.S., M.S., Kansas State College of Pittsburg; Ed.D., University of Missouri, Columbia
- Burdick, Richard K. (1976) *Professor of Statistics*
B.S., University of Wyoming; M.S., Ph.D., Texas A&M University
- Burg, B. Richard (1967) *Professor of History*
B.A., University of Colorado; M.A., Western State College of Colorado; Ph.D., University of Colorado
- Burgess, Hugh (1974) *Professor of Planning*
B.S., University of Idaho; M.S.Arch., Columbia University; Arch.D., Rice University
- Burgess, Paul L. (1969) *Professor of Economics*
B.S., Ph.D., University of Colorado, Boulder
- Burgoyne, Edward E. (1951) *Professor Emeritus of Chemistry*
B.S., Utah State University; M.S., Ph.D., University of Wisconsin, Madison
- Burk, Karl W. (1949) *Associate Professor Emeritus of Technology*
B.A. in Ed., M.A. in Ed., Arizona State University; Ed.D., Bradley University
- Burke, Joy Patricia (1981) *Associate Professor of Education*
B.A., San Jose State University; M.Ed., Ed.D., Rutgers, The State University

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- Burke, William F. Jr. (1977) *Associate Professor of Microbiology*
B.A., University of Dallas, Irving; M.A., North Texas State University; Ph.D., Arizona State University
- Burke, William J. (1962) *Professor Emeritus of Chemistry*
A.B., Ohio University; Ph.D., Ohio State University
- Burkett, Lee N. (1974) *Associate Professor of Physical Education*
B.A., M.A., San Diego State University; Ph.D., Washington State University
- Burns, Elizabeth K. (1983) *Professor of Geography*
B.A., Smith College; M.A., Ph.D., University of California, Berkeley
- Burrows, Veronica (1986) *Assistant Professor of Engineering*
B.S., Drexel University; Ph.D., Princeton University
- Burstein, David (1982) *Assistant Professor of Physics/Astronomy*
B.A., Wesleyan University; Ph.D., University of California, Santa Cruz
- Burt, Donald M. (1974) *Professor of Geology*
A.B., Princeton University; A.M., Ph.D., Harvard University
- Burton, Dora (1976) *Assistant Professor of Russian*
M.D., First Leningrad and Kazan' Medical Institute (Russia); M.A., Ph.D., University of Washington
- Burton, Foster M. (1969) *Associate Professor of Construction*
B.S.C.E., B.S., 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*
B.S., Arizona State University; M.A., University of Notre Dame; Ph.D., University of New Mexico
- Bustoz, Joaquin (1975) *Professor of Mathematics*
B.A., M.A., Ph.D., Arizona State University
- Buter, Thomas A. (1986) *Assistant Professor of Aerospace Studies*
B.S., M.S., North Carolina State University
- Butler, Jay Q. (1972) *Associate Professor of Finance*
B.B.A., M.B.A., University of New Mexico; Ph.D., University of Washington
- Byrnes, Christopher (1984) *Professor of Mathematics; Research Professor of Engineering*
B.S., Manhattan College; M.A., Ph.D., University of Massachusetts
- Cabianca, William A. (1967) *Professor of Counseling*
B.Ed., Gonzaga University; M.Ed., Ph.D., Washington State University
- Cachey, Theodore (1984) *Assistant Professor of Italian*
B.A., Northwestern University; M.A., Ph.D., University of California, Los Angeles
- Cady, Linell E. (1983) *Assistant Professor of Religious Studies*
B.A., Newton College; M.T.S., Th.D., Harvard University
- Cadzow, James A. (1981) *Research Professor of Engineering*
B.S.E.E., University of Buffalo; M.S.E.E., State University of New York, Buffalo; Ph.D., Cornell University
- Cale, Timothy S. (1981) *Associate Professor of Engineering*
B.S., Arizona State University; Ph.D., University of Houston
- Callarman, Thomas E. (1980) *Associate Professor of Operations Management*
B.B.A., West Texas State University; M.B.A., Arizona State University; Ph.D., Purdue University
- Calleros, Charles R. (1980) *Professor of Law*
B.A., University of California, Santa Cruz; J.D., University of California, Davis
- Canright, James E. (1964) *Professor Emeritus of Botany*
B.A., Miami University; A.M., Ph.D., Harvard University
- Capco, David G. (1984) *Assistant Professor of Zoology*
B.S., Edinboro State College; M.S., University of Houston; Ph.D., University of Texas, Austin
- Carlsen, Paul A. (1978) *Assistant Professor of Technology*
B.A.E., M.N.S., Ed.D., Arizona State University

- Carlson, Ingeborg L. (1964) *Professor of German*
 Abitur, Hölderlinschule, Heidelberg; Vorsemaster and cand.phil., University of Heidelberg;
 Dr. phil., University of Erlangen-Nuremberg
- Carlson, Ron (1986) *Assistant Professor of English*
 B.A., M.A., University of Utah
- Carney, James D. (1967) *Professor of Philosophy*
 M.A., Roosevelt University; Ph.D., University of Nebraska, Lincoln
- Carpenter, R. W. (1980) *Professor of Engineering; Director, Center for Solid State Science*
 B.S., M.S., Ph.D., University of California, Berkeley
- Carr, Christopher (1985) *Assistant Professor of Anthropology*
 B.A., University of Illinois, Chicago Circle; M.A., Ph.D., University of Michigan
- Carrigan, Larry E. (1986) *Professor of Aerospace Studies; Chair, Department of Aerospace Studies*
 B.S., Arizona State University; M.S., Shippensburg State University
- Carroll, Christina (1966) *Professor of Music*
- Carroll, James L. (1976) *Professor of Education*
 B.A., Bethel College; Ph.D., University of Minnesota
- Carroll, Kevin K. (1975) *Assistant Professor of History*
 B.A., Canisius College; M.A., Ph.D., Harvard University
- Carroll, Steven (1984) *Assistant Professor of Statistics*
 B.S., Tulane University; M.S., Oregon State University; M.B.A., Ph.D., University of Oregon
- Carson, Kenneth P. (1986) *Assistant Professor of Management*
 B.S., B.A., Geneva College; M.A., Ph.D., University of Akron
- Carver, George L. (1965) *Associate Professor of Classical Languages*
 B.A., M.A., University of Texas; S.T.B., St. Mary's Seminary, Baltimore; Ph.D., St. Louis University
- Casanova, Ursula (1987) *Assistant Professor of Educational Administration and Supervision*
 B.A., Hunter College of the City of New York; *and Social and Philosophical Foundations*
 M.S., State University of New York-Brockport; Ph.D., Arizona State University
- Case, James L. (1969) *Associate Professor of Speech and Hearing Science*
 B.S., Weber State College; M.S., Ph.D., University of Utah
- Castelazo, Ismael (1984) *Assistant Professor of Engineering*
 Ing. Mec., Instituto Politécnico Nacional, Mexico City; M.S., Ph.D., Massachusetts Institute of Technology
- Cavalliere, William A. (1946) *Assistant Professor Emeritus of Technology*
 B.A. in Ed., M.A. in Ed., Arizona State University
- Cavender, Gray (1977) *Associate Professor of Justice Studies*
 B.S., University of Tennessee; M.S., Middle Tennessee State University; Ph.D., Florida State University;
 J.D., University of Tennessee
- Cayer, N. Joseph (1980) *Professor of Public Affairs*
 B.A., M.P.A., University of Colorado; Ph.D., University of Massachusetts
- Cazier, Mont A. (1962) *Professor Emeritus of Zoology*
 B.S., Ph.D., University of California, Berkeley
- Cervený, Randall S. (1986) *Assistant Professor of Geography*
 B.S., M.A., Ph.D., University of Nebraska
- Cesta, John R. (1975) *Associate Professor of Finance*
 B.S., Capital University, Columbus, Ohio; M.B.A., Ph.D., Florida State University
- Chalquest, Richard R. (1971) *Professor of Agribusiness and Environmental Resources*
 B.S., D.V.M., Washington State University; M.S., Ph.D., Cornell University
- Chamberlin, Ralph V. (1986) *Assistant Professor of Physics*
 B.S., University of Utah, Salt Lake City; M.S., Ph.D., University of California, Los Angeles
- Chance, John K. (1987) *Associate Professor of Anthropology*
 A.B., University of Pennsylvania; A.M., Ph.D., University of Illinois, Urbana-Champaign
- Chandler, Douglas E. (1980) *Associate Professor of Zoology*
 B.S., University of Rochester; M.A., Johns Hopkins School of Medicine; Ph.D., University of California, San Francisco

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- Chartier, George M. (1971) *Associate Professor of Psychology*
 B.S., University of Illinois; M.A., Ph.D., University of Oregon
- Chasey, Eugene F. (1965) *Associate Professor Emeritus of Education*
 B.S., Northwestern State College; M.A., Colorado State College; Ed.D., University of Wyoming
- Chassin, Laurie (1979) *Associate Professor of Psychology*
 B.A., Brown University; M.S., Ph.D., Columbia University
- Chaudhuri, Joyotpaul (1985) *Professor of Political Science;*
 B.A., Central State University, Oklahoma; *Associate Dean, College of Liberal Arts and Sciences*
 M.A., Ph.D., University of Oklahoma
- Cheatham, Glenn W. (1975) *Professor of Leisure Studies; Associate Dean, College of Public Programs*
 B.S., M.S., San Francisco State University; Ph.D., University of Minnesota
- Chen, Stanley S. (1967) *Professor of Engineering*
 Diploma, Taipei Institute of Technology (Republic of China); M.S., Ohio University;
 Ph.D., University of Wisconsin, Madison
- Cheng, Li-Chou (1987) *Assistant Professor of Dance*
- Chewning, Gene (1984) *Assistant Professor of Accountancy*
 B.S.B.A., University of North Carolina, Chapel Hill; M.B.A., East Carolina University;
 Ph.D., University of South Carolina; C.P.A., North Carolina
- Chlistowa, Xenia (1980) *Associate Professor of Dance*
- Cho, Jaewun (1988) *Assistant Professor of Marketing*
 B.S., Seoul National University (Korea); M.B.A., Northwestern University
- Chou, Ju-Hsi (1975) *Professor of Art*
 B.A., University of Kentucky; M.A., Ph.D., Princeton University
- Christensen, George (1975) *Assistant Professor of Architecture*
 B.Arch., Illinois Institute of Technology
- Christensen, Philip R. (1987) *Assistant Professor of Geology*
 B.S., M.S., Ph.D., University of California, Los Angeles
- Christian, Charles W. (1985) *Assistant Professor of Accountancy*
 B.B.A., University of Georgia; J.D., University of Virginia; Ph.D., University of Georgia
- Christiansen, Kent M (1966) *Associate Professor of Counseling; Director, Student Services*
 B.S., M.S., Brigham Young University; Ph.D., Michigan State University
- Christine, Ray O. (1958) *Associate Professor of Elementary Education*
 A.B., A.M., Northern Colorado University; Ed.D., Arizona State University
- Christopher, F. Scott (1986) *Assistant Professor of Family Resources and Human Development*
 B.S., M.S., University of Nebraska; Ph.D., Oregon State University
- Chubrich, Robert E. (1971) *Associate Professor of Speech and Hearing Science*
 B.A., Grinnell College; M.A., Indiana University; Ph.D., State University of New York, Buffalo
- Church, Kathleen K. (1969) *Professor of Zoology*
 B.S., M.A., University of Utah; Ph.D., University of California, Berkeley
- Churchill, William D. (1966) *Associate Professor Emeritus of Education;*
 A.B., Colgate University; M.Ed., Alfred University; *Counselor, University Counseling Service*
 Ed.D., University of Rochester
- Cialdini, Robert B. (1971) *Professor of Psychology*
 B.S., University of Wisconsin; Ph.D., University of North Carolina
- Clark, Geoffrey A. (1971) *Professor of Anthropology*
 B.A., M.A., University of Arizona; Ph.D., University of Chicago
- Clark, Robert C. (1981) *Professor of Music*
 B.Mus., Central Methodist College; S.M.M., Union Theological Seminary
- Clark, William Dennis (1976) *Associate Professor of Botany*
 B.A., Sacramento State College; Ph.D., University of Texas
- Cleary, Edward W. (1967) *Professor Emeritus of Law*
 A.B., Illinois College; J.D., University of Illinois; J.S.D., Yale University

- Clothier, Ronald R. (1955) *Associate Professor Emeritus of Zoology*
A.B., Fresno State College; M.A., Montana State University; Ph.D., University of New Mexico
- Cluff, Gordon L. (1963) *Professor of Speech and Hearing Science*
B.A., Arizona State University; M.S., Ph.D., Southern Illinois University
- Cobas, José A. (1975) *Associate Professor of Sociology*
B.A., Maryville College; M.A., University of Tennessee, Knoxville; Ph.D., University of Texas, Austin
- Cochran, Douglas L. (1968) *Associate Professor Emeritus of Management*
B.S., Ohio State University; M.B.A., Harvard University; Ph.D., University of Oregon
- Cochran, Jeffery K. (1984) *Assistant Professor of Engineering*
B.S.E., M.S.N.E., M.S.I.E., Ph.D., Purdue University
- Cochran, John A. (1962) *Professor of Economics*
A.B., Drake University; A.M., Ph.D., Harvard University
- Cocke, Robert D. (1983) *Assistant Professor of Art*
B.F.A., University of Arizona; M.A., M.F.A., University of Iowa
- Coghlan, William A. (1982) *Associate Professor of Engineering*
B.S., Montana School of Mines; M.S., Ph.D., Stanford University
- Cohen, Cecilia (1982) *Instructor of Nursing*
B.S., Boston College; M.S., Arizona State University
- Cohen, David (1967) *Professor Emeritus of Music*
B.S., M.S., The Juilliard School; D.M.A., University of Southern California
- Cohen, Herbert G. (1977) *Associate Professor of Elementary Education*
B.S., Muhlenberg College; M.A., Hofstra University; Ph.D., University of Iowa
- Cohn, Sanford J. (1979) *Associate Professor of Special Education*
B.A., M.Ed., Ph.D., Johns Hopkins University
- Colby, Arthur L. (1965) *Assistant Professor of English*
B.A., University of Massachusetts; M.A., Ph.D., University of North Carolina
- Cole, Gerald A. (1958) *Professor Emeritus of Zoology*
A.B., Middlebury College; M.S., St. Lawrence University; Ph.D., University of Minnesota
- Collins, James P. (1975) *Associate Professor of Zoology*
B.S., Manhattan College; M.S., Ph.D., University of Michigan
- Collofello, James S. (1979) *Associate Professor of Computer Science*
A.A., Joliet Junior College; B.S., M.S., Northern Illinois University; Ph.D., Northwestern University
- Comeaux, Malcolm L. (1969) *Professor of Geography*
B.A., University of Southwestern Louisiana; M.A., Southern Illinois University; Ph.D., Louisiana State University
- Comfort, Joseph R. (1981) *Professor of Physics*
A.B., Ripon College; M.S., Ph.D., Yale University
- Cook, Edward A. (1985) *Assistant Professor of Planning*
B.S.L.A., Washington State University; M.L.A., Utah State University
- Cook, Jeffrey (1961) *Professor of Architecture*
B.Arch., University of Manitoba (Canada); M.Arch., Pratt Institute
- Cook, Phil A. (1963) *Professor Emeritus of Education*
B.A., Southwestern State College; M.A., Colorado State College of Education; Ed.D., University of Kansas
- Cook, Suzanne M. (1974) *Associate Professor of Management*
B.B.A., M.B.A., D.B.A., Texas Tech University
- Corbin, Charles B. (1982) *Professor of Physical Education*
B.S., University of New Mexico; M.S., University of Illinois; Ph.D., University of New Mexico
- Corder, Brice W. (1971) *Professor of Health Science; Assistant Dean, Pre-Health Professions,
College of Liberal Arts and Sciences*
B.A., Lynchburg College; M.Ed., Ed.D., Temple University
- Corey, Frederick C. (1987) *Assistant Professor of Communication*
B.S., Central Michigan University; M.S., Southern Illinois University; Ph.D., University of Arizona

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- Corman, Steven R. (1987) *Assistant Professor of Communication*
 B.S., Illinois State University; M.A., University of Illinois
- Cosand, Walter A. (1976) *Associate Professor of Music*
 B.M., M.M., University of Rochester
- Cota-Cardenas, Margarita (1981) *Associate Professor of Spanish*
 B.A., California State University, Turlock; M.A., University of California, Davis; Ph.D., University of Arizona
- Couch, Sanford C. (1962) *Professor of Russian*
 B.A., M.A., Ph.D., University of Wisconsin, Madison
- Coudroglou, Aliko (1971) *Professor of Social Work*
 B.A., College of St. Benedict; M.S.W., University of Minnesota; D.S.W., Columbia University
- Cowley, Anne P. (1983) *Professor of Physics/Astronomy*
 B.A., Wellesley College; M.S., Ph.D., University of Michigan
- Cowley, John M. (1969) *Galvin Professor of Physics*
 B.S., M.S., D.Sc., University of Adelaide (Australia); Ph.D., Massachusetts Institute of Technology
- Cox, Frank E. (1972) *Professor Emeritus of Technology*
 B.S.M.E., Purdue University; M.S.E., Arizona State University
- Cox, Steven R. (1970) *Associate Professor of Economics*
 B.S., University of Wisconsin, Madison; M.A., Ph.D., University of Michigan
- Craft, John E. (1973) *Associate Professor of Journalism and Telecommunication*
 B.F.A., M.A., Ph.D., Ohio University
- Cranmer, William H. (1963) *Professor Emeritus of Social Work*
 B.A., University of Akron; M.S., Case Western Reserve University
- Crawford, John E. (1980) *Associate Professor of Communication*
 B.A., Nebraska Wesleyan University; M.A., Sacramento State College; Ph.D., University of Southern California
- Creath, J. Richard (1974) *Associate Professor of Philosophy*
 B.A., Knox College; M.A. (Phil.), M.A. (Hist./Phil.Sci.), Ph.D., University of Pittsburgh
- Creighton, Judith M. (1967) *Assistant Professor Emeritus of Family Resources and Human Development*
 B.S., University of Arizona; M.S., M.C., Arizona State University; Ph.D., University of Arizona
- Croft, Lee B. (1973) *Associate Professor of Russian*
 B.S., Arizona State University; M.A., University of Arizona; Ph.D., Cornell University
- Cronin, John R. (1966) *Professor of Chemistry*
 B.A., College of Wooster; Ph.D., University of Colorado
- Cronkite, Walter (1986) *Professor of Journalism and Telecommunication*
- Crosby, Lawrence A. (1983) *Associate Professor of Marketing*
 B.S., M.B.A., Ph.D., University of Michigan
- Cross, James P. (1983) *Assistant Professor of Marketing*
 B.S., M.B.A., Ph.D., University of Minnesota
- Crosson, Stephen (1987) *Assistant Professor of Military Science*
 B.S., University of Southern Colorado; M.P.A., Western Kentucky University
- Crouch, Beulah (1953) *Assistant Professor Emeritus of Education*
 B.A. in Ed., M.A. in Ed., Arizona State University
- Crouch, Peter (1985) *Associate Professor of Engineering*
 B.S., M.S., University of Warwick; Ph.D., Harvard University
- Crowder, Troy F. (1970) *Associate Professor Emeritus of Journalism and Telecommunication*
 B.A., University of South Dakota; M.A., University of Iowa
- Crowe, Barbara J. (1981) *Associate Professor of Music; Director, Music Therapy*
 B.M., M.M., Michigan State University
- Cullen, Ruth M. (1986) *Assistant Professor of Sociology*
 B.A., Mount Saint Agnes; Ph.D., Fordham University
- Cummings, Lawrence T. (1970) *Associate Professor of Counseling*
 B.A., M.A., Arizona State University; Ed.D., University of California, Los Angeles

- Curran, Mark J. (1968) *Professor of Spanish and Portuguese*
B.S., Rockhurst College; Ph.D., St. Louis University
- Cusimano, Barbara E. (1985) *Assistant Professor of Physical Education*
B.S., Oklahoma State University; M.S., Ph.D., Arizona State University
- D'Andrea, Frank L. (1972) *Associate Professor Emeritus of Music*
B.A., M.A., Ed.D., Columbia University
- D'Angelo, Frank J. (1970) *Professor of English*
B.S., Loyola University, New Orleans; M.A., Tulane University; Ph.D., University of Nebraska, Lincoln
- Daane, Calvin J. (1963) *Professor Emeritus of Counselor Education*
B.S., University of Wisconsin; M.A., Columbia University; Ed.D., Indiana University
- Dagger, Richard K. (1976) *Associate Professor of Political Science*
B.A., University of Missouri; Ph.D., University of Minnesota
- Dahl, Richard C. (1966) *Professor Emeritus of Law*
B.A., B.L.S., University of California; LL.B., Catholic University
- Dahl, Ronald D. (1988) *Associate Professor of Technology*
B.S., M.S., University of North Dakota; Ph.D., Iowa State University
- Daley, Michael J. (1978) *Professor of Social Work*
B.S., Spring Hill College; M.S.W., St. Louis University; M.S., University of Pittsburgh; D.S.W., Tulane University
- Dalgleish, Donald D. (1962) *Associate Professor of Political Science*
B.A., Carleton College; A.M., Columbia University; Ph.D., University of Colorado
- Dallyn, Selwyn L. (1983) *Clinical Professor of Law*
B.A., Graceland College; J.D., University of Iowa
- Daneke, Gregory A. (1982) *Professor of Public Affairs, Business Administration and Environmental Studies*
A.A., San Bernardino Valley College; B.A., M.A., Brigham Young University; Ph.D., University of California, Santa Barbara
- Daniel, Norman E. (1970) *Associate Professor of Transportation*
B.S., M.S., University of Tennessee, Knoxville; Ph.D., Indiana University
- Dannenfeldt, Karl H. (1956) *Professor Emeritus of History*
A.B., Valparaiso University; M.A., Indiana University; Ph.D., University of Chicago
- Dantico, Marilyn (1978) *Associate Professor of Political Science*
B.A., University of Illinois; M.A., Ph.D., Florida State University
- Darst, Paul W. (1976) *Professor of Physical Education*
B.S., M.S., Akron University; Ph.D., Ohio State University
- Datesman, Susan K. (1979) *Associate Professor of Justice Studies*
B.A., Kutztown State College; M.A., Ph.D., University of Delaware
- Datta, Ajoy K. (1984) *Assistant Professor of Computer Science*
B.E., P.G., Ph.D., Jadavpur University
- Dauten, Joel J. (1960) *Professor Emeritus of Finance*
B.S., M.S., Washington University; Ph.D., University of Iowa
- Davey, William G. (1976) *Associate Professor of Communication;*
B.A., Pennsylvania State University; *Director, American Language and Culture Program*
M.A., Columbia University; Ph.D., Indiana University
- Davidson, Joseph K. (1973) *Professor of Engineering*
B.M.E., M.Sc., Ph.D., Ohio State University
- Davies, Charles (1986) *Assistant Professor of Music*
B.F.A., Kearney State College; M.F.A., University of Iowa
- Davis, George R. (1980) *Associate Professor of Engineering*
B.S.E.E., M.S., University of Illinois; Ph.D., University of Arizona
- Davis, Joseph M. (1975) *Associate Professor of Finance*
B.S., University of South Carolina; M.B.A., Texas A&M University; Ph.D., University of Georgia

450 RESIDENT FACULTY

- Davis, Keith (1958) *Professor Emeritus of Management*
B.B.A., M.B.A., University of Texas; Ph.D., Ohio State University
- Davis, Robert E. (1959) *Professor Emeritus of Communication*
B.A., M.A., Ph.D., University of Illinois
- Davis, Sanford S. (1953) *Professor Emeritus of Counselor Education*
A.B., B.S., Central Missouri State College; A.M., University of Missouri, Kansas City; Ed.D., University of Colorado
- Davy, Jeanette A. (1986) *Assistant Professor of Management*
B.S., Viterbo College; Ph.D., University of Arizona
- Deach, Dorothy F. (1967) *Professor Emeritus of Physical Education*
B.S., M.S., University of Illinois; Ph.D., University of Michigan
- Dean, Arthur G. (1971) *Associate Professor of Engineering*
B.A., M.S., Texas Tech University; Ph.D., Texas A&M University
- Debenport, Sylvia (1978) *Associate Professor of Music*
B.M.E., B.M., M.M., Indiana University
- DeBerg, Curtis L. (1985) *Assistant Professor of Accountancy*
B.A., University of Northern Iowa; M.S., Ph.D., Oklahoma State University; C.P.A., Iowa
- DeFranco, Rosemary (1987) *Assistant Professor of Military Science*
B.A., Barnard College; M.S., J.D., Syracuse University
- Dellheim, Charles J. (1980) *Associate Professor of History*
B.A., State University of New York, Binghamton; M.A., Ph.D., Yale University
- DeMars, James R. (1981) *Associate Professor of Music*
B.A., Macalester College; M.A., Ph.D., University of Minnesota, Minneapolis
- DeMassa, Thomas A. (1966) *Professor of Engineering*
B.S.E.E., M.S.E.E., Ph.D., University of Michigan, Ann Arbor
- de Matties, Nicholas (1974) *Associate Professor of Art*
B.A., Long Beach State University; M.S., Illinois Institute of Technology
- Demeke, Howard J. (1962) *Associate Professor Emeritus of Education*
A.B., San Francisco State College; M.S., Ed.D., University of Southern California
- DeSerpa, Allan C. (1975) *Associate Professor of Economics*
B.A., University of Santa Clara; Ph.D., University of California, Santa Barbara
- Detrie, Thomas (1984) *Associate Professor of Art*
B.F.A., M.F.A., Louisiana Tech University
- Dey, Sandwip (1987) *Assistant Professor of Engineering*
B.Tech., Banars Hindu University; M.S., Ph.D., Alfred University
- Dezelsky, Thomas L. (1968) *Associate Professor of Health Science*
B.S., Central Michigan University; M.A., University of Michigan; H.S.D., Indiana University
- Díaz, José Luis (1984) *Assistant Professor of Agribusiness and Environmental Resources*
B.S., Escuela Técnica de Ingenieros Agrónomos, Madrid; M.B.A., State University of New York, Buffalo;
Ph.D., Texas A&M University
- Dietz, Robert (1977) *Professor Emeritus of Geology*
B.S., M.S., Ph.D., University of Illinois
- Diffenderfer, Peter J. (1986) *Assistant Professor of Leisure Studies*
B.S., State University of New York, Cortland; M.S., Ph.D., University of Oregon
- Ditsworth, Richard L. (1959) *Professor of Engineering*
B.S., M.S., Iowa State College; Ph.D., Michigan State University
- Dittert, Alfred E. Jr. (1967) *Professor Emeritus of Anthropology*
B.A., M.A., University of New Mexico; Ph.D., University of Arizona
- Doan, Jerry (1979) *Professor of Music*
B.M.E., M.M., North Texas State University; D.M.A., University of Michigan
- Doane, Winifred W. (1977) *Professor of Zoology*
B.A., Hunter College of the City of New York; M.S., University of Wisconsin; Ph.D., Yale University

- Dobkin, William E. (1970) *Professor of Theatre*
 A.B., Eastern Michigan University; M.A., University of Colorado; Ph.D., Indiana University
- Doebler, Bettie Anne (1971) *Professor of English; Director, Interdisciplinary Humanities Program*
 B.A., M.A., Duke University; Ph.D., University of Wisconsin, Madison
- Doebler, John W. (1970) *Professor of English*
 B.A., Duke University; M.A., Ph.D., University of Wisconsin, Madison
- Donelson, Kenneth L. (1965) *Professor of English*
 B.A., M.A., Ph.D., University of Iowa
- Donnelly, Aaron V. (1962) *Professor Emeritus of Engineering*
 B.S.E.E., M.S., University of Iowa; M.A., Columbia University; Ph.D., University of Iowa
- Dorman, Michael F. (1976) *Professor of Speech and Hearing Science*
 B.S., University of Washington; M.A., Hollins College; Ph.D., University of Connecticut
- Dorson, William J. (1966) *Professor of Engineering*
 B.Ch.E., M.Ch.E., Rensselaer Polytechnic Institute; Ph.D., University of Cincinnati
- Dove, Rita (1981) *Professor of English*
 B.A., Miami University, Ohio; M.F.A., University of Iowa
- Downing, George D. Jr. (1964) *Professor Emeritus of Marketing*
 B.S.E.E., Iowa State University; D.B.A., Michigan State University
- Doyle, Donald P. (1962) *Professor of Theatre*
 B.A., Arizona State University; M.A., Northwestern University; Ph.D., University of Minnesota
- Drake, Jackson M. (1974) *Associate Professor Emeritus of Education*
 B.S., M.S., Southern Illinois University; Ed.D., Columbia University
- Dresskell, Nadine (1946) *Professor Emeritus of Music*
 B.S., Bowling Green State University; M.A., Columbia University
- Driscoll, Michael F. (1971) *Associate Professor of Mathematics*
 B.A., St. John's University; M.S., Ph.D., University of Arizona
- Dubie, Norman (1978) *Professor of English*
 B.A., Goddard College; M.F.A., University of Iowa
- Dudek, Leona M. (1960) *Assistant Professor Emeritus of Education*
 B.Ed., National College of Education; M.A. in Ed., Arizona State University
- Duffy, Dennis M. (1977) *Associate Professor of Engineering*
 B.S., M.S., Ph.D., University of Arizona
- Duncan, William A. (1980) *Assistant Professor of Accountancy*
 B.S., Portland State University; Ph.D., University of Texas; C.P.A., Texas
- Dundas, Mary Jane (1975) *Associate Professor of General Business*
 B.A., California State University, Long Beach; J.D., Loyola University, Los Angeles
- Durrenberger, Robert W. (1971) *Professor Emeritus of Geography*
 B.S., Moorhead State College; B.S., California Institute of Technology; M.S., University of Wisconsin, Madison;
 Ph.D., University of California, Los Angeles
- Dycus, Augustus M. (1959) *Associate Professor Emeritus of Botany*
 B.S., Akron University; Ph.D., Cornell University
- Eck, Roger D. (1970) *Professor of Decision and Information Systems*
 B.S.Ch.E., Clarkson College of Technology; M.B.A., University of New Mexico; Ph.D., Tulane University
- Eckert, Thomas W. (1971) *Associate Professor of Art*
 B.A., M.F.A., Arizona State University
- Edelsky, Carole (1976) *Associate Professor of Elementary Education*
 B.S., University of Cincinnati; Ph.D., University of New Mexico
- Eder, James F. Jr. (1975) *Associate Professor of Anthropology*
 B.S., California Institute of Technology; M.A., Ph.D., University of California, Santa Barbara
- Edwards, John (1964) *Professor of Reading and Library Science; Executive Director, Off-Campus Academic Services*
 B.S., Ball State University; M.A., Ed.D., Arizona State University

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- Edwards, Mark R. (1978) *Associate Professor of Agribusiness and Environmental Resources*
 B.S.M.E., U.S. Naval Academy; M.B.A., D.B.A., Arizona State University
- Edwards, Marvin J. (1959) *Assistant Professor of Technology*
 B.S., M.A. in Ed., Arizona State University
- Eeds, Maryann H. (1975) *Associate Professor of Reading and Library Science*
 B.S., California State University, Sacramento; Ph.D., University of Oregon
- Effland, Richard W. (1967) *Professor Emeritus of Law*
 A.B., LL.B., University of Wisconsin; LL.M., Columbia University
- Eisenberg, Nancy H. (1976) *Professor of Psychology*
 B.A., University of Michigan; M.A., Ph.D., University of California, Berkeley
- Ekmanis, Rolfs (1963) *Professor of Russian*
 B.A., M.A., University of Wisconsin, Madison; Ph.D., Indiana University
- Ellis, Robert H. (1962) *Associate Professor of Journalism and Telecommunication;*
 B.A., Arizona State University; *Associate Vice President for University Relations*
 M.A., Case Western Reserve University
- Ellison, Geraldine (1981-83; 1986) *Assistant Professor of Nursing*
 B.S.N., Berea College; M.S.N., Vanderbilt University; M.A., Ph.D., Arizona State University
- Ellman, Ira Mark (1978) *Professor of Law*
 B.A., Reed College; M.A., University of Illinois; J.D., University of California, Berkeley
- Ellner, Anthony Jr. (1960) *Professor Emeritus of Architecture*
 B.A., City University of New York; M.A., Columbia University; M.Arch., Yale University
- Ellsworth, Lola M. (1938) *Professor Emeritus of Family Resources and Human Development*
 B.S., Brigham Young University; M.A., Columbia University
- Elmore, James W. (1949) *Professor Emeritus of Planning*
 A.B., University of Nebraska; M.S. in Arch., Columbia University
- Emery, Raymond C. (1962) *Associate Professor Emeritus of English*
 B.A., M.A., University of Wyoming; Ed.D., Stanford University
- Engel, Glorianne (1982) *Associate Professor of Theatre*
 B.F.A., University of Arizona; M.A., Ph.D., University of Pittsburgh
- Engelhardt, Florence P. (1965) *Associate Professor of Social Work*
 B.A., College of Mount Saint Vincent; M.S.S., Fordham University
- English, William S. (1962) *Professor Emeritus of Music*
 B.M., Washburn University; M.A., Ph.D., George Peabody College
- Engstrom, John A. III, Master Sergeant (1987) *Assistant Professor of Military Science*
- Entz, Adele (1984) *Instructor of Nursing*
 B.S.N., University of Washington; M.N., University of Kansas
- Erno, Richard B. (1957-62; 1963) *Professor Emeritus of English*
 B.A., Michigan State University; M.A., University of Denver; Ph.D., University of Minnesota
- Evans, Donovan L. (1966) *Professor of Engineering;*
 B.S.M.E., University of Cincinnati; *Acting Chair, Department of Mechanical and Aerospace Engineering*
 Ph.D., Northwestern University
- Evans, John X. (1964) *Professor of English*
 B.A., Holy Cross College; M.A., Ph.D., Yale University
- Evans, Kenneth R. (1980) *Associate Professor of Marketing*
 B.A., University of California, Davis; M.B.A., California State University, Sacramento;
 D.B.A., University of Colorado, Boulder
- Eyring, LeRoy (1961) *Professor of Chemistry*
 B.S., University of Arizona; Ph.D., University of California, Berkeley
- Faas, Larry A. (1967) *Professor of Special Education*
 B.S., Iowa State University; M.A., Colorado State College; Ed.D., Utah State University

- Fabes, Richard A. (1983) *Assistant Professor of Family Resources and Human Development*
B.A., University of Colorado; M.S., Ph.D., Oklahoma State University
- Faeth, Stanley H. (1980) *Associate Professor of Zoology*
B.S., M.S., University of Cincinnati; Ph.D., Florida State University
- Fafitis, Apostolos (1984) *Assistant Professor of Engineering*
B.S.Eng., Aristotolion University of Thessaloniki, Greece; M.Eng., South Dakota School of Mines and Technology;
Ph.D., Northwestern University
- Fainter, Robert (1987) *Assistant Professor of Computer Science*
B.S., University of North Carolina, M.S., Ph.D., Virginia Polytechnic Institute
- Faith, Roger L. (1981) *Professor of Economics*
B.A., St. Mary's College of California; M.A., Ph.D., University of California, Los Angeles
- Faltz, Leonard M. (1979) *Associate Professor of Computer Science*
B.S., City University of New York; M.S., Harvard University; Ph.D., University of California, Berkeley
- Fann, Gail L. (1986) *Assistant Professor of General Business*
B.S., Northern Arizona University; M.Ed., Ed.D., Arizona State University
- Farber, Bernard (1971) *Professor of Sociology*
A.B., Roosevelt University; A.M., Ph.D., University of Chicago
- Farin, Gerald (1987) *Associate Professor of Computer Science*
B.A., M.A., Ph.D., University of Braunschweig
- Farmer, Frank D. (1970) *Associate Professor of Mathematics*
B.A., M.A., University of California, Riverside; Ph.D., University of Washington
- Farness, Sherly F. (1969) *Assistant Professor Emeritus of Art*
B.A., M.A., Michigan State University
- Farrar, Roger D. (1974) *Associate Professor of Educational Administration and Supervision*
B.A., M.S., Kearney State College; Ed.D., University of Nebraska
- Farris, Martin T. (1957) *Professor of Transportation*
B.A., M.A., University of Montana; Ph.D., Ohio State University
- Fausel, Donald F. (1969) *Associate Professor of Social Work; Director, MSW Program*
A.B., S.T.B., S.T.L., St. Mary's University; M.S.W., Fordham University; D.S.W., Columbia University
- Faustini, Antony A. (1983) *Assistant Professor of Computer Science*
B.S./C.S., Ph.D., University of Warwick
- Fearon, Harold E. (1961) *Professor of Purchasing Management;*
B.S., M.B.A., Indiana University; *National Association of Purchasing Management Professor*
Ph.D., Michigan State University
- Fehr, Fred S. (1971) *Associate Professor of Psychology*
B.S., University of Wisconsin; M.A., Ph.D., Washington University
- Feldhaus, Anne (1981) *Associate Professor of Religious Studies*
B.A., Manhattanville College; Ph.D., University of Pennsylvania
- Feldstein, Alan (1970) *Professor of Mathematics*
B.A., Arizona State University; Ph.D., University of California, Los Angeles
- Feller, Carolyn M. (1972) *Associate Professor of Nursing*
B.S.N., M.S., Arizona State University; Ph.D., Texas Woman's University
- Feller, Joseph M. (1987) *Associate Professor of Law*
B.A., St. Mary's Dominican College; M.S., Ph.D., University of California, Los Angeles; J.D., Harvard University
- Fellows, Rushia G. (1977) *Assistant Professor of Architecture*
B.S., Arizona State University; M.Arch, University of Arizona
- Fenske, Robert H. (1974) *Professor of Higher Education*
B.S., M.S., Ph.D., University of Wisconsin
- Fernando, Harindra (1984) *Assistant Professor of Engineering*
B.Sc., University of Sri Lanka; M.A., Ph.D., Johns Hopkins University; Post-Doctoral, California Institute of Technology
- Ferraro, Kathleen (1982) *Assistant Professor of Justice Studies*
B.A., Case Western Reserve University; M.A., Ph.D., Arizona State University

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- Ferrell, Wilfred A. (1959) *Professor of English*
 B.A., M.A., Ph.D., University of Texas
- Ferris, Jean (1985) *Assistant Professor of Music*
 B.M., University of Michigan; M.A., Arizona State University
- Ferry, David K. (1983) *Professor of Engineering; Director, Center for Solid State Electronics*
 B.S.E.E., M.S.E.E., Texas Technological College; Ph.D., University of Texas, Austin
- Fielding, Ken (1987) *Assistant Professor of Journalism and Telecommunication*
 B.S., M.S., University of Illinois, Urbana
- Fifield, Michael E. (1984) *Assistant Professor of Architecture*
 B.A., University of California, Berkeley; M.Arch., University of California, Los Angeles
- Finch, A. Joyce (1965) *Assistant Professor of Nursing*
 B.S.N., Augustana College; M.S., University of Colorado; Ph.D., University of Texas, Austin
- Findler, Nicholas V. (1982) *Professor of Computer Science*
 B.Eng., Ph.D., Budapest University for Technical Sciences
- Findley, Lisa R. (1984) *Assistant Professor of Architecture*
 B.A., University of California, Santa Cruz; M.Arch., University of California, Los Angeles
- Finer, Neal (1977) *Associate Professor of Secondary Education*
 B.A., University of Houston; M.A., Mexico City College (University of the Americas); Ph.D., University of Texas, Austin
- Fink, Jonathan H. (1982) *Associate Professor of Geology*
 B.A., Colby College; Ph.D., Stanford University
- Fink, Raymond R. (1958) *Professor Emeritus of Art*
 B.A.E., School of the Art Institute of Chicago; M.S.A.E., Illinois Institute of Technology
- Finn, Mary G. (1986) *Assistant Professor of Economics*
 B.A., M.A., National University of Ireland; Ph.D., University of Western Ontario
- Firestone, Melvin M. (1968) *Associate Professor of Anthropology*
 B.A., University of New Mexico; M.A., Ph.D., University of Washington
- Fisher, Marvin M. (1958) *Professor of English*
 A.B., A.M., Wayne University; Ph.D., University of Minnesota
- Fisher, Stuart G. (1976) *Professor of Zoology*
 B.S., M.A., Wake Forest College; Ph.D., Dartmouth College
- Fitch, Gregory W. (1974) *Professor of Philosophy; Chair, Department of Philosophy*
 B.A., Western Washington State College; M.A., Ph.D., University of Massachusetts, Amherst
- Flaherty, Richard E. (1978) *Professor of Accountancy*
 B.A., M.S., Ph.D., University of Kansas; C.P.A., Kansas
- Fleming, Robert C. (1974) *Associate Professor of Music*
 B.S., Indiana University of Pennsylvania; M.F.A., Carnegie-Mellon University; Ph.D., Southern Illinois University
- Fletcher, Grant (1956) *Professor Emeritus of Music*
 B.M., Illinois Wesleyan University; M.M., University of Michigan; Ph.D., Eastman School, University of Rochester
- Fletcher, Ian (1982) *Professor of English*
 Ph.D., University of Reading (England)
- Florschuetz, Leon W. (1964) *Professor of Engineering*
 B.S., M.S., Ph.D., University of Illinois
- Flym, Mary Kay (1986) *Instructor of Nursing*
 B.S.N., University of Evansville; M.A.N., University of Iowa
- Flys, Michael J. (1975) *Professor of Spanish*
 Licenciado en Filosofia y Letras, Doctor en Filosofia y Letras, Universidad de Madrid (Spain)
- Foard, James H. (1977) *Associate Professor of Religious Studies*
 B.A., College of Wooster, A.M., Ph.D., Stanford University
- Foley, Thomas A. (1984) *Assistant Professor of Computer Science*
 B.S., M.A., Ph.D., Arizona State University

- Fordenwalt, James N (1987) *Associate Professor of Technology*
 B.S., M.S., University of Arizona; Ph.D., State University of Iowa
- Foster, Brian L. (1980) *Professor of Anthropology; Dean, Graduate College*
 B.A., Northern Illinois University; 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
- Franklin, Vincent P. (1986) *Associate Professor of History*
 B.A., Pennsylvania State University; M.A.T., Harvard University; Ph.D., University of Chicago
- Frasier, James E. (1963) *Professor Emeritus of Education*
 B.A., University of Northern Colorado; M.A., University of Michigan; Ed.D., University of Northern Colorado
- Frazier, Robert C. (1973) *Associate Professor Emeritus of Humanities 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) *Professor of Spanish*
 B.A., University of Virginia; M.A., Ph.D., Johns Hopkins University
- Fritz, Karen (1983) *Instructor of Nursing*
 Diploma, Sioux Valley Hospital, Sioux Falls, South Dakota; B.A., Sioux Falls College; M.S., University of Minnesota
- Fritzmeier, Joe R. (1973) *Professor of Accountancy*
 B.B.A., Baylor University; M.B.A., D.B.A., Indiana University; C.P.A., Texas
- Fronsk, Jeanne Otis (1975) *Associate Professor of Art*
 B.A., DePauw University; B.F.A., Denison University; M.F.A., Ohio State University
- Frost, Melvin Jesse (1965) *Assistant Professor Emeritus of Geography*
 B.S., Arizona State University; M.S., Brigham Young University; Ph.D., University 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; Assistant Vice President for Academic Affairs*
 B.S., M.A., University of South Dakota; Ph.D., University of Iowa
- Fuchs, Jacob (1951) *Professor of Chemistry*
 B.A., New York University; M.S., Ph.D., University of Illinois
- Fuchs, Rachel G. (1983) *Assistant Professor of History*
 B.A., M.A., Boston University; Ph.D., Indiana University
- Fullerton, Bill J. (1958) *Professor Emeritus of Education*
 B.S., Northwestern State College; Ed.M., D.Ed., University of Oklahoma
- Fullinwider, S. Pendleton (1967) *Associate Professor of History*
 B.S., U.S. Naval Academy; M.S., Ph.D., University of Wisconsin, Madison
- Furnish, Dale B. (1970) *Professor of Law*
 B.A., Grinnell College; J.D., University of Iowa; LL.M., University of Michigan
- Gabaldon, Diana J. (1980) *Assistant Professor, Research, Center for Environmental Studies*
 B.S., Northern Arizona University; M.S., Scripps Institute of Oceanography; Ph.D., Northern Arizona University
- Gaffney, Philip D. (1957) *Professor Emeritus of Education*
 B.S., Northern Illinois State University; M.A., Ph.D., State University of Iowa
- Gaines, Sylvia W. (1972) *Associate Professor of Anthropology*
 B.A., M.A., Ph.D., Arizona State University
- Galat, David L. (1984) *Assistant Professor of Zoology*
 B.S., Cornell University; M.S., Ph.D., Colorado State University
- Galician, Mary-Lou (1982) *Assistant Professor of Journalism and Telecommunication*
 B.A., Long Island University; M.S., Syracuse University; Ed.D., Memphis State University

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- Gallinger, George W. (1977) *Assistant Professor of Finance*
 B.A., Waterloo Lutheran College; M.B.A., York University; Ph.D., Purdue University
- Garcia, Margot (1984) *Assistant Professor of Planning*
 B.Sc., University of New Mexico; M.Sc., University of Wisconsin; Ph.D., University of Arizona
- Garcia, Nelda C. (1973-75; 1986) *Associate Professor of General Business*
 B.S., M.A., Texas Woman's University; Ph.D., Michigan State University
- Garrity, Marjorie L. (1975) *Assistant Professor of Nursing*
 Diploma, Vassar Brothers Hospital; B.S., University of Bridgeport; M.S., Case Western Reserve University
- Gasowski, Ronald E. (1971) *Professor of Art*
 B.S.D., University of Michigan; M.F.A., University of Washington
- Geer, John G. (1986) *Assistant Professor of Political Science*
 B.A., Franklin and Marshall College; M.A., Ph.D., Princeton University
- Gereboff, Joel (1978) *Associate Professor of Religious Studies*
 B.A., New York University; Ph.D., Brown University
- Gerking, Shelby D. (1974) *Professor Emeritus of Zoology*
 A.B., DePauw University; Ph.D., Indiana University
- Gerlach, Vernon S. (1963) *Professor of Education*
 B.A., Wayne State University; M.A., University of Minnesota; Ed.D., Arizona State University
- Gesell, Laurence E. (1984) *Assistant Professor of Technology*
 B.A., Upper Iowa University; M.P.A., University of San Francisco
- Gibbons, Robert T., Captain (1987) *Assistant Professor of Military Science*
 B.A., Brigham Young University
- Gieschen, Donald W. (1959) *Associate Professor of Philosophy*
 B.S., Northwestern University; M.A., Ph.D., University of Minnesota
- Giffin, Frederick C. (1967) *Professor of History*
 B.A., Denison University; M.A., Ph.D., Emory University
- Gill, George A. (1966) *Assistant Professor Emeritus of Education*
 B.S., M.A., Arizona State University
- Gill, James D. (1981) *Assistant Professor of Marketing*
 B.S., M.A., Ph.D., University of Nebraska, Lincoln
- Gillingwater, Denis (1973) *Associate Professor of Art*
 B.F.A., M.F.A., University of Cincinnati
- Gilsdorf, Jeanette W. (1979) *Associate Professor of General Business*
 A.B., Creighton University, Omaha; M.A., Ph.D., University of Nebraska, Lincoln
- Gisolo, Margaret (1954) *Professor Emeritus of Dance*
 B.S., Indiana State Teachers College; M.A., New York University
- Glanzman, Dennis L. (1977) *Associate Professor of Psychology*
 B.A., M.S., Ph.D., University of California, Irvine
- Glass, Gene V. (1986) *Professor of Educational Administration and Supervision
 and Social and Philosophical Foundations*
 B.A., University of Nebraska;
 M.S., Ph.D., University of Wisconsin, Madison
- Glaunsinger, William S. (1972) *Professor of Chemistry; Chair, Department of Chemistry*
 B.S., Miami University; Ph.D., Cornell University
- Gober, Patricia A. (1975) *Professor of Geography; Chair, Department of Geography*
 B.S., University of Wisconsin, Whitewater; M.S., Ph.D., Ohio State University
- Goldstein, Elliott S. (1974) *Associate Professor of Zoology*
 B.S., University of Hartford; M.S., Ph.D., University of Minnesota
- Goldstein, Myron (1963) *Professor of Mathematics*
 B.S., M.A., Ph.D., University of California, Los Angeles
- Golen, Steven P. (1984) *Associate Professor of General Business*
 B.S., M.A., Western Kentucky University; Ph.D., Arizona State University

- Golshani, Forouzan (1984) *Assistant Professor of Computer Science*
B.S., Arya Mehr University of Technology; M.S., Ph.D., Warwick University, UK
- Gomez, Reynaldo A. (1980) *Assistant Professor of Education*
B.A., Southwest Texas State University; M.Ed., Stephen F. Austin State University; Ph.D., Pennsylvania State University
- Goo, Benjamin (1955) *Professor Emeritus of Art*
B.F.A., University of Iowa; M.F.A., Cranbrook Academy of Art
- Gooding, Elmer R. (1967) *Professor of Economics; Associate Vice President for Academic Affairs*
B.S., McPherson College; M.A., Ph.D., University of Kansas
- Gordon, Leonard (1967) *Professor of Sociology; Chair, Department of Sociology*
B.A., Wayne State University; A.M., University of Michigan; Ph.D., Wayne State University
- Gordon, Richard S. (1980) *Professor of Agribusiness and Environmental Resources*
A.B., University of Rochester; M.A., Harvard University; Ph.D., Massachusetts Institute of Technology
- Gorur, Ravi S. (1987) *Assistant Professor of Engineering*
B.E., Bangalore University; M.E., Indian Institute of Science (India); Ph.D., University of Windsor (Canada)
- Goul, K. Michael (1985) *Assistant Professor of Decision and Information Systems*
B.S., M.B.A., Ph.D., Oregon State University
- Gourley, David R. (1967) *Associate Professor of Marketing*
B.S., Miami University; M.B.A., University of Toledo; D.B.A., Indiana University
- Goyer, Robert S. (1981) *Professor of Communication; Chair, Department of Communication*
B.A., DePauw University; M.A., Miami University; Ph.D., Ohio State University
- Grace, Edward E. (1963) *Professor of Mathematics*
B.S., Ph.D., University of North Carolina
- Graf, William L. (1978) *Professor of Geography*
B.A., M.S., Ph.D., University of Wisconsin, Madison
- Graham, Denny L. (1974) *Associate Professor of Technology*
B.S., Ohio State University; M.S., Denver University; Ph.D., Purdue University
- Grasso, Lawrence (1987) *Assistant Professor of Accountancy*
B.S., Sprague University; M.B.A., Rensselaer Polytechnic Institute; C.P.A., Connecticut
- Gratton, Brian J. (1983) *Assistant Professor of History*
B.A., University of New Mexico; Ph.D., Boston University
- Greathouse, Betty M. (1972) *Associate Professor of Elementary Education;*
B.A., M.A., Ph.D., Arizona State University
Director, Division of Curriculum and Instruction
- Greeley, Ronald (1977) *Professor of Geology; Chair, Department of Geology*
B.S., M.S., Mississippi State University; Ph.D., University of Missouri, Rolla
- Green, Gary I. (1980) *Associate Professor of Information Systems*
B.A., University of Colorado; M.B.A., Seattle University; Ph.D., University of Washington
- Green, James L. (1967) *Associate Professor of English*
B.A., M.A., University of Kansas; Ph.D., University of Nevada, Reno
- Green, Mary E. (1967) *Associate Professor of English; Assistant Dean, Student Academic Affairs.*
B.A., Queens College, New York;
College of Liberal Arts and Sciences
M.A., St. John's University, New York; Ph.D., University of Chicago
- Greene, Mildred S. (1966) *Associate Professor of English*
A.B., Wellesley College; M.A.T., Radcliff College; M.A., University of Massachusetts; Ph.D., University of New Mexico
- Greeneich, Edwin W. (1982) *Research Associate Professor of Engineering*
A.A., Diablo Valley College; B.S.E.E., M.S.E.E., Ph.D., University of California, Berkeley
- Greey, George W. (1969) *Professor Emeritus of Leisure Studies*
B.A., M.A., Purdue University; Ph.D., University of Michigan
- Grey, Betsy (1987) *Associate Professor of Law*
B.A., Barnard College, Columbia University; J.D., Georgetown
- Grier, Marvin (1957) *Assistant Professor of Physical Education*
B.A., Wisconsin State College, La Crosse; M.A., New York University

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- Griffith, LeRoy H. (1958) *Professor Emeritus of Education*
 B.S. in Ed., M.S. in Ed., Drake University; Ph.D., University of Iowa
- Grigsby, J. Eugene (1966) *Professor Emeritus of Art*
 A.B., Morehouse College; M.A., Ohio State University; Ph.D., New York University
- Grinder, Robert F. (1973) *Professor of Education*
 B.S., University of California; Ed.D., Harvard University
- Gritzmacher, Karen A. (1986) *Assistant Professor of Operations Management*
 B.S., Carroll College, WI; M.A., Marquette University, WI; Ph.D., Bowling Green State University
- Grobe, Edwin P. (1957) *Professor of French*
 A.B., William Jewell College; M.A., Ph.D., Indiana University
- Grondin, Robert O. (1983) *Associate Professor of Engineering*
 B.S., M.S., Ph.D., University of Michigan, Ann Arbor
- Gronseth, Evangeline (1982) *Associate Professor of Nursing*
 B.A., St. Olaf College; M.N., Yale University; M.A., Ph.D., Columbia University
- Gross, Douglas R. (1968) *Associate Professor of Counseling;*
 B.A., M.A., Western Michigan University; *Acting Program Coordinator, Counseling*
 Ph.D., University of Wisconsin, Madison
- Grossman, Louis H. (1966) *Professor of Management*
 B.A., University of Michigan; M.B.A., Ph.D., Michigan State University
- Gruzinska, Aleksandra (1973) *Assistant Professor of French*
 Lycée Francais, Barcelona, Spain; B.A., M.A., State University of New York, Buffalo; Ph.D., Pennsylvania State University
- Gryder, Robert (1959-63; 1964) *Professor of General Business*
 B.A., Northwestern State College; M.Ed., Louisiana State University; Ed.D., University of North Dakota
- Gudykunst, William B. (1984) *Professor of Communication*
 B.S., M.A., Arizona State University; Ph.D., University of Minnesota
- Guerin, Sanford M. (1984) *Professor of Law*
 B.S., Boston University; J.D., University of San Francisco; LL.M., New York University
- Guilbeau, Eric J. (1977) *Professor of Engineering*
 B.S. in Ch.E., M.S., in Ch.E., Ph.D. in Ch.E., Louisiana Tech University
- Guillot, Elizabeth E. (1964) *Professor Emeritus of Sociology*
 B.S., Simmons College; M.A., Ph.D., University of Pennsylvania
- Guinouard, Donald E. (1966) *Professor of Counseling*
 B.S., M.S., Montana State College; Ed.D., Washington State University
- Guleserian, Theodore (1971) *Associate Professor of Philosophy*
 B.A., University of California, Riverside; Ph.D., Yale University
- Gully, Anthony Lacy (1972) *Associate Professor of Art*
 B.A., University of California, Riverside; M.A., University of California, Berkeley; Ph.D., Stanford University
- Guntermann, Gail (1977) *Associate Professor of Spanish*
 B.S., University of Montana; M.A., University of New Mexico; Ph.D., Ohio State University
- Guntermann, Karl L. (1982) *Arizona Association of Realtors Professor of Real Estate*
 A.B., Knox College; M.B.A., D.B.A., Indiana University
- Gurnee, Herbert (1943) *Professor Emeritus of Psychology*
 A.B., M.A., Wesleyan University; Ph.D., Harvard University
- Gust, J. Devens (1975) *Professor of Chemistry*
 B.S., Stanford University; M.S., Ph.D., Princeton University
- Gutierrez, Nancy A. (1985) *Assistant Professor of English*
 B.A., Denison University; M.A., Ph.D., University of Chicago
- Gwinner, Robert F. (1970) *Professor of Marketing*
 B.S., University of Southern Mississippi; M.B.A., Ph.D., University of Arkansas

- Haberman, Donald C. (1967) *Professor of English*
 B.A., Rutgers. The State University; M.A., Ph.D., Yale University
- Haberman, Lidia W. (1967) *Instructor of Latin*
 B.A., Bryn Mawr College; M.A., Yale University
- Hackbarth, Glenn A. (1976) *Associate Professor of Music*
 B.M., University of Wisconsin. Madison; M.M., D.M.A., University of Illinois
- Haden, Clovis R. (1978) *Professor of Engineering; Vice President for Academic Affairs*
 B.S., University of Texas. Arlington; M.S., California Institute of Technology; Ph.D., University of Texas, Austin
- Hadley, Neil F. (1966) *Professor of Zoology*
 B.A., Eastern Michigan University; Ph.D., University of Colorado
- Haefler, J. Richard (1976) *Associate Professor of Music*
 B.M., Ohio State University; M.M., University of Arizona; Ph.D., University of Illinois
- Haggerson, Nelson L. (1961-63; 1964) *Professor of Secondary Education*
 B.A., Vanderbilt University; M.S. in Ed., New Mexico Western College; Ph.D., Claremont Graduate School
- Hahn, Arthur W. (1962) *Professor Emeritus of Art*
 B.F.A., San Francisco Art Institute; M.A., California State University, San Francisco
- Hajicek, James (1976) *Associate Professor of Art*
 B.F.A., Kansas City Art Institute; M.F.A., University of New Mexico
- Hakac, John (1966) *Associate Professor of English*
 A.B., Centre College; M.A., Ph.D., University of Texas, Austin
- Hale, John Douglas (1956) *Professor Emeritus of Art*
 B.F.A., M.F.A., University of Southern California; Ph.D., Ohio State University
- Haley, Arthur J. (1976) *Professor of Leisure Studies; Chair, Department of Leisure Studies*
 B.A., Stonehill College; M.Ed., Springfield College; Ph.D., Texas A&M University
- Hall, John S. (1973) *Professor of Public Affairs*
 B.A., M.A., San Diego State University; Ph.D., University of Oregon
- Hall, Mark A. (1985) *Associate Professor of Law*
 B.A., Middle Tennessee State University; J.D., University of Chicago
- Hamilton, Robert (1980) *Professor of Music*
 B.M., Indiana University; M.M., Catholic University
- Hanna, Albert Lyle (1967) *Associate Professor of Music*
 B.M., College of Music of Cincinnati; Ph.D., Indiana University
- Hanson, Hugh (1948) *Professor Emeritus of Zoology*
 B.S., Kansas State Teachers College; M.S., Ph.D., University of Illinois
- Hanson, Roland C. (1966) *Professor of Physics*
 B.S., Michigan College of Mining and Technology; M.S., Ph.D., University of Illinois
- Happel, Stephen K. (1975) *Associate Professor of Economics*
 B.A., University of Missouri; M.A., Ph.D., Duke University
- Hardert, Ronald A. (1966) *Associate Professor of Sociology*
 A.B., M.A., University of Cincinnati; Ph.D., Indiana University
- Hardt, Annabelle (1968) *Associate Professor of Multicultural Education;*
Program Coordinator, Multicultural Education
 B.A., Southwestern University; A.M., Cornell University;
 Ph.D., University of Texas, Austin
- Haried, Andrew A. (1969) *Professor of Accountancy*
 B.A., Hastings College; M.A.S., Ph.D., University of Illinois; C.P.A., Illinois, North Carolina and Arizona
- Harper, Pegge (1983) *Instructor of Dance*
 B.F.A., University of Michigan; M.F.A., University of North Carolina
- Harris, Jerry D. (1972) *Professor of Education*
 B.S., Illinois State University; Ph.D., University of Minnesota
- Harris, Joseph (1963) *Professor of Chemistry*
 B.S., University of Maryland; M.A., Ph.D., Johns Hopkins University

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- Harris, Kathryn M. (1965) *Instructor of English*
B.A., M.A., Arizona State University
- Harris, Mark (1980) *Professor of English*
B.A., M.A., University of Denver; Ph.D., University of Minnesota
- Harris, Walter (1980) *Associate Professor of Music; Associate Dean, College of Fine Arts*
B.S., Knoxville College; M.M., Ph.D., Michigan State University
- Harris, William H. (1960) *Professor Emeritus of Marketing*
B.S., University of Denver; M.B.A., Ph.D., Ohio State University
- Harrison, Jeffrey S. (1985) *Assistant Professor of Management*
B.S., Brigham Young University; M.B.A., Ph.D., University of Utah
- Hartwell, L. Kay (1975) *Associate Professor of Educational Administration and Supervision*
B.S., M.A., Murray State University; Ph.D., Southern Illinois University
- Harward, Naomi (1956) *Professor Emeritus of Social Work*
B.D., Garrett Biblical Institute; B.A., Northwestern University; M.A. (Rel. Ed.), M.A. (Social Welfare), University of Chicago
- Hassett, Matthew J. (1966) *Associate Professor of Mathematics*
B.S., Fordham University; M.S., Ph.D., Rutgers, The State University
- Hastings, Vernon L. (1973) *Professor Emeritus of Construction*
B.S.M.E., University of Nebraska; M.S.I.E., Oklahoma A&M University
- Hayes-Thumann, Karen (1984) *Assistant Professor of Art*
B.S., University of Cincinnati; M.F.A., Indiana University, Bloomington
- Haygood, Robert C. (1970) *Professor of Psychology*
B.S., University of Illinois, Urbana; M.S., Ph.D., University of Utah
- Haynes, Peter (1975) *Professor of Justice Studies*
B.S., University of Southampton, England; M.A., Ph.D., University of Toronto
- Hazel, Jeffrey R. (1975) *Professor of Zoology*
B.A., College of Wooster; M.S., Ph.D., University of Illinois
- Hecht, Michael L. (1983) *Associate Professor of Communication*
B.A., M.A., Queens College; Ph.D., University of Illinois
- Hedlund, Ann (1976) *Assistant Professor of Anthropology*
B.A., University of Colorado; M.A., Texas Technical University; Ph.D., University of Colorado, Boulder
- Heier, William D. (1966) *Professor Emeritus of Management*
B.S., University of Maryland; M.A., George Washington University; Ph.D., American University
- Heller, Jules (1976) *Professor of Art*
B.A., Arizona State University; M.A., Columbia University; Ph.D., University of Southern California
- Helms, Loyce Randel (1976) *Professor of English*
B.A., University of California, Riverside; Ph.D., University of Washington
- Helmstadter, G. C. (1959) *Professor of Education; Director, Division of Psychology in Education;*
B.S., M.S., Iowa State University; *Program Coordinator, Educational Psychology*
Ph.D., University of Minnesota
- Hellon, Jon C. (1973) *Associate Professor of Mathematics*
B.S., Southwest Texas State College; M.A., Ph.D., University of Texas, Austin
- Henderson, Mark (1984) *Assistant Professor of Engineering*
B.S.M.E., M.S.M.E., Ph.D., Purdue University
- Hendrick, Thomas E. (1984) *Professor of Operations Management*
B.S., M.B.A., University of Washington; Ph.D., University of Oregon
- Hendrickson, Lester E. (1968) *Associate Professor of Engineering*
B.S., M.S., Michigan Technological University; Ph.D., University of Illinois
- Hendrickson, William L. (1976) *Associate Professor of French*
B.A., Arizona State University; M.A., University of Kansas; Ph.D., Princeton University
- Henkel, Ray (1966) *Assistant Professor of Geography*
B.S., Arizona State University; M.S., Ph.D., University of Wisconsin, Madison

- Hennington, Jo Ann (1975) *Professor of General Business; Associate Dean, College of Business*
 B.A., M.B.A., Ed.D., Arizona State University
- Henze, Lura F. (1966) *Professor Emeritus of Sociology*
 B.A., M.A., Arizona State University
- Hepburn, John R. (1984) *Professor of Justice Studies; Director, School of Justice Studies*
 B.A., Butler University; M.S., University of Kentucky, Lexington; Ph.D., University of Iowa
- Herman, George R. (1956) *Associate Professor Emeritus of English*
 M.A., University of Kansas
- Hernandez, Armand P. (1974) *Associate Professor of Justice Studies*
 B.A., M.A., San Jose State University; Ed.D., University of Southern California
- Hero, Rodney E. (1988) *Associate Professor of Political Science*
 B.S., Florida State University; M.A., Ph.D., Purdue University
- Herrero, Domingo (1981) *Professor of Mathematics*
 M.A., University of Buenos Aires; Ph.D., University of Chicago
- Hershauer, James C. (1969) *Professor of Decision and Information Systems*
 B.S., Purdue University; M.B.A., D.B.A., Indiana University
- Hertz, Michael G. (1987) *Assistant Professor of Finance*
 B.A., M.B.A., M.S., University of Rochester; Ph.D. University of Oregon
- Herzik, Eric (1986) *Assistant Professor of Public Affairs*
 B.A., University of California, Irvine; M.A., Ph.D., University of North Carolina
- Hestenes, David O. (1966) *Professor of Physics*
 B.A., Pacific Lutheran College; M.A., Ph.D., University of California, Los Angeles
- Hickman, David R. (1982) *Professor of Music*
 B.M., University of Colorado; M.M., Wichita State University
- Higgins, Norman C. (1968) *Professor of Educational Media and Computers*
 B.S., Central Missouri State College; M.S., Ph.D., Syracuse University
- Higgins, Walter T. Jr. (1967) *Professor of Engineering*
 B.E.E., Manhattan College; M.S., Ph.D., University of Arizona
- Hill, Bernard (1966) *Associate Professor Emeritus of Social Work*
 B.S.S., City College of New York; M.S.W., Tulane University
- Hill, Louis A. (1958) *Professor Emeritus of Engineering*
 B.A., B.S.C.E., M.S.C.E., Oklahoma State University; Ph.D., Case Western Reserve University
- Hines, Harold C. (1952) *Professor Emeritus of Music*
 B.S., M.S., University of Illinois
- Hink, Heinz R. (1958) *Professor of Political Science*
 LL.B., University of Berlin (Germany); M.A., Ph.D., University of Washington
- Hinks, Robert W. (1981) *Associate Professor of Engineering*
 B.Sc., University of Wales; M.S.E., M.A., Ph.D., Princeton University
- Hinrichs, Richard N. (1987) *Assistant Professor of Physical Education*
 A.B., Oberlin College; M.A. University of Iowa; Ph.D., Pennsylvania State University
- Hinshaw, Donald A. (1966) *Associate Professor Emeritus of Architecture*
 B.Arch., University of Notre Dame
- Hirata, Ernest T. (1974) *Associate Professor of Technology*
 B.A., San Diego State College; Ed.D., Arizona State University
- Hirleman, Edwin D. Jr. (1977) *Associate Professor of Engineering*
 B.S.M.E., M.S.M.E., Ph.D., Purdue University
- Hoffer, Warren W. (1972) *Associate Professor of Music*
 B.M., M.M., University of Wisconsin, Madison
- Hoffman, Dennis L. (1979) *Associate Professor of Economics*
 B.S., Grand Valley State Colleges; M.A., Ph.D., Michigan State University

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- Hoffman, Steven A. (1985) *Assistant Professor of Microbiology*
 B.A., Clark University, Mass.; M.A., Ph.D., University of Colorado
- Hoffmeister, J. Ronald (1983) *Associate Professor of Finance*
 B.S., Milliken University; M.S., Ph.D., University of Illinois
- Hogan, Timothy D. (1970) *Professor of Economics*
 A.B., University of California, Berkeley; M.A., University of California, Davis; Ph.D., Virginia Polytechnic Institute
- Holbrook, Amy K. (1975) *Associate Professor of Music*
 B.A., M.A., Mills College; Ph.D., University of Washington
- Holloway, John R. (1969) *Professor of Chemistry and Geology*
 B.S., University of Oregon; Ph.D., Pennsylvania State University
- Holmes, Jack E. (1972) *Professor Emeritus of Political Science*
 A.B., M.A., University of Wyoming; Ph.D., University of Chicago
- Hom, Peter W. (1984) *Associate Professor of Management*
 B.A., New York University; M.A., University of California, Berkeley; Ph.D., University of Illinois
- Homa, Donald L. (1975) *Professor of Psychology*
 B.S., University of Iowa; M.S., Ph.D., University of Wisconsin, Madison
- Hoover, Eric John (1977) *Professor of Music*
 B.S., Duquesne University; M.M., Catholic University of America
- Hoover, Helene M. (1957) *Professor of Family Resources and Human Development*
 B.S., M.S., Louisiana State University; Ed.D., Oklahoma State University
- Hoover, Kenneth H. (1956) *Professor Emeritus of Secondary Education*
 B.S., M.A., Louisiana State University; Ed.D., University of Washington
- Horan, John J. (1985) *Professor of Counseling Psychology; Program Coordinator, Counseling Psychology*
 A.B., M.A., University of Detroit; Ph.D., Michigan State University
- Horowitz, Renee (1986) *Associate Professor of Technology*
 B.A., Brooklyn College; M.A., Ph.D., University of Colorado
- Horwath, Peter (1973) *Professor of German; Chair, Department of Foreign Languages*
 Abitur, Realgymnasium Landshut; B.A., M.A., Indiana University; Ph.D., University of Michigan
- Hoult, Thomas Ford (1964) *Professor Emeritus of Sociology*
 A.B., University of Illinois; M.A., Whittier College; Ph.D., University of Southern California
- Houston, Robert A. (1985) *Instructor of Computer Science*
 B.A., University of Toledo; M.S., Bowling Green State University
- Houston, Sandra L. (1983) *Assistant Professor of Engineering*
 B.S., University of Oklahoma; M.S.C.E., University of New Mexico; Ph.D., University of California, Berkeley
- Houston, William N. (1984) *Professor of Engineering*
 Professional Degree in Geological Engineering, Colorado School of Mines;
 M.S.C.E., Ph.D., University of California, Berkeley
- Houzenga, Audrey I. (1986) *Instructor of Nursing*
 B.S.N., M.S.N., Arizona State University
- Howell, Kenneth W. (1975) *Professor of Special Education; Program Coordinator, Special Education*
 B.A., M.A., Arizona State University; Ph.D., University of Oregon
- Howells, Edmund G. (1960) *Assistant Professor of Philosophy*
 B.A., University of Utah; M.A., University of Michigan; M.A., Middlebury College; Ph.D., Stanford University
- Howery, Betty I. (1975) *Professor Emeritus of Music*
 B.S. in Ed., M.Mus. Ed., ED.S., University of Kansas
- Hoy, Frank P. (1978) *Associate Professor of Journalism and Telecommunication*
 B.A., George Washington University; M.A., American University
- Hoyt, Charles D. Jr. (1962) *Professor Emeritus of Engineering*
 B.S., M.S., Ph.D., Purdue University
- Hubbard, Paul G. (1950) *Professor of History; Assistant Vice President for Academic Affairs*
 A.B., Wabash College; M.A., Ph.D., University of Illinois

- Hubele, Norma J. (1984) *Assistant Professor of Engineering*
B.S., University of Massachusetts; M.S., Ph.D., Rensselaer Polytechnic Institute
- Hudson, John W. (1964) *Professor of Sociology*
B.S., M.A., Ph.D., Ohio State University
- Hudson, Walter W. (1986) *Professor of Social Work*
M.A., Ph.D., University of Chicago
- Huey, Ben M. (1979) *Associate Professor of Computer Science*
B.S., Harding College; M.S., Ph.D., University of Arizona
- Huff, Robert A. (1985) *Professor of Education*
B.A., University of Kansas; M.A., University of Missouri, Kansas City; Ed.D., University of Oregon
- Hughes, Robert G. (1986) *Assistant Professor of Health Administration and Policy*
B.A., Depauw University; M.A., Ohio State University; Ph.D., Johns Hopkins School of Hygiene and Public Health
- Hughston, George A. (1983) *Associate Professor of Family Resources and Human Development;*
B.S., M.S., Brigham Young University; Ph.D., Pennsylvania State University
- Huizingh, William (1959) *Professor Emeritus of Accountancy*
B.S.B.A., M.B.A., University of Denver; Ph.D., University of Michigan; C.P.A., Arizona and Colorado
- Hull, Kathleen (1986) *Instructor of Nursing*
B.S.N., University of Nevada; M.S., Ph.D., Texas Woman's University
- Humphrey, Ted (1966) *Professor of Philosophy; Director, The University Honors Program*
A.B., M.A., University of California, Riverside; Ph.D., University of California, San Diego
- Humphreys, Jere T. (1987) *Associate Professor of Music*
B.M., University of Mississippi; M.M., Florida State University; Ph.D., University of Michigan
- Hungate, Randall W. (1986) *Assistant Professor of Chemistry*
B.S., Northern Arizona University; Ph.D., University of California, Santa Barbara
- Hunnicut, Harold B. (1962) *Professor of Educational Administration and Supervision*
B.S., Ed.M., Ed.D., University of Oklahoma
- Hunter, Betty A. (1966) *Assistant Professor of Family Resources and Human Development*
B.S., M.Ed., University of North Carolina, Greensboro
- Huntington, Virginia R. (1962) *Associate Professor Emeritus of Accountancy*
B.A., M.B.A., University of Kansas; Ph.D., University of Texas; C.P.A., Missouri and Arizona
- Hurston, Clifford J. (1975) *Assistant Professor of General Business*
B.S., M.S., Tennessee State University; Ed.D., Arizona State University
- Hurtado, Albert L. (1986) *Assistant Professor of History*
M.A., California State University, Sacramento; Ph.D., University of California, Santa Barbara
- Huskey, Sybil (1979) *Associate Professor of Dance; Assistant Dean, Fine Arts*
B.F.A., M.F.A., University of Utah
- Huston, Gerald D. (1962) *Associate Professor of Decision and Information Systems*
B.S.C., M.A., Ph.D., University of Iowa
- Hutt, Michael D. (1982) *Associate Professor of Marketing*
B.B.A., M.B.A., Ohio University; Ph.D., Michigan State University
- Hutt, Roger W. (1975) *Associate Professor of General Business*
B.S., M.B.A., Ohio State University; Ph.D., Michigan State University
- Hrig, Edwin (1979) *Professor of Mathematics*
B.S., M.A., University of Maryland; Ph.D., University of Toronto
- Imdieke, LeRoy F. (1968) *Professor of Accountancy*
B.S., Valley City State College; M.A., University of North Dakota; Ph.D., University of Illinois; C.P.A., Illinois
- Inskip, Gordon C. (1968) *Professor Emeritus of Management*
B.Ch.E., Ohio State University; Ph.D., Columbia University
- Ismail, Mourad E. (1978) *Professor of Mathematics*
B.S., Cairo University; M.S., Ph.D., University of Alberta

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- Jacks, Mary L. (1955) *Associate Professor Emeritus of General Business*
 B.A., M.A., Arizona State University; C.P.S., Arizona
- Jackson, Donald W. Jr. (1972) *Professor of Marketing; Director, MBA for Executives Program*
 B.A., Albion College; M.B.A., Ph.D., Michigan State University
- Jackson, Marvin R. Jr. (1962) *Professor of Economics*
 B.S., M.A., University of Colorado; Ph.D., University of California, Berkeley
- Jacob, Richard J. (1963) *Professor of Physics; Chair, Department of Physics*
 B.S., Ph.D., University of Utah
- Jacobowitz, Ronald (1970) *Professor of Mathematics*
 B.A., City College of New York; M.S., University of Chicago; Ph.D., Princeton University
- Jacobs, Bertram L. (1985) *Assistant Professor of Microbiology*
 B.S., Rutgers University; Ph.D. University of California, Berkeley
- Jacobs, H. Donald (1972) *Associate Professor of Reading and Library Science*
 B.A.Ed., M.A.Ed., Central Washington State College; D.Ed., University of Oregon
- Jacobson, Arthur (1956) *Professor Emeritus of Art*
 B.S., M.S., University of Wisconsin, Madison
- Jacobson, Dean L. (1974) *Professor of Engineering*
 B.S., M.S., University of Notre Dame; Ph.D., University of California, Los Angeles
- Jain, Nemi C. (1976) *Professor of Communication*
 B.S., M.S., Agra University; Ph.D., Michigan State University
- Jakob, John H. (1960) *Associate Professor Emeritus of Architecture*
 B.Arch., Ohio State University; M.S.Arch., Columbia University
- Jankowski, Daniel F. (1964) *Professor of Engineering*
 B.S.E., M.S.E., Ph.D., University of Michigan
- Janssen, James G. (1968) *Associate Professor of English*
 B.A., M.A., Marquette University; Ph.D., University of Wisconsin, Madison
- Jay, Bill (1974) *Professor of Art*
 B.A. (Equiv.), Berkshire College of Art, England; M.A., M.F.A., University of New Mexico
- Jelinek, James J. (1953) *Professor Emeritus of Education*
 B.S., University of Illinois; M.A., Northwestern University; Ed.D., Indiana University
- Jenkins, William (1979) *Associate Professor of Art*
 B.A., St. Lawrence University; M.F.A., State University of New York, Buffalo
- Jennings, Marianne G. (1977) *Professor of General Business*
 B.S., J.D., Brigham Young University
- Jindal, Bal K. (1987) *Associate Professor of Engineering*
 B.S., Ranchi University; M.S., Ph.D., Stanford University
- Jo, Yung-Hwan (1966) *Professor of Political Science*
 B.A., Lincoln Memorial University; M.A., University of Tennessee, Knoxville; Ph.D., American University
- Jochnk, Michael D. (1983) *Professor of Finance*
 B.S., University of Arizona; M.B.A., Arizona State University; Ph.D., University of Arizona
- Johnson, Alan P. (1967) *Associate Professor of English*
 B.A., Amherst College; M.A., University of Michigan; Ph.D., University of Minnesota
- Johnson, Douglas A. (1974) *Professor of Accountancy*
 B.B.A., Ph.D., University of Texas; C.P.A., Texas
- Johnson, John M. (1972) *Professor of Justice Studies*
 B.A., Indiana University; M.A., San Diego State College; Ph.D., University of California, San Diego
- Johnson, Linda (1985) *Assistant Professor of Design*
 B.A., M.A., Iowa State University
- Johnson, Mary F. (1984) *Associate Professor of Art*
 B.A., Montana State University; M.F.A., University of Cincinnati

- Johnson, Rosemary (1959) *Professor Emeritus of Nursing*
B.S., M.P.H., University of Minnesota
- Johnson, Roy M. (1952-53; 1955) *Professor Emeritus of Microbiology*
A.B., M.S., University of Chicago; Ph.D., University of New Mexico
- Johnston, Carol S. (1986) *Assistant Professor of Family Resources and Human Development*
B.S., University of Michigan; M.A., Ph.D., University of Texas, Austin
- Johnston, Gladys S. (1986) *Professor of Educational Administration and Supervision;*
B.S., Cheyney State College; M.E.D., Temple University; Ph.D., Cornell University *Dean, College of Education*
- Jones, Austin E. (1968) *Professor of Psychology*
B.A., University of Illinois; M.S., Purdue University; Ph.D., University of Rochester
- Jones, Daisy M. (1963) *Professor Emeritus of Education*
B.S., M.S., Indiana State University; Ed.D., Indiana University
- Jones, Marion K. (1970) *Professor of Dance*
B.A., Wayne State University; M.A., Arizona State University
- Jones, Ruth (1969) *Professor of Political Science; Chair, Department of Political Science*
B.S., Indiana State University; M.A., Ph.D., Georgetown University
- Jordan, K. Forbis (1987) *Professor of Educational Administration and Supervision*
A.B., M.A., Western Kentucky State College; Ed.D., Indiana University
- Jorgensen, Paul (1986) *Assistant Professor of Computer Science*
B.A., North Central College; M.A., University of Illinois; Ph.D., 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 Agribusiness and Environmental Resources*
B.S., M.S., Utah State University; Ph.D., University of Nebraska, Lincoln
- Jurik, Nancy (1981) *Associate Professor of Justice Studies*
B.A., M.A., Southern Methodist University; Ph.D., University of California, Santa Barbara
- Justus, Jerry T. (1968) *Associate Professor of Zoology*
B.A., Franklin College; M.A., Ph.D., Indiana University
- Juvel, Richard S. Jr. (1970) *Professor of Chemistry*
B.S., Ph.D., University of California, Los Angeles
- Kadell, Kevin (1981) *Associate Professor of Mathematics*
B.A., California State University, Sacramento; M.A., University of Maryland; Ph.D., Pennsylvania State University
- Kader, David (1979) *Professor of Law*
B.A., California State University, Fresno; J.D., University of Washington; LL.M., University of London
- Kagy, Virginia L. (1947) *Professor Emeritus of Family Resources and Human Development*
B.A., Drake University; M.S., Iowa State University; Ph.D., Johns Hopkins University
- Kahn, B. Winston (1966) *Associate Professor of History*
B.A., National Taiwan University (Republic of China); M.A., University of Minnesota; Ph.D., University of Pennsylvania
- Kaida, Tamarra (1980) *Associate Professor of Art*
B.A., Goddard College; M.F.A., State University of New York, Buffalo
- Kajikawa, William M. (1937) *Associate Professor Emeritus of Physical Education*
B.A., M.A., Arizona State University
- Kale, Sudhir H. (1984) *Assistant Professor of Marketing*
B.S., University of Poona (India); M.M.S., Jammalal Bajaj Institute of Management Studies, Bombay;
Ph.D., University of Illinois
- Kamins, Martin P. (1970) *Associate Professor of Elementary Education*
B.Ed., University of Miami; M.S., Florida State University; Ed.D., Wayne State University
- Kaminsky, Elijah Ben-Zion (1962) *Professor of Political Science*
A.B., A.M., Ph.D., Harvard University

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- Kammer, Ann E. (1986) *Professor of Zoology; Chair, Department of Zoology*
B.S., State University of New York, College for Teachers, Albany; M.S., University of New Hampshire;
Ph.D., University of California, Berkeley
- Kaplan, Robert G. (1984) *Assistant Professor of Dance*
B.M.E., Hart College of Music
- Kaplan, Steve (1981) *Associate Professor of Accountancy*
B.S., Arizona State University; M.A.S., Ph.D., University of Illinois
- Karady, George (1986) *SRP Professor of Electrical and Computer Engineering*
Ph.D., Budapest University for Technical Sciences
- Karjala, Dennis S. (1978) *Professor of Law*
B.S.E., Princeton University; M.S., Ph.D., University of Illinois; J.D., University of California, Berkeley
- Karnes, Thomas L. (1968) *Professor Emeritus of History*
A.B., Colorado University; A.M., Ph.D., Stanford University
- Karnig, Albert K. (1978) *Professor of Public Affairs*
B.A., Augustana College; M.A., Ph.D., University of Illinois
- Karoly, Paul (1982) *Professor of Psychology; Director, Clinical Training*
B.A., City College of New York; Ph.D., University of Rochester
- Kastenbaum, Robert J. (1981) *Professor of Gerontology;*
A.A., East Los Angeles College; *Director, Adult Development and Aging Studies Program*
B.A., Long Beach State College; Ph.D., University of Southern California
- Katzman, Elaine Menter (1983) *Assistant Professor of Nursing*
R.N., B.S., M.S., Ph.D., Syracuse University
- Kaufman, Herbert M. (1973) *Professor of Economics*
B.A., State University of New York, Binghamton; Ph.D., Pennsylvania State University
- Kaufman, Irving (1965) *Professor of Engineering*
B.E., Vanderbilt University; M.S., Ph.D., University of Illinois, Urbana
- Kaufman, Lucile B. (1951) *Assistant Professor Emeritus of Engineering*
B.S.M.E., M.S., University of Colorado, P.E.
- Kaufmann, William B. (1968) *Professor of Physics*
A.B., M.A., Ph.D., University of California, Berkeley
- Kaye, David (1976) *Professor of Law*
B.S., Massachusetts Institute of Technology; M.A., Harvard University; J.D., Yale University
- Kazmier, Leonard J. (1965) *Professor of Decision and Information Systems*
B.A., M.A., Wayne State University; Ph.D., Ohio State University
- Kearfott, Kimberlee (1984) *Associate Professor of Engineering*
B.S., St. Mary's University; M.F.N.E., University of Virginia; Sc.D., Massachusetts Institute of Technology
- Kearney, James R. III (1968) *Associate Professor of History*
B.A., Pomona College; M.A., Washington University; Ph.D., University of Wisconsin, Madison
- Keating, Thomas (1972) *Assistant Professor of Political Science*
B.A., M.A., California State University, Sacramento; M.P.A., Ph.D., Indiana University
- Keats, J. Bert (1984) *Associate Professor of Engineering;*
B.S.I.E., Lehigh University; *Acting Chair, Department of Industrial and Management Systems Engineering*
M.S., Ph.D., Florida State University; Ph.D., Oklahoma State University
- Kehl, Delmar G. (1965) *Professor of English*
B.A., Bob Jones University; M.S., University of Wisconsin, Madison; Ph.D., University of Southern California
- Kehrer, Laura (1984) *Instructor of Nursing*
B.S.N., Alverno College; M.S., Arizona State University
- Keim, Robert T. (1979) *Associate Professor of Information Systems*
B.S., M.B.A., Ph.D., University of Pittsburgh
- Keith, Marlow F. (1946) *Assistant Professor Emeritus of Technology*
B.A. in Ed., M.A. in Ed., Arizona State University

- Keller, Gary D. (1986) *Professor of Spanish*
 B.A., University of the Americas, Mexico City; M.A., New School for Social Research;
 M.A., Ph.D., Columbia University, New York
- Keller, Thomas (1980) *Associate Professor of General Business*
 B.Ed., M.Ed., Ed. Spec., Ed.D., University of Toledo
- Kelley, Donald G. (1980) *Associate Professor of Technology; Chair, Department of Manufacturing Technology*
 B.S., M.S., Arizona State University
- Kelly, John B. (1962) *Professor of Mathematics*
 B.A., Columbia University; Ph.D., Massachusetts Institute of Technology
- Kelly, Richard W. (1965) *Professor of Engineering;*
 B.S.E., M.S.E., Ph.D., University of Iowa *Assistant Dean, College of Engineering and Applied Sciences*
- Kelly, Rita Mae (1982) *Professor of Justice Studies and Women's Studies*
 B.A., University of Minnesota; M.A., Ph.D., Indiana University
- Kelly, Rob Roy (1983) *Professor of Art*
 B.F.A., Minneapolis School of Art; M.F.A., Yale University
- Kennedy, Thomas D. (1974) *Professor of Justice Studies*
 B.A., Tulane University; M.A., Ph.D., Louisiana State University
- Kenney, Patrick J. (1986) *Assistant Professor of Political Science*
 M.A., P.A., Ph.D., University of Iowa
- Kenrick, Douglas T. (1980) *Associate Professor of Psychology*
 B.A., Dowling College; M.A., Ph.D., Arizona State University
- Kerr, Nancy J. (1968) *Professor of Education*
 B.S., University of Illinois; M.A., Ph.D., University of Houston
- Kettner, Peter M. (1979) *Professor of Social Work; Associate Dean, School of Social Work*
 B.A., Valparaiso University; M.S.W., George Warren Brown School of Social Work, Washington University;
 D.S.W., University of Southern California
- Kevane, Clement J. (1956) *Professor Emeritus of Physics*
 B.S., Ph.D., Iowa State University
- Kiesow, Milton A. (1957) *Professor Emeritus of Education*
 B.S., University of Wisconsin; M.A., Ph.D., University of Nebraska, Lincoln
- Kigin, Denis J. (1958-65; 1967) *Professor Emeritus of Technology*
 B.S., Mankato State University; M.S., University of Wisconsin, Stout; Ed.D., University of Missouri, Columbia
- Kilian, Christopher (1987) *Assistant Professor of Technology*
 B.S., M.S., University of California, Los Angeles
- Killeen, Mary (1982-85; 1986) *Assistant Professor of Nursing*
 B.S.N., M.S., Arizona State University; Ph.D., University of Texas, Austin
- Killeen, Peter R. (1968) *Professor of Psychology*
 B.S., Michigan State University; Ph.D., Harvard University
- Kim, Joochul (1980) *Associate Professor of Planning*
 B.A., University of California, Berkeley; M.U.P., Ph.D., University of Michigan
- Kimler, Stephen J. (1967) *Associate Professor Emeritus of Education*
 B.Ed., Milwaukee State Teachers College; M.Ed., Marquette University; Ed.D., Arizona State University
- Kingsbury, Warren T. (1964) *Professor Emeritus of Education*
 A.B., Central College, Fayette, Missouri; A.M., University of Missouri; Ed.D., New York University
- Kingston, Jerry L. (1969) *Professor of Economics*
 B.A.E., Wayne State University; M.S., Colorado State University; Ph.D., Pennsylvania State University
- Kinicki, Angelo J. (1982) *Assistant Professor of Management*
 B.B.A., M.B.A., D.B.A., Kent State University
- Kinnier, Richard (1982) *Assistant Professor of Counseling Psychology*
 B.A., Boston College; Ed.M., Teachers College, Columbia University; Ph.D., Stanford University
- Kintigh, Keith W. (1987) *Associate Professor of Anthropology*
 A.B., M.S., Stafford University; Ph.D., University of Michigan

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- Kirkman-Liff, Bradford L. (1981) *Associate Professor of Health Administration and Policy*
B.S., M.S., Carnegie-Mellon University; D.P.H., University of North Carolina, Chapel Hill
- Kirkpatrick, Samuel A. (1984) *Professor of Political Science; Dean, College of Liberal Arts and Sciences*
B.S., Shippensburg State College; M.A., Ph.D., Pennsylvania State University
- Kirkwood, Craig W. (1983) *Professor of Management Science;*
S.B., S.M., E.E., Ph.D., *Chair, Department of Decision and Information Systems*
Massachusetts Institute of Technology
- Kisielewski, Robert V. (1978) *Associate Professor of Technology*
B.S.M.E., M.S.M.E., University of Wisconsin, Madison
- Klann, Margaret L. (1945) *Associate Professor Emeritus of Physical Education*
B.S., University of Illinois; M.A., University of Northern Colorado
- Kleine, Robert E. III (1988) *Assistant Professor of Marketing*
B.S., University of New Hampshire
- Kleinfeld, Gerald R. (1962) *Professor of History*
B.A., New York University; M.A., University of Michigan; Ph.D., New York University
- Kliwer, Darleen (1975) *Professor of Music*
B.M.E., Bethany College; M.M., Wichita State University
- Klock, John W. (1960) *Professor of Engineering*
B.E., University of Southern California; M.S., Ph.D., University of California, Berkeley
- Klopatek, Jeffrey M. (1981) *Associate Professor of Botany*
B.S., M.S., University of Wisconsin, Milwaukee; Ph.D., University of Oklahoma
- Knaupp, Jonathan E. (1970) *Associate Professor of Elementary Education*
B.S., Oregon State University; M.A., Ph.D., University of Illinois
- Knauth, L. Paul (1979) *Professor of Geology*
B.A., University of Chicago; Ph.D., California Institute of Technology
- Kneer, Dan C. (1981) *Associate Professor of Accountancy*
B.S., University of Evansville; M.A., Ph.D., University of Missouri, Columbia; C.P.A., California, Missouri
- Knight, Donald O. (1981) *Associate Professor of Engineering*
B.F.E., Marquette University; M.S.E., Ph.D., Arizona State University
- Knight, Leland W. (1978) *Associate Professor of Design*
B.P.A., Art Center College of Design; M.F.A., Stanford University
- Knowlton, John F. (1964) *Associate Professor of Spanish*
B.A., Lewis and Clark College; M.A., Ph.D., University of Oregon
- Knox, Robert L. (1963) *Professor of Economics*
B.S., M.S., Oklahoma State University; Ph.D., University of North Carolina
- Knudsen, Frances S. (1964) *Associate Professor of Nursing*
B.S., University of Arizona; M.S., University of Colorado; Ph.D., Arizona State University
- Knupfer, Nancy N. (1987) *Assistant Professor of Educational Media and Computers*
B.S., University of Wisconsin, LaCrosse; M.A., Ph.D., University of Wisconsin, Madison
- Kobes, Bernard W. (1986) *Assistant Professor of Philosophy*
B.A., Calvin College; M.A., Ph.D., University of California, Los Angeles
- Kommenich, Pauline (1984) *Associate Professor of Nursing; Associate Dean, Research, College of Nursing*
B.S., Stanford University; M.N., University of Washington; M.A., Ph.D., University of Arizona
- Koonce, Frank W. (1978) *Associate Professor of Music*
B.M., North Carolina School of the Arts; M.M., Southern Methodist University
- Kouris, Demitris A. (1987) *Assistant Professor of Engineering*
Diploma in Civil Engineering, National Technical University of Athens; M.S., Illinois Institute of Technology;
Ph.D., Northwestern University
- Kozacki, Dorothy Piercey (1968) *Professor Emeritus of Education*
B.A., College of St. Francis; M.A., Arizona State University; Ph.D., University of Arizona
- Kozicki, Michael (1986) *Assistant Professor of Engineering*
B.S., Ph.D., University of Edinburgh

- Kraft, John** (1986) *Professor of Finance; Dean, College of Business*
B.S., St. Bonaventure University; M.A., Ph.D., University of Pittsburgh
- Krahenbuhl, Gary S.** (1973) *Professor of Physical Education;*
B.S., M.S., Northern Illinois University; *Associate Dean, College of Liberal Arts and Sciences*
Ed.D., University of Northern Colorado
- Krause, Stephen J.** (1981) *Associate Professor of Engineering*
B.S., Northwestern University; M.S., Illinois Institute of Technology; Ph.D., University of Michigan
- Kreamer, David** (1986) *Assistant Professor of Engineering*
B.S., M.S., Ph.D., University of Arizona
- Kreitner, Robert J., III** (1975) *Professor of Management*
B.S., M.B.A., University of Nebraska, Omaha; Ph.D., University of Nebraska, Lincoln
- Krinsley, David** (1976) *Professor of Geology*
Ph.B., S.B., S.M., Ph.D., University of Chicago
- Kroelinger, Michael D.** (1980) *Associate Professor of Design*
B.S., University of Alabama; M.S., Ph.D., University of Tennessee
- Kronengold, Eric A.** (1970) *Associate Professor of Art*
B.A., M.A., San Francisco State University
- Krueger, Janelle** (1984) *Professor of Nursing; Dean, College of Nursing*
Diploma, St. Luke's Hospital, Cleveland, Ohio; B.S., M.S., Ph.D., University of Colorado
- Krus, David J.** (1975) *Professor of Education*
B.A., M.A., Charles University; Ph.D., University of Minnesota
- Kruse, Diane** (1984) *Instructor of Nursing*
B.S.N., M.S., Arizona State University
- Kuester, James L.** (1969) *Professor of Engineering*
B.S., University of Texas, Austin; M.E., Ph.D., Texas A&M University
- Kuiper, Hendrik J.** (1971) *Associate Professor of Mathematics*
B.S., University of Wisconsin, Milwaukee; M.S. (Physics), M.A. (Math), Ph.D., University of Wisconsin, Madison
- Kulhavy, Raymond W.** (1971) *Professor of Education*
A.B., M.A., California State College, San Diego; Ph.D., University of Illinois
- Kulis, Stephen** (1984) *Assistant Professor of Sociology*
B.A., George Washington University; M.A., Ph.D., Columbia University
- Kuo, Chen-Yuan** (1986) *Assistant Professor of Engineering*
B.S., National Taiwan University (Republic of China); M.S., Northwestern University;
Ph.D., University of California, Berkeley
- Kurtz, Lynn C.** (1967) *Associate Professor of Mathematics*
B.S., South Dakota School of Mines and Technology; M.S., Ph.D., University of Utah
- Kyrala, Ali** (1960-62; 1964) *Professor of Physics*
B.S., Massachusetts Institute of Technology; M.S., Stanford University; S.M., Harvard University;
D.S., Technische Hochschule Wien (Austria)
- Laananen, David** (1983) *Associate Professor of Engineering*
B.S., Worcester Polytechnic Institute; M.S., Ph.D., Northeastern University
- Ladman, Jerry R.** (1967) *Professor of Economics*
B.S., Ph.D., Iowa State University
- Laetz, Hans G.** (1964) *Assistant Professor of German*
A.B., University of California, Berkeley; A.M., Ph.D., Stanford University
- Lafford, Barbara** (1980) *Assistant Professor of Spanish*
B.A., Middlebury College, Vermont; M.A., Ph.D., Cornell University
- Lai, Richard T.** (1973) *Associate Professor of Planning; Acting Chair, Department of Planning*
A.B., M.F.A. in Arch., Princeton University; Ph.D., University of Pennsylvania
- Lake, Robert L.** (1958) *Assistant Professor Emeritus of Mathematics*
B.S., South Dakota School of Mines and Technology; M.A., Arizona State University

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- Lamberts, Jacob J. (1960) *Professor Emeritus of English*
 B.A., Calvin College; M.A., Ph.D., University of Michigan
- Lamerand, Richard K. (1987) *Assistant Professor of Technology*
 B.S.M.E., Michigan Technological University; M.S.M.E., University of Houston
- Lamm, Robert C. (1959) *Professor Emeritus of Humanities Education and Music*
 B.M., University of Louisville; M.M., University of Arizona; Ph.D., Indiana University
- Landeira, Ricardo L. (1962) *Professor Emeritus of Spanish*
 Bachiller Universitario, Universidad de Santiago (Spain); Maestro Nacional, Escuela Normal de Santiago (Spain);
 Ph.D., University of Colorado
- Landeros, Robert (1987) *Assistant Professor of Purchasing*
 B.S., Pepperdine University; M.B.A., Michigan State University
- Landers, Daniel M. (1981) *Professor of Physical Education*
 B.A., San Jose State College; M.S., Ph.D., University of Illinois
- Landers, E. James (1960) *Professor Emeritus of Zoology*
 B.A., M.S., University of Wyoming; Ph.D., New York University
- Laner, Mary R. (1976) *Associate Professor of Sociology*
 B.A., University of Chicago; M.A., University of New Mexico; Ph.D., Virginia Polytechnic Institute and State University
- Lanyon, Richard I. (1975) *Professor of Psychology*
 B.E., University of Adelaide (Australia); M.A., Ph.D., University of Iowa
- Lape, Jerry V., Lieutenant Colonel (1981) *Assistant Professor Emeritus of Military Science*
 B.S., U.S. Military Academy
- LaPointe, Leonard L. (1984) *Professor of Speech and Hearing Science;*
 B.A., Michigan State University; *Chair, Department of Speech and Hearing Science*
 M.A., Ph.D., University of Colorado
- Larimer, John W. (1969) *Professor of Geology*
 B.A., M.S., Ph.D., Lehigh University
- Larish, Douglas D. (1985) *Assistant Professor of Physical Education*
 B.S., State University of New York, Brockport; M.S., Ph.D., University of Wisconsin, Madison
- Larson, George W. (1972) *Clinical Professor of Planning*
 B.S.L.A., Utah State University; M.S.L.A., University of Wisconsin
- Larson, Kent A., Captain (1986) *Assistant Professor of Military Science*
 B.S.F.S., Georgetown University
- Lauderdale, Pat (1981) *Professor of Justice Studies*
 B.A., University of Oklahoma; M.A., University of Texas; M.A., Ph.D., Stanford University
- Lawler, Eugene D. (1967) *Associate Professor of Technology*
 B.S., Northern State College, South Dakota; M.A., Arizona State University
- Lawson, Anton E. (1977) *Professor of Zoology*
 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
- Lechler, George P., III, Captain (1986) *Assistant Professor of Military Science*
 B.S.C., University of Tampa; M.A., Central Michigan University
- LeCroy, Craig (1984) *Assistant Professor of Social Work*
 B.S.W., San Jose State University; M.S.W., Western Michigan University; Ph.D., University of Wisconsin, Madison
- Lee, Idelle B. (1962) *Assistant Professor Emeritus of Education*
 B.A., University of Wisconsin; M.A., Arizona State University
- Lehrer, Leonard (1977) *Professor of Art; Director, School of Art*
 B.F.A., Philadelphia College of Art; M.F.A., University of Pennsylvania
- Leigh, Frederic A. (1979) *Assistant Professor of Journalism and Telecommunication*
 B.A., University of South Dakota; M.A., University of Iowa
- Lentz, Richard G. (1985) *Associate Professor of Journalism and Telecommunication*
 A.B., University of North Alabama, Florence; M.A., Southern Illinois University, Carbondale; Ph.D., University of Iowa

- Leonard, Donald J. (1974) *Associate Professor of General Business*
B.S., M.B.A., Nicholls State University; Ph.D., Louisiana State University
- 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*
B.S., M.A., Brooklyn College; Ph.D., City University of New York
- 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 College; M.A., Ph.D., Texas Woman's University
- Levan, Frederick D. (1965) *Associate Professor of Educational Administration and Supervision*
B.S., M.Ed., Pennsylvania State University; Ed.D., Oklahoma State University
- Levine, Gustav (1967) *Associate Professor of Psychology*
B.A., M.A., College of the City of New York; Ph.D., Columbia University
- Lewis, Joseph Perley (1972) *Assistant Professor Emeritus of General Business*
B.A., University of Arizona; J.D., University of Colorado
- Lewis, Ronald G. (1981) *Professor of Social Work*
B.A., Oklahoma Baptist University; M.S.W., Our Lady of the Lake-Worden, San Antonio; Ph.D., University of Denver
- Lewis, William E. (1965) *Professor of Computer Science*
B.S.E., Johns Hopkins University; *Assistant Dean, College of Engineering and Applied Sciences*
M.S., Ph.D., Northwestern University
- Leyba, Raul L. (1970) *Associate Professor of Social Work*
B.A., New Mexico Western University; M.S.W., University of Denver
- Lie, Gwat-Yong (1985) *Assistant Professor of Social Work*
B.S.Sc., University of Singapore; M.S.W., University of Wisconsin, Milwaukee; Ph.D., University of Wisconsin, Madison
- Lightfoot, Marjorie J. (1964) *Professor of English*
B.A., Brown University; M.A., Ph.D., Northwestern University
- Lin, Sheng H. (1965) *Professor of Chemistry*
B.S., M.S., National Taiwan University (Republic of China); Ph.D., University of Utah
- Linder, Darwyn E. (1972) *Professor of Psychology*
B.A., Macalester College; Ph.D., University of Minnesota
- Linderman, Earl W. (1966) *Professor of Art*
B.S., New York State College for Teachers, Buffalo; M.Ed., Ed.D., Pennsylvania State University
- Lindholm, Ernest (1971) *Associate Professor of Psychology*
B.A., University of California, Berkeley; M.S., Ph.D., University of Wisconsin, Madison
- Lindquist, Timothy (1985) *Associate Professor of Computer Science*
B.S., Purdue University; M.S., Ph.D., Iowa State University
- Lindsay, Stuart M. (1978) *Associate Professor of Physics*
B.Sc., Ph.D., University of Manchester, England
- Lindstrom, Frederick B. (1953) *Professor Emeritus of Sociology; Consultant, 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 Emeritus of Technology*
A.B., Peru State Teachers College, Nebraska; M.A., University of Minnesota; Ed.D., University of Missouri, Columbia
- Liu, C. H. (1965) *Professor of Chemistry*
B.A., Ph.D., University of Illinois
- Liu, Danny D. (1982) *Associate Professor of Engineering*
B.S., National Taiwan University; M.S., Georgia Institute of Technology; Ph.D., University of Southampton
- Liu, Marjory Bong-Ray (1973) *Associate Professor of Philosophy*
B.M., Alverno College; M.M., University of Southern California; C. Phil., Ph.D., University of California, Los Angeles

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- Lock, Ethan (1981) *Associate Professor of General Business*
 B.A., University of California, Berkeley; M.B.A., Arizona State University; J.D., University of North Carolina, Chapel Hill
- Lockwood, Ralph G. (1972) *Professor of Music*
 B.M., Baldwin Wallace College; M.M., New England Conservatory of Music
- Logan, Earl Jr. (1963) *Professor of Engineering*
 B.S., M.S., Texas A&M University; B.A., Arizona State University; Ph.D., Purdue University
- Lohr, Dennis E. (1979) *Associate Professor of Chemistry*
 B.S., Beloit College; Ph.D., University of North Carolina
- Lombardi, Eugene P. (1957) *Professor of Music*
 B.Mus. Ed., Westminster College; M.A., Columbia University; Ed.S., George Peabody College; D.M., Westminster College
- Lonse, Deborah N. (1973) *Associate Professor of French*
 B.A., Connecticut College; M.A., Ph.D., University of North Carolina, Chapel Hill
- Lounsbury, John F. (1969) *Professor Emeritus of Geography*
 B.S., M.S., University of Illinois; Ph.D., Northwestern University
- Low, Stuart A. (1979) *Associate Professor of Economics*
 B.S., M.S., Ph.D., University of Illinois
- Lowe, John W. (1956) *Associate Professor Emeritus of Economics*
 B.S., Arizona State University; M.S., University of Wisconsin, Madison; Ph.D., University of Florida
- Lowe, Rebecca I. (1987) *Assistant Professor of Agribusiness and Environmental Resources*
 B.S., Oklahoma State University; M.S., New Mexico State University
- Lowe, Robert W. (1966) *Professor Emeritus of Romance Languages*
 M.A., Columbia University; Doctoral, University of Paris
- Lorenzthal, Gary T. (1976) *Professor of Law*
 A.B., Harvard College; J.D., University of Chicago
- Lu, Pao (1964) *Professor of Physics*
 B.S., National Taiwan University (Republic of China); M.S., National Tsing Hua University (Republic of China); Ph.D., Iowa State University
- Luchinger, Wayne W. (1966) *Professor Emeritus of Chemistry*
 B.S., M.S., Ph.D., University of Minnesota
- Luckingham, Bradford F. (1971) *Professor of History*
 B.S., Northern Arizona University; M.A., University of Missouri, Columbia; Ph.D., University of California, Davis
- Ludemann, Ruth (1984) *Professor of Nursing; Associate Dean, Academic Programs, College of Nursing*
 R.N., Biogen Memorial Hospital, Grand Rapids, Michigan; B.S.N., Teachers College, Columbia University; M.S.N., Wayne State University; Ph.D., Arizona State University
- Ludlow, Elizabeth A. (1972) *Assistant Professor of Nursing*
 B.S.N., University of New Mexico; M.S., Arizona State University
- Ludwig, Ann (1979) *Professor of Dance*
 B.S., North Dakota State University; M.S., University of Kansas
- Lutenow, Paul F. Jr. (1958) *Professor Emeritus of Spanish*
 B.A., M.A., University of Washington; Ph.D., University of New Mexico
- Luján, Carol C. (1987) *Assistant Professor of Justice Studies*
 B.A. (Sociology and Psychology), M.A.P.A., Ph.D., University of New Mexico
- Lundberg, Florence W. (1962) *Professor Emeritus of Social Work*
 B.S., M.S., University of Utah; M.S.W., University of California, Berkeley; Ph.D., University of Minnesota
- Lundgren, Harry R. (1962) *Professor of Engineering*
 B.S.C.E., Purdue University; M.S., Arizona State University; Ph.D., Oklahoma State University
- Lundin, Robert F. (1962) *Professor of Geology*
 B.A., Augustana College; M.S., Ph.D., University of Illinois
- Lyle, Mary G. (1959) *Assistant Professor Emeritus of English*
 B.A., University of Iowa; M.A., University of South Dakota
- Lynch, David H. (1976) *Associate Professor of General Business*
 A.A., *Theoretical Junior College*; B.S., University of Illinois; M.S., Ed.D., Northern Illinois University

- Lynch, Madonna (1987) *Instructor of Nursing*
B.S.N., M.S.N., University of Illinois
- Lytle, Robert G. (1972) *Associate Professor Emeritus of Agribusiness and Environmental Resources*
B.S., Western Kentucky University; M.S., Arizona State University
- Maarsingh, Norma J. (1964) *Associate Professor Emeritus of Physical Education*
B.S., M.S., University of Southern California
- MacEachron, Ann (1984) *Professor of Social Work*
B.A., Cornell University; M.S.W., University of Pittsburgh; Ph.D., Cornell 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) *Associate Professor of Engineering*
B.S.I.E., M.S.I.E., Ph.D., Purdue University
- Maddy, Kenneth H. (1980) *Associate Professor of Agribusiness and Environmental Resources*
B.S., Pennsylvania State University; M.S., University of Wisconsin, Madison; Ph.D., Pennsylvania State University
- Magel, Donald (1978) *Associate Professor of Social Work; Director, BSW Program*
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., University of California, Santa Barbara; M.M., D.M.A., University of Southern California
- Maienschein, Jane (1981) *Associate Professor of Philosophy*
B.A., Yale; M.A., Ph.D., Indiana University
- Maisel, James (1985) *Professor of Technology*
B.Eng.Sci., B.E.E., Fenn College; M.S.E.E., Ohio State University
- Malin, Michael C. (1979) *Professor of Geology*
A.B., University of California, Berkeley; Ph.D., California Institute of Technology
- Malone, Charles F. (1966) *Professor of Elementary Education*
B.S., Emporia State University, Kansas; M.Ed., Ed.D., University of Kansas
- Mamlouk, Michael S. (1984) *Associate Professor of Engineering*
B.S.C.E., Cairo University, Egypt; M.S.C.E., Ph.D., Purdue University
- Manera, Elizabeth S. (1967) *Associate Professor of Secondary Education*
B.S., M.A., Towson State College; Ed.D., Arizona State University
- Mankin, Lawrence D. (1973) *Associate Professor of Public Affairs; Assistant to the President for Administration*
B.B.A., City College of New York; M.A., Ph.D., University of Illinois
- Manore, Melinda M. (1984) *Assistant Professor of Family Resources and Human Development*
B.S., Seattle Pacific University; M.S., University of Oregon; Ph.D., Oregon State University
- Manukutla, Lakshmi V. (1987) *Associate Professor of Engineering*
M.S., Andhra University (India); Ph.D., Ohio University
- Maracas, George N. (1984) *Associate Professor of Engineering*
B.A., New York University; M.E., Ph.D., Cornell University
- Marcus, Melvin G. (1974) *Professor of Geography*
B.A., University of Miami, Coral Gables; M.A., University of Colorado; Ph.D., University of Chicago
- Marine, Susan S. (1988) *Assistant Professor of Marketing*
B.A., Wittenberg University; M.B.A., Miami University
- Marion, Sheila (1981) *Associate Professor of Dance*
B.A., M.A., University of California, Los Angeles
- Marohnic, Charles S. (1981) *Associate Professor of Music; Director, Jazz Studies*
B.A., M.M., University of Miami, Florida
- Marsh, Paul C. (1980) *Associate Professor, Center for Environmental Studies;*
Adjunct Associate Professor of Zoology
B.A., M.S., University of Connecticut; Ph.D., University of Minnesota

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- Martin, John F. Jr. (1966) *Associate Professor of Anthropology*
 B.A., Beloit College; M.A., Ph.D., University of Chicago
- Martin, Linda J. (1980) *Associate Professor of Finance*
 B.A., University of Louisville; M.S., University of Kansas; M.B.A., D.B.A., Louisiana Technological University
- Martin, Philip E. (1983) *Assistant Professor of Physical Education*
 B.S., M.S., University of Illinois, Urbana; Ph.D., Pennsylvania State University
- Martin, Richard (1975) *Associate Professor of Religious Studies; Chair, Department 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; Ph.D., University of Illinois
- Martinez, Quino E. (1957) *Professor Emeritus 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*
 B.A., M.S., J.D., University of Utah
- Matson, John H. (1978) *Associate 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
- May, Judy (1986) *Assistant Professor of Music*
 M.M., The Juilliard School
- Mayer, Albert J. (1968) *Professor of Sociology*
 A.B., A.M., Ph.D., University of Chicago
- Mayer, Lawrence S. (1983) *Professor of Statistics*
 B.S., M.S., Ph.D., Ohio State University
- Mayer, Michael (1978) *Associate Professor of Communication*
 B.A., M.A., University of Wyoming; Ph.D., University of Kansas
- Mazen, S. David (1970) *Associate Professor of Counseling*
 B.A., Whitworth College; M.Ed., Eastern Washington State College; Ed.D., Washington State University
- McBrien, Edward F. (1986) *Associate Professor of Technology*
 B.S.E., Fenn College; M.S.E.E., Cleveland State University
- McCarter, Joan H. (1961) *Assistant Professor of Mathematics*
 B.S., M.A., University of Arizona
- McClain, Paula D. (1982) *Associate Professor of Public Affairs*
 B.A., M.A., Ph.D., Howard University
- McClure, Jesse F. (1983) *Professor of Social Work; Dean, School of Social Work*
 A.B., M.S.W., University of Michigan; Ph.D., Brandeis University
- McCoy, Kathleen M. (1976) *Associate Professor of Special Education*
 B.S., University of Portland; M.S., Portland State University; Ph.D., University of Oregon
- McCready, Richard R. (1960) *Professor Emeritus of Decision and Information Systems*
 B.S., Valley City State Teachers College; M.A., Ed.D., University of Northern Colorado
- McDonald, John N. (1969) *Professor of Mathematics*
 A.B., Kings College; M.S., Ph.D., Rutgers, The State University

- McDowell, John M. (1978) *Associate Professor of Economics*
 B.A., M.A., Ph.D., University of California, Los Angeles
- McEwen, Douglas R. (1969) *Professor of Music; Director, Choirs*
 B.S., Bowling Green State University; M.M., Indiana University; Ed.D., University of Northern Colorado
- McFarland, Elaine H. (1973) *Associate Professor Emeritus of Health Science*
 B.A., Marietta College; M.N., Case Western Reserve University
- McGaughey, Robert W. (1971) *Professor of Zoology*
 B.A., Augustana College; M.A., University of Colorado; Ph.D., Boston University
- McGaw, Dickinson L. (1968) *Associate Professor of Political Science*
 A.B., A.M., Ph.D., Indiana University
- McGinty, Tim (1983) *Associate Professor of Architecture;*
Assistant Dean, College of Architecture and Environmental Design
 B.Arch., University of Kansas; M.Arch., University of Pennsylvania
- McGowan, Patrick J. (1979) *Professor of Political Science*
 B.A., University of the South; M.A., Johns Hopkins University; Ph.D., Northwestern University
- McGrath, G.D. (1950) *Professor Emeritus of Education*
 A.B., Findlay College; M.A., University of Michigan; Ph.D., University of Colorado
- McHenry, Albert L. (1978) *Professor of Technology;*
Chair, Department of Electronics and Computer Technology
 B.S., Southern University; M.S., Ph.D., Arizona State University
- McHugh, Kevin E. (1985) *Assistant Professor of Geography*
 B.S., Pennsylvania State University; M.A., Arizona State University; Ph.D., University of Illinois, Urbana-Champaign
- McIntosh, Patricia G. (1983) *Assistant Professor of Architecture*
 B.Arch., University of British Columbia; Arch.D., University of Michigan
- McIsaac, Marina Stock (1980) *Associate Professor of Educational Media and Computers*
and Reading and Library Science
 B.A., Pomona College; M.A., Ph.D., University of Wisconsin, Madison
- McKenzie, Patrick Bruce (1970) *Professor of Accountancy*
 B.S., M.S., Kansas State University; Ph.D., Michigan State University; C.P.A., Kansas
- McKlveen, John W. (1974) *Professor of Engineering*
 B.S., United States Naval Academy; M.E.N.E., Ph.D., University of Virginia
- McLeod, Lois L. (1976) *Professor of Music*
 A.A., Stephens College
- McMillan, Paul F. (1983) *Assistant Professor of Chemistry*
 B.Sc., University of Edinburgh, Scotland; Ph.D., Arizona State University
- McMurtry, Steven (1987) *Assistant Professor of Social Work*
 B.A., Texas Tech University; M.S.S.W., University of Texas, Arlington; Ph.D., University of Wisconsin, Madison
- McNeill, Barry W. (1976) *Assistant Professor of Engineering*
 B.S., M.S., Ph.D., Stanford University
- McPheters, Lee R. (1976) *Professor of Economics*
 A.B., San Francisco State University; Ph.D., Virginia Polytechnic Institute
- McSheffrey, Gerald R. (1982) *Professor of Architecture*
 Dipl. Arch., University College, London; Dipl. C.D., Edinburgh University
- McTaggart, W. Donald (1971) *Professor of Geography*
 B.A., M.A., University of St. Andrews (Scotland); Ph.D., Australian National University
- McWhirter, J. Jeffries (1970) *Professor of Counseling Psychology*
 B.A., St. Martin's College; M.Ed., Oregon State University; M.Ed., Ph.D., University of Oregon
- Meissinger, Ellen Murray (1986) *Professor of Art*
 B.F.A., M.F.A., University of North Carolina, Greensboro
- Meister, Arnold G. (1957) *Professor Emeritus of Physics*
 B.S., Central YMCA College; Ph.D., Illinois Institute of Technology
- Melicher, Dudley W. (1974) *Assistant Professor of Justice Studies; Assistant Dean, Student Services,*
College of Public Programs
 B.S., M.S. in Ed., South Dakota State University; Ed.D., Arizona State University

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- Mellon, Terry F. (1984) *Assistant Professor of Computer Science*
 B.S., University of Polytechnic; Ph.D., University of California, Irvine
- Melvin, Michael (1980) *Associate Professor of Economics*
 B.B.A., University of Houston; M.A., San Diego State University; Ph.D., University of California, Los Angeles
- Melvin, Nancy (1975) *Assistant Professor of Nursing*
 B.S., M.A., University of Nebraska; Ph.D., University of Arizona
- Mendez, Jose A. (1980) *Associate Professor of Economics*
 B.A., M.A., University of Texas, Austin; M.A., Ph.D., Southern Methodist University
- Menéndez, José (1987) *Assistant Professor of Physics*
 Licenciado en Física, Instituto, Balseiro; Ph.D., Stuttgart University (West Germany)
- Menke, Robert F. (1947) *Professor Emeritus of Education*
 B.S., Oshkosh State College; M.A. in Ed., Ph.D., Northwestern University
- Merbs, Charles F. (1973) *Professor of Anthropology*
 B.S., M.S., Ph.D., University of Wisconsin, Madison
- Merrill, Bruce D. (1971) *Associate Professor of Communication; Director, Public Opinion Research Program*
 B.A., Southern Oregon College; M.A., Brigham Young University; Ph.D., University of Michigan
- Metcalf, V. Alonzo (1971) *Professor of Agribusiness and Environmental Resources*
 B.S., M.S., University of Arkansas; Ph.D., University of Missouri, Columbia
- Metha, Arlene (1973) *Associate Professor of Counseling Psychology*
 B.A., Arizona State University; M.A., Ohio State University; Ph.D., University of Southern California
- Metos, Thomas H. (1965) *Professor of Educational Administration and Supervision;*
Program Coordinator, Educational Administration and Supervision
 B.S., M.S., Ph.D., University of Utah
- Metz, John (1980) *Associate Professor of Music*
 B.A., M.M., Syracuse University; D.M.A., The Juilliard School
- Metzger, Darryl E. (1963) *Professor of Engineering*
 B.S.M.E., M.S.M.E., Ph.D., Stanford University
- Meunier, John (1987) *Professor of Architecture; Dean, College of Architecture and Environmental Design*
 B.Arch., University of Liverpool (England); M.Arch., Harvard University; M.Arts, Cambridge University
- Meyer, Janice Catherine (1977) *Associate Professor of Music*
 B.M.E., M.M.E., University of Wisconsin; M.M., Western Michigan; D.M., Northwestern University
- Meyers, Sandra K. (1987) *Instructor of Nursing*
 B.S.N., University of Arizona; M.S.N., Arizona State University
- Meyerson, Lee (1962) *Professor of Psychology*
 A.B., Lafayette College; A.M., University of California, Los Angeles; Ph.D., Stanford University
- Michels, LeMoyné F. (1963) *Professor Emeritus of Construction*
 B.S., U.S. Military Academy
- Mignolet, Marc P. (1987) *Assistant Professor of Engineering*
 Ph.D., Rice University
- Miller, Barbara K. (1976) *Associate Professor of Nursing*
 B.S.N., M.S.Ed., University of Akron; Ph.D., University of Texas, Austin
- Miller, Donald S. (1981) *Associate Professor of Computer Science*
 B.S., Syracuse University; M.S., Ph.D., University of Southern California
- Miller, Karen A. (1984) *Associate Professor of Sociology; Director, Sociology Survey Research Laboratory*
 B.A., University of California, Berkeley; M.A., Ph.D., Stanford University
- Miller, Keith D. (1987) *Assistant Professor of English*
 B.A., Texas Christian University; M.A., State University of New York, Albany; Ph.D., Texas Christian University
- Miller, Paul T. (1947) *Professor Emeritus of Geology*
 B.A., Simpson College; M.S., Ph.D., University of Iowa
- Miller, Victor J. (1958) *Professor Emeritus of Agribusiness and Environmental Resources*
 B.S., M.S., Ph.D., University of Illinois

- Miller, Warren (1954) *Professor of Political Science*
B.S., M.A., University of Oregon; Ph.D., Maxwell School of Citizenship and Public Affairs, Syracuse University
- Miller, William Edgar (1966) *Associate Professor Emeritus of Counselor Education*
B.M.E., Ed.D., University of Kansas
- Miller, William H. (1984) *Assistant Professor of Agribusiness and Environmental Resources*
B.S., M.S., Ph.D., Washington State University
- Milner, Joe W. (1967) *Professor of Journalism and Telecommunication*
B.A., East Texas State University; M.A., University of Oklahoma; Ed.D., University of Wyoming
- Milstein, Stanley R. (1974) *Instructor of Zoology*
B.A., City College New York; M.A., M.D., University of Iowa
- Minkley, Wendell L. (1963) *Professor of Zoology*
B.S., Kansas State University; M.A., University of Kansas; Ph.D., University of Louisville
- Mingolet, Marc P. (1987) *Assistant Professor of Engineering*
Engineer's Degree in Aerospace Engineering, Universite de Liege; Ph.D., Rice University
- 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 Arizona
- Mitchell, Frederic F. (1961) *Professor Emeritus of Education*
B.A., M.A., University of Arizona; Ph.D., Columbia University
- Mittelmann, Hans Detlef (1983) *Professor of Mathematics*
Ph.D., Technical University, Darmstadt
- Mittelstaedt, H. Fred (1987) *Assistant Professor of Accountancy*
B.A., M.S., Illinois State University; Ph.D., University of Illinois
- Moeckel, Cindy L. (1987) *Assistant Professor of Accountancy*
B.A., M.B.A., Miami University (Oxford Ohio); Ph.D., University of North Carolina, Chapel Hill
- Moeller, Therald (1969) *Professor Emeritus of Chemistry*
B.S., Oregon State College; Ph.D., University of Wisconsin, Madison
- Mokwa, Michael P. (1979) *Associate Professor of Marketing*
B.B.A., M.B.A., Ph.D., University of Houston
- Montanari, John R. (1980) *Professor of Management*
B.S.M.E., University of Dayton; M.B.A., University of New Mexico; D.B.A., University of Colorado
- Monte, Woodrow (1979) *Associate Professor of Family Resources and Human Development*
B.S., New Mexico Institute of Mining and Technology; M.S., Ph.D., Colorado State University
- Montero, Darrel (1979) *Associate Professor of Social Work*
B.A., California State University; M.A., Ph.D., University of California
- Montiel, Miguel (1974) *Professor of Social Work; Assistant Vice President for Academic Affairs*
B.S., University of Arizona; M.S.W., Arizona State University; D.S.W., University of California, Berkeley
- Moody, E. Grant (1951) *Professor Emeritus of Agribusiness and Environmental Resources*
B.S., University of Arizona; M.S., Kansas State University; Ph.D., Purdue University
- Moor, William C. (1968) *Associate Professor of Engineering*
B.S., M.S., Washington University; Ph.D., Northwestern University
- Moore, Byron C. (1968) *Professor of Special 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., California Institute of Technology
- Moore, Elsie Gloria Jean (1981) *Associate Professor of Counselor Education*
B.A., Elmhurst College; M.A., Ph.D., University of Chicago
- Moore, J. Douglas (1969) *Associate Professor of Mathematics*
B.S., M.S., Idaho State University; Ph.D., Syracuse University

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- Moore, Michael (1982) *Assistant Professor of Zoology*
 B.A., Indiana University; M.S., Ph.D., University of Washington
- Moore, Patricia D. (1984) *Assistant Professor of Nursing;*
 B.S., Loyola University of Chicago; *Assistant Dean, Community Resources, College of Nursing*
 M.S., Catholic University of America; M.P.H., D.P.H., Johns Hopkins University
- Moore, Thomas A. (1976) *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
- Morgan, Miriam J. (1965) *Instructor of French*
 Licence-ès-Lettres, University of Paris (France); M.A., Arizona State University
- Morgan, Owen W. (1968) *Professor of Family Resources and Human Development*
 B.A., Grinnell College; M.A., University of Nebraska, Omaha; Ph.D., University of Nebraska, Lincoln
- Morgan, Thais E. (1985) *Assistant Professor of English*
 B.A., Smith College; M.A., Ph.D., Brown University
- Moroney, Robert M. (1981) *Professor of Social Work; Director, DSW Program*
 A.B., M.S.W., Boston College; M.P.H., Harvard University; Ph.D., Brandeis University
- Morris, Donald H. (1962) *Professor of Anthropology*
 B.A., Arizona State University; M.A., Ph.D., University of Arizona
- Morris, John P. (1968) *Professor of Law*
 A.B., J.D., Northwestern University
- Morrison, Kenneth M. (1983) *Associate Professor of Religious Studies*
 B.A., St. Dunstan's University; M.A., Ph.D., University of Maine
- Moulton, Gerald L. (1967) *Professor Emeritus of Education*
 B.A., Hamline University; M.Ed., Ed.D., University of Oregon
- Mower, 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; Program Coordinator, Early Childhood Education*
 B.S., Kutztown State College; M.Ed., Pennsylvania State University; Ph.D., University of Maryland
- Muhtenkamp, Ann F. (1973) *Professor of Nursing*
 B.S., M.S., Marquette University; Ph.D., University of Kansas
- Mulholland, Marion (1985) *Assistant Professor of Nursing*
 B.S., State University of New York, Plattsburgh; M.Ed., Ed.D., Columbia University
- Mulligan, Donald E. (1985) *Associate Professor of Construction*
 B.S.E., M.S.M.E., Arizona State University
- Munk, Morton E. (1961) *Professor of Chemistry*
 B.S., Northwestern University; M.S., University of Miami; Ph.D., Wayne State University
- Munukutla, Lakshmi V. (1987) *Associate Professor of Technology*
 B.S., M.S., Andhra University; Ph.D., Ohio University
- Murphy, Jeffrie G. (1981) *Professor of Philosophy and Law*
 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 General Business*
 B.A., Fremont 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

- Murthy, Jayathi (1984) *Assistant Professor of Engineering*
 B.Tech., Indian Institute of Technology, Kanpur (India); M.S., Washington State University; Ph.D., University of Minnesota
- Musheno, Michael C. (1977) *Professor of Justice Studies and Public Affairs*
 B.A., Lycoming College; M.A., Ph.D., American University
- Mushkatel, Alvin H. (1980) *Professor of Public Affairs;*
 B.A., Ohio State University; *Director, Applied Urban Research, Center for Urban Studies*
 M.S., Ph.D., University of Oregon
- Mutch, Kathleen (1984) *Assistant Professor of Computer Science*
 B.S., Viterbo College; M.S., Ph.D., University of Minnesota
- Myers, Barbee C. (1987) *Assistant Professor of Physical Education*
 B.A., M.A., Wake Forest University; Ph.D., University of Tennessee, Knoxville
- Myler, Charles E. Jr. (1968) *Associate Professor of Finance*
 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) *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 University
- Natsiavas, Sotirios (1987) *Assistant Professor of Engineering*
 Diploma in Mechanical Engineering, Aristotle University; M.S., Ph.D., California Institute of Technology
- Nebeker, Helen E. (1958) *Professor Emeritus of English*
 B.A., M.A., Arizona State University
- Neitzel, G. Paul (1979) *Associate Professor of Engineering*
 B.S., Rollins College; M.S., Ph.D., Johns Hopkins University
- Nelsen, Edward A. (1975) *Professor of Education*
 B.S., University of Wisconsin, Madison; Ph.D., Stanford University
- Nelson, G. Lynn (1973) *Assistant Professor of English*
 B.A., Kearney State College; Ph.D., University of Nebraska, Lincoln
- Nelson, Harold D. (1967) *Professor of Engineering*
 B.S., South Dakota School of Mines and Technology; M.S., Kansas State University; Ph.D., Arizona State University
- Nelson, J. Russell (1981) *Professor of Finance; President of the University*
 B.A., Pacific Union College; M.B.A., Ph.D., University of California, Los Angeles
- Nelson, John C. (1967) *Associate Professor of Special Education*
 B.S., M.A., Arizona State University; Ph.D., George Peabody College
- Nering, Evar D. (1960) *Professor of Mathematics*
 B.A., Indiana University; M.A., Ph.D., Princeton University
- Netting, Ellen (1983) *Assistant Professor of Social Work*
 B.A., Duke University, M.S.W., University of Chicago; Ph.D., University of Chicago
- Ney, James W. (1969) *Professor of English*
 B.A., M.A., Wheaton College; Ph.D., University of Michigan
- Nicholls, Keith (1986) *Assistant Professor of Political Science*
 B.A., M.A., Memphis State University; Ph.D., Florida State University
- Nichols, Ann W. (1970) *Associate Professor of Social Work*
 A.B., Stanford University; M.S.W., D.S.W., Columbia University;
- Nichols, Catherine G. (1952) *Professor Emeritus of Counselor Education*
 A.B., M.A., University of Kentucky; Ph.D., Columbia University

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- Nichols-Casebolt, Ann (1985) *Assistant Professor of Social Work*
 B.A., M.S.W., Ph.D., University of Wisconsin, Madison
- Nielsen, Michael J. (1969) *Associate Professor of Design*
 B.P.D., North Carolina State University; M.A., Stanford University
- Nielson, Gregory M. (1970) *Professor of Computer Science*
 B.S., M.S., Ph.D., University of Utah
- Niemeir, Wilma M. (1959) *Assistant Professor Emeritus of Mathematics*
 B.A., New Mexico Highlands University; M.S., University of Wyoming
- Niemiera, Alexander (1986) *Assistant Professor of Agribusiness and Environmental Resources*
 B.S., Roanoke College; B.S., University of Kentucky; M.S., Ph.D., Virginia Polytechnic Institute and State University
- Nigam, Bishan Perakash (1964) *Professor of Physics*
 B.S., M.S., University of Delhi (India); Ph.D., University of Rochester
- Nigg, Joanne M. (1979) *Associate Professor of Public Affairs; Director, Office of Hazards Studies*
 B.A., California State University; M.A., Ph.D., University of California, Los Angeles
- Nigro, Kirsten F. (1986) *Assistant Professor of Spanish*
 B.A., University of Delaware; M.A., Middlebury College; Ph.D., University of Illinois
- Nilsen, Aileen P. (1975) *Professor of Reading and Library Science; Assistant Dean, Graduate College*
 B.A., Brigham Young University; M.Ed., American University; Ph.D., University of Iowa
- Nilsen, Don L. F. (1973) *Professor of English*
 B.A., Brigham Young University; M.A., American University; Ph.D., University of Michigan
- Noble, Frank C. (1971) *Professor of Counseling*
 B.S., Northern Illinois University; M.Ed., Ed.D., University of Illinois
- North, Larry W. (1980) *Associate Professor of Nursing*
 B.A., Hastings College; M.S., University of Colorado; Ph.D., University of Arizona
- Northey, William T. (1959) *Professor Emeritus of Microbiology*
 B.A., University of Minnesota; M.A., Ph.D., University of Kansas
- Northrup, John E. (1986) *Assistant Professor of Physics*
 B.A., University of Colorado, Boulder; Ph.D., University of California, Berkeley
- Norton, M. Scott (1973) *Professor of Educational Administration and Supervision*
 B.S., M.Ed., Ed.D., University of Nebraska
- O'Bannon, Charles E. (1964) *Professor of Engineering, Chair, Department of Civil Engineering*
 B.S.C.E., University of New Mexico; M.S., Harvard University; Ph.D., Oklahoma State University
- O'Beirne, Donald E. (1959) *Professor Emeritus of Education*
 B.E., Whitewater State Teachers College; M.A., Ed.D., Northwestern University
- O'Brien, Carmen A. (1959) *Associate Professor Emeritus of Education*
 B.A. in Ed., M.A. in Ed., Arizona State University
- O'Connor, Elinor J. (1970) *Assistant Professor Emeritus of Family Resources and Human Development*
 B.S., College of St. Catherine; M.S., University of Iowa
- O'Dell, Michael A. (1980) *Associate Professor of Accountancy*
 B.S., M.B.A., University of California, Los Angeles; Ph.D., University of Texas; C.P.A., Colorado
- O'Grady, E. P. (1977) *Associate Professor of Computer Science*
 B.S., St. Louis University; M.S., Ph.D., University of Arizona
- O'Nuallachain, Breandan (1987) *Assistant Professor of Geography*
 B.A., National University of Ireland; M.A., Indiana University; Ph.D., University of Illinois
- O'Keefe, Michael (1963) *Professor of Chemistry*
 B.S., Ph.D., University of Bristol (England)
- O'Leary, Timothy J. (1978) *Associate Professor of Decision and Information Systems*
 B.S., Westminster College; M.B.A., D.B.A., Kent State University
- Odenkirk, James E. (1967) *Professor of Physical Education*
 B.S., M.A., Ohio State University; Ed.D., Columbia University

- Ohmart, Robert D. (1970) *Professor of Zoology*
B.S., M.S., New Mexico State University; Ph.D., University of Arizona
- Ohsfeldt, Robert L. (1986) *Assistant Professor of Health Administration and Policy*
B.S., M.A., Ph.D., University of Houston
- Ojala, William T. (1971) *Associate Professor of English; Director, Freshman English*
B.S., M.A., University of Minnesota; Ph.D., Florida State University
- Okun, Morris A. (1976) *Professor of Education*
B.A., Brooklyn College; M.S., Ph.D., Pennsylvania State University
- Oldani, Robert W. (1982) *Associate Professor of Music*
B.A., University of Illinois, Urbana-Champaign; M.A., Ph.D., University of Michigan, Ann Arbor
- Olivas, Louis (1979) *Associate Professor of General Business*
B.A., M.A., Ed.D., Arizona State University
- Oliver, Robert S. (1963) *Professor Emeritus of Architecture*
A.B., M.A., University of California, Berkeley; M.F.A., Instituto Allende (Mexico)
- Olmsted, Cameron B. (1956) *Associate Professor Emeritus of Education*
B.A. in Ed., M.A. in Ed., Arizona State University; Ed.D., University of Northern Colorado
- Olney, Claude W. (1967) *Associate Professor of General Business*
B.S., J.D., Marquette University
- Olson, Grace P. (1977) *Assistant Professor of Nursing*
B.S.N., M.S., Arizona State University; Ph.D., Texas Woman's University
- Olson, Richard (1985) *Associate Professor of Political Science; Director, International Programs*
B.A., University of California, Davis; M.A., University of California, Los Angeles; Ph.D., University of Oregon
- Ormiston, Michael B. (1984) *Associate Professor of Economics*
B.S., Michigan State University; M.A., Ph.D., Johns Hopkins University
- Ossipov, Helene (1987) *Instructor of French*
B.A., Queens College of CUNY; M.A. (French Linguistics), M.A. (Russian Area Studies), Indiana University
- Osterhoudt, Robert G. (1976) *Professor of Physical Education*
B.S., M.S., Pennsylvania State University; Ph.D., University of Illinois
- Ostrom, Lonnie L. (1973) *Professor of Marketing; Director, Development*
B.B.A., University of Wisconsin; M.S., Southern Illinois University; Ph.D., University of Alabama
- Overman, Glenn D. (1956) *Professor Emeritus of Marketing*
B.S., Central State College; M.S., Oklahoma State University; D.B.A., Indiana University
- Owen, John E. (1964) *Professor of Sociology*
B.A., Duke University; A.M., Ph.D., University of Southern California
- Ozkarahan, Esen A. (1982) *Associate Professor of Computer Science*
B.S., Middle East Technical University; M.S., New York University; Ph.D., University of Toronto
- Packer, Merle A. (1959) *Associate Professor Emeritus of Physical Education*
B.A., M.A., Arizona State University; Ed.D., University of Northern Colorado
- Padilla, Raymond V. (1982) *Associate Professor of Higher Education; Director, Hispanic Research Center*
B.A., University of Michigan; M.A., Ph.D., University of California, Berkeley
- Pagano, Caio (1986) *Professor of Music*
B.Laws, Universidade de Sao Paulo; D.M.A., Catholic University of America
- Page, John B. (1969) *Professor of Physics*
B.S., Ph.D., University of Utah
- Pai, Ammembal L. (1982) *Associate Professor of Computer Science*
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, Ann Arbor
- Palmgren, Dale E. (1984) *Assistant Professor of Technology*
B.S., M.S., Ph.D., University of Wisconsin, Madison

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- Palumbo, Dennis J. (1983) *Professor of Justice Studies*
M.A. (Social Science), M.A. (Political Science), Ph.D., University of Chicago
- Pangrazi, Robert P. (1973) *Professor of Physical Education;*
B.A., M.S., Ph.D., Washington State University *Chair, Department of Health and Physical Education*
- Pany, Kurt J. (1978) *Professor of Accountancy*
B.S.B.A., University of Arizona; M.B.A., University of Minnesota; Ph.D., University of Illinois; C.P.A., Arizona
- Parlini, Louis J. (1967) *Professor of Technology; Chair, Department of Industrial Technology*
B.A., A.M., Idaho State University; Ed.D., University of Northern Colorado
- Parker, L. Mayland (1955) *Professor Emeritus 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
- 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 Management; Director, Center for Private and Public Sector Ethics*
B.A., University of Pittsburgh; A.M., Ph.D., Harvard University
- Patten, Duncan T. (1965) *Professor of Botany; Director, Center for Environmental Studies*
B.A., Amherst College; M.S., University of Massachusetts; Ph.D., Duke University
- Patterson, Robert A. (1957) *Professor of Zoology*
B.S., University of Michigan; Ph.D., Ohio State University
- Paulsen, George E. (1959) *Professor of History*
B.A., Hobart College; M.A., Rutgers, The State University; Ph.D., Ohio State University
- Peacock, Simon M. (1985) *Assistant Professor of Geology*
B.S., M.S., Massachusetts Institute of Technology; Ph.D., University of California, Los Angeles
- Pearce, Martha V. (1977) *Associate Professor of Technology*
B.S., Columbia University; M.S., Boston University; Ed.D., Arizona State University
- Pearson, Bethyl Ann (1986) *Assistant Professor of English*
B.A., Albion College; M.Ed., Wright State University; M.A., Michigan State University
- Pearson, John N. (1981) *Associate Professor of Operations 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
- Peck, Robert E. (1984) *Associate Professor of Engineering*
B.S., University of California, Berkeley; M.S., Ph.D., University of California, Irvine
- Pedrick, Willard H. (1966) *Professor Emeritus of Law*
B.A., Parsons College; J.D., Northwestern University
- Peck, George A. Jr. (1964) *Professor Emeritus of Political Science*
B.A., M.A., Ph.D., University of Virginia
- Pei, Ker-Wei (Buck) (1986) *Assistant Professor of Accountancy*
B.A., National Chung-Hsing University (Taipei); M.A., Southern Illinois University; Ph.D., North Texas State University
- Peltier, Robert V. (1987) *Assistant Professor of Technology*
B.S., M.S., San Diego State University
- Penley, Larry E. (1985) *Professor of Management; Chair, Department of Management*
B.A., M.A., Wake Forest University; Ph.D., University of Georgia
- Perantoni, Daniel T. (1982) *Professor of Music*
B.M., Eastman School of Music; M.M., Catholic University of America
- Perrill, Lester S. (1957) *Professor Emeritus of Education*
B.A., Ohio Wesleyan University; M.A., Ohio State University; Ph.D., University of North Carolina
- Perrill, Norman K. (1966) *Professor of Communication*
B.S., M.A., Northwestern University; Ph.D., University of Southern California

- Perry, Patsy (1985) *Assistant Professor of Nursing*
B.S., Columbia Union College; M.S., University of Colorado; Ph.D., University of Michigan
- Perry, Ronald W. (1983) *Professor of Public Affairs; Director, Doctor of Public Administration Program*
B.Sc., M.A., Arizona State University; Ph.D., University of Washington
- Peterman, Gordon G. (1966) *Professor Emeritus of Construction*
B.S.C.E., University of Iowa
- Peters, Kathleen A. (1967) *Assistant Professor of Family Resources and Human Development*
B.S., M.S., Kansas State University
- Peterson, Edward R. (1977) *Assistant Professor of Technology*
B.S.E.E., Fairleigh Dickinson University; M.S.E.E., Arizona State University
- Peterson, Gary (1987) *Professor of Family Resources and Human Development;*
B.S., M.S., University of Nebraska, Lincoln; *Chair, Family Resources and Human Development*
Ph.D., Brigham Young University
- Peterson, John R. (1963) *Professor of Architecture*
B.A., St. Olaf College; B.Arch., University of Minnesota; M.Arch., Harvard University
- Peterson, Ralph (1976) *Associate Professor of Elementary Education*
B.A., Eastern Washington State College; M.A., Ed.D., Columbia University
- Petronio, Sandra G. (1986) *Assistant Professor of Communication*
B.A., State University of New York, Stony Brook; M.A., Ph.D., University of Michigan, Ann Arbor
- Petit, George R. (1964) *Professor of Chemistry; Director, Cancer Research Institute*
B.S., Washington State University; M.S., Ph.D., Wayne State University
- Petuskey, William T. (1983) *Associate Professor of Chemistry*
B.S., University of Utah; Sc.D., Massachusetts Institute of Technology
- Péwé, Troy L. (1965) *Professor Emeritus of Geology*
A.B., Augustana College; M.S., University of Iowa; Ph.D., Stanford University
- Pfuhl, Erdwin H. Jr. (1968) *Professor of Sociology*
A.B., Whitman College; A.M., University of Idaho; Ph.D., Washington State University
- Pheanis, David C. (1975) *Associate Professor of Computer Science*
B.S., Case Institute of Technology; M.S., Ph.D., Arizona State University
- Philippakis, Andrew S. (1967) *Professor of Information Systems*
B.S., Gannon College; M.B.A., Ph.D., University of Wisconsin, Madison
- Phillips, William W. (1958) *Associate Professor Emeritus of History*
Ph.B., M.A., University of North Dakota; Ph.D., University of Missouri, Columbia
- Pian, Richard H. J. (1959) *Professor Emeritus of Engineering*
B.S.C.E., Kung Shang University (China); M.S.E., Ph.D., Cornell University
- Pickens, Judith M. (1987) *Instructor of Nursing*
B.S.N., Marymount College; M.S.N., University of Wisconsin
- Pihlak, Madis (1986) *Assistant Professor of Planning*
B.E.S. (Hons. Urban and Regional Planning), University of Waterloo (Canada);
M.C.P., M.L.A., University of California, Berkeley
- Pijawka, David (1982) *Associate Professor of Public Affairs*
B.A., Brock University; M.A., Ph.D., Clark University
- Pile, James (1971) *Associate Professor of Art*
B.F.A., M.F.A., University of Nebraska, Lincoln
- Pimentel, David (1973) *Associate Professor of Art*
B.S. Ed., Massachusetts College of Art; M.F.A., Rochester Institute of Technology
- Pinkava, Donald J. (1964) *Professor of Botany; Director, ASU Herbarium*
B.S., M.S., Ph.D., Ohio State University
- Pittman, Anne M. (1952) *Professor Emeritus of Physical Education*
B.S., University of Texas; M.A., New York University; Ed.D., Stanford University
- Plantz, Don V. (1960) *Professor Emeritus of Economics*
B.S., M.B.A., University of Kansas; Ph.D., Indiana University

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- Podlich, William F. (1949) *Professor Emeritus of Education*
B.S., Maryland State Teachers College; Ph.D., University of Iowa
- Poe, Jerry B. (1974) *Professor of Finance*
B.A., Drury College; M.B.A., Washington University; D.B.A., Harvard University
- Polenz, G. Donald (1967) *Associate Professor Emeritus of Social Work*
B.A., Warburg College; M.A., University of Utah; D.S.W., University of Southern California
- Portnoff, Collice H. (1945) *Professor Emeritus of English*
A.B., M.A., University of California, Berkeley; F.A.A.R., M.A., American Academy in Rome (Italy);
Ph.D., Stanford University
- Powers, Doris C. (1960) *Associate Professor Emeritus of English*
B.A., Wellesley College; M.A., Occidental College; Ph.D., University of California, Berkeley
- Prather, Elizabeth (1978) *Professor of Speech and Hearing Science*
B.S., University of Nebraska; M.A., Ph.D., University of Iowa
- Presson, Clark C. (1984) *Associate Professor of Psychology*
B.A., Pomona College; M.S., Ph.D., Columbia University
- Price, Thornton W. (1961) *Professor Emeritus of Engineering*
B.S., University of Illinois; M.S., Lehigh University; Ph.D., University of Illinois
- Prieto, Alfonso G. (1974) *Professor of Special Education*
B.A., University of New Mexico; M.S.S.W., Ph.D., University of Missouri
- Primas, Phyllis J. (1987) *Assistant Professor of Nursing*
B.S.N., University of Pennsylvania; M.P.H., Ph.D., University of Pittsburgh
- Prisman, Eliezer Z. (1985) *Assistant Professor of Finance*
B.A., Hebrew University of Jerusalem; M.S.C., D.Sc., Technion-Israel Institute of Technology
- Prust, Zenas A. (1959) *Professor Emeritus of Technology*
B.S., University of Wisconsin, Stout; M.A., University of Minnesota; Ed.D., University of Northern Colorado
- Quesada, Eugene R. (1973) *Assistant Professor of Design*
B.A., Arizona State University
- Quigg, John C. (1981) *Associate Professor of Mathematics*
B.S., M.S., Ph.D., Drexel University
- Rabiner, Donald N. (1979) *Associate Professor of Art*
B.A., Hamilton College; M.A., Ph.D., University of Kansas
- Raccach, Moshe (1980) *Associate Professor of Agribusiness and Environmental Resources*
B.Sc., M.Sc., The Hebrew University (Israel); Ph.D., Cornell University
- Rader, Martha (1975) *Associate Professor of General Business*
B.S., M.B.E., University of Mississippi; Ph.D., Kansas State University
- Radin, Tari (1985) *Instructor of Nursing*
B.S., M.S., Arizona State University; B.S., Ph.D., University of California, Davis
- Radke, Judith J. (1960) *Associate Professor of French*
B.S., M.A., University of Wisconsin, Madison; Ph.D., University of Colorado
- Radwan, A. Essam (1984) *Associate Professor of Engineering*
B.S.C.E., Cairo University (Egypt); M.S.C.E., Ph.D., Purdue University
- Ragan, Donal M. (1967) *Professor of Geology*
B.A., Occidental College; M.S., University of Southern California; Ph.D., University of Washington
- Rajan, Mahesh (1981) *Assistant Professor of Engineering*
B.S., Bangalore University; M.S., Howard University; Ph.D., Virginia Polytechnic Institute
- Rajan, Subramaniam D. (1983) *Assistant Professor of Engineering*
B.Tech., (Hons) Indian Institute of Technology Kharagpur; M.S., Ph.D., University of Iowa
- Ramirez, Richard (1987) *Assistant Professor of Decision and Information Systems*
B.S., University of Guadalajara (Mexico); M.S., Postgraduate College, Chapingo (Mexico); Ph.D., Texas A&M University

- Randall, Virginia R. (1962) *Associate Professor Emeritus of English*
B.A., College of New Rochelle; M.A., Arizona State University; Ph.D., Occidental College
- Rankin, Robert L. (1971) *Associate Professor of Engineering*
B.S., University of Texas, El Paso; Ph.D., Rice University
- Rankin, W. Parkman (1982) *Professor Emeritus of Journalism and Telecommunication*
B.S., Syracuse University; M.B.A., Ph.D., New York University
- Rasmussen, David I. (1963) *Professor of Zoology*
B.S., M.S., University of Utah; Ph.D., University of Michigan
- Rasmussen, Robert D. (1949) *Associate Professor Emeritus of Agribusiness and Environmental Resources*
B.S., Iowa State University; M.S., Washington State University
- Raupp, Gregory B. (1985) *Assistant Professor of Engineering*
B.S., M.S., Purdue University; Ph.D., University of Wisconsin
- 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, Urbana
- Rawls, William S. (1974) *Professor Emeritus of Physics*
B.S., Murray State College; M.S., Tulane University; Ph.D., Iowa State University
- Ray, William J. (1968) *Professor of Elementary Education; Program Coordinator, Elementary 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
- Reckers, M.J. Philip (1980) *Professor of Accountancy*
B.S., Quincy College; M.B.A., Washington University; Ph.D., University of Illinois
- Red Horse, John (1979) *Associate Professor of Social Work*
A.B., University of the Pacific; M.S.W., University of California, Los Angeles; Ph.D., University of Minnesota
- Redman, Charles L. (1983) *Professor of Anthropology; Chair, Department of Anthropology*
B.A., Harvard University; M.A., Ph.D., University of Chicago
- Reed, Helen (1986) *Associate Professor of Engineering*
A.B., Goucher College; M.S., Ph.D., Virginia Polytechnic Institute and State University
- Reed, William H. (1968) *Associate Professor of Technology*
B.S., University of Oklahoma; M.S., Arizona State University
- Reeves, Henry C. (1969) *Professor of Microbiology; Vice President for Research*
B.S., Franklin and Marshall College; M.A., Ph.D., Vanderbilt University
- Regier, Philip R. (1987) *Assistant Professor of Accountancy*
B.A., St. John's College; Ph.D., University of Illinois
- Reich, John W. (1965) *Professor of Psychology*
B.A., M.S., University of Oklahoma; Ph.D., University of Colorado
- Reif, William E. (1970) *Professor of Management*
B.B.A., M.A., Ph.D., University of Iowa
- Reiman, Etsuko Obata (1978) *Associate Professor of Japanese*
B.A., Keio University (Japan); M.A., Seton Hall University; M.A., Ph.D., University of Wisconsin, Madison
- Rein'l, Robert L. (1961) *Professor Emeritus of Philosophy*
A.B., A.M., Ph.D., Harvard University
- Reinard, John C. (1975) *Associate Professor of Communication*
B.A., M.A., California State University, Fullerton; Ph.D., University of Southern California
- Reingen, Peter H. (1982) *Professor of Marketing*
B.B.A., Cologne College (Germany); M.B.A., Ph.D., University of Cincinnati
- Reiser, Castle O. (1958) *Professor Emeritus of Engineering*
B.S., Colorado State University; Pet. E., Colorado School of Mines; Ph.D., University of Wisconsin, Madison

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- Reiss, Peter W. (1976) *Assistant Professor of General Business*
 B.S., J.D., Marquette University; M.A., Arizona State University
- Renaut, Rosemary (1987) *Assistant Professor of Mathematics*
 B.S., Collingwood College, Durham University; Ph.D., Cambridge University
- Reneau, J. Hal (1975) *Associate Professor of Accountancy*
 B.B.A., M.S., Texas Tech University; Ph.D., University of Missouri, Columbia
- Reuter, Vincent G. (1961) *Professor Emeritus of Operations Management*
 B.S.C., M.A., Ph.D., University of Iowa
- Reynolds, Robert D. (1970) *Associate Professor of Music*
 B.M., Texas Christian University; M.M., University of Texas, Austin; Ph.D., Ohio State University
- Rez, Peter (1985) *Assistant Professor of Physics and Center for Solid State Science*
 B.A., M.A., University of Cambridge; Ph.D., University of Oxford
- Reznikoff, Sivan C. (1973) *Professor of Design*
 Certificate, New York School of Interior Design; B.A., University of Southwestern Louisiana;
 M.A., Louisiana State University
- Rice, Glen E. (1986) *Associate Professor (Research) of Anthropology;*
Director, Office of Cultural Resource Management
 B.A., Reed College;
 M.A., Ph.D., University of Washington, Seattle
- Rice, Margaret J. (1968) *Assistant Professor Emeritus of Communication*
 A.B., A.M., University of Kansas
- Rice, Ross R. (1950) *Professor of Political Science*
 M.A., Ph.D., University of Chicago
- Rice, Roy C. (1946) *Professor Emeritus of Education*
 B.S., University of New Mexico; M.S., University of Massachusetts; Ph.D., University of Texas
- Rice, Warren (1958) *Professor of Engineering*
 B.S., M.S., Ph.D., Texas A&M University
- Richards, Gale L. (1965) *Professor Emeritus of Communication*
 B.A., University of Akron; M.A., Ph.D., University of Iowa
- Richards, Mary L. (1978) *Assistant Professor of Nursing*
 B.S.N., M.S.N., De Paul University; Ph.D., Texas Woman's University
- Richardson, Deane E. (1970) *Professor Emeritus of Physical Education*
 B.S., Bradley University; M.A., Ed.D., Stanford University
- Richardson, Grant L. (1953) *Professor Emeritus of Agribusiness and Environmental Resources*
 B.S., M.S., University of Arizona; Ph.D., Oregon State University
- Richardson, H.D. (1940) *Professor Emeritus of Counselor Education*
 Ph.B., Ph.M., University of Wisconsin; Ph.D., Northwestern University; LL.D., Arizona State University
- Richardson, Richard C. Jr. (1977) *Professor of Higher Education*
 B.S., Castleton State College; M.S., Michigan State University; Ph.D., University of Texas
- Rickel, Harry P. (1948) *Professor Emeritus of Music*
 B.M., M.M., University of Arizona
- Rider, Wendell J. (1953) *Professor Emeritus of Music*
 B.S., Iowa State Teachers College; M.M., Eastman School of Music; Ph.D., University of Iowa
- Riegelhaupt, Florence (1976) *Associate Professor of Spanish*
 B.A., State University of New York, Albany; M.A., Ph.D., State University of New York, Buffalo
- Ringhofer, Christian (1983) *Associate Professor of Mathematics*
 M.A., Ph.D., University of Vienna
- Rios, Alberto A. (1982) *Associate Professor of English*
 B.A., M.F.A., University of Arizona
- Riske, Marc C. (1985) *Assistant Professor of Theatre*
 B.F.A., North Dakota State University; M.F.A., Wayne State University, Detroit
- Risseuw, John L. (1980) *Associate Professor of Art*
 B.S., M.A., M.F.A., University of Wisconsin, Madison

- Rissing, Steven W. (1981) *Associate Professor of Zoology*
B.S., Indiana University; Ph.D., University of Washington
- Ritchie, Barry G. (1984) *Assistant Professor of Physics*
B.S., Appalachian State University; M.S., Ph.D., University of South Carolina
- Ritchie, Kathleen E. (1972) *Instructor of Psychology*
B.A., University of Arizona; M.A., Arizona State University
- Robbins, Earl R. (1961) *Associate Professor of Computer Science*
B.S.E.E., Texas Technological College; M.S.E., Ph.D., Arizona State University
- Robbins, Rebecca (1985) *Assistant Professor of Communication*
B.A., Arizona State University; M.Ed., Ph.D., Pennsylvania State
- Roberts, Carolyn (1982) *Associate Professor of Nursing*
B.Sc.N., University of Western Ontario; M.Ed., Teachers College, Columbia University; Ph.D., Wayne State University
- Roberts, Thomas G. (1970) *Associate Professor of Special Education*
B.A., Wake Forest University; M.A., Ph.D., University of North Carolina
- Robinson, Daniel O. (1950) *Professor Emeritus of Agribusiness and Environmental Resources*
A.B., Brigham Young University; M.S., University of Arizona; Ph.D., Ohio State University
- Robinson, Helene M. (1967) *Associate Professor Emeritus of Music*
B.A., University of Oregon; M.M., Northwestern University
- Robinson, Sharon E. (1978) *Professor of Counseling Psychology*
B.S., M.S., University of Wisconsin, LaCrosse; Ph.D., Indiana University
- 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
- Rodman, Leiba (1984) *Professor of Mathematics*
M.A., Ph.D., Tel-Aviv University
- Roe, Keith B. (1979) *Associate Professor of Technology*
B.S., Wisconsin State College; M.A., University of Michigan
- Roedel, Ronald J. (1981) *Professor of Engineering*
B.S.E., Princeton University; M.S., Ph.D., University of California, Los Angeles
- Rogers, Bradley B. (1984) *Instructor of Technology*
B.S., M.S., Montana State University
- Rogers, Rodney (1987) *Assistant Professor of Music*
B.M., University of Iowa; M.M., Arizona State University; Ph.D., University of Iowa
- Rollier, Dwayne A. (1971) *Associate Professor of Engineering*
B.S., M.S., Oklahoma State University; Ph.D., Florida State University
- Rook, Fern H. (1969) *Assistant Professor Emeritus of Technology*
B.A., University of Colorado; M.A., Arizona State University
- Roosa, Mark W. (1980) *Associate Professor of Family Resources and Human Development*
B.S., Ohio State University; M.A., Ph.D., Michigan State University
- Roper, Devon J. (1966) *Associate Professor of Technology*
B.S., Utah State University; M.S., Arizona State University
- Rosales, F. Arturo (1980) *Associate Professor of History*
B.A., Arizona State University; M.A., Stanford University; Ph.D., Indiana University
- Rose, Jonathan (1968) *Professor of Law; Associate Dean, College of Law*
B.A., University of Pennsylvania; LL.B., University of Minnesota
- Rose, Seth D. (1976) *Associate Professor of Chemistry*
B.S., University of California, Berkeley; Ph.D., University of California, San Diego
- Rosen, Bernice M. (1986) *Curator of Dance*
B.A., Brooklyn College; M.A., New York University
- Rosen, Seymour L. (1986) *Professor of Music; Dean, College of Fine Arts*
B.S., The Juilliard School

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- Rossi, Patrick J. (1967) *Associate Professor of Psychology*
 B.S., St. Mary's College; M.A., San Fernando Valley State College; Ph.D., University of California, Riverside
- Rothschild, Mary A. (1975) *Associate Professor of History*
 B.A., M.A., Ph.D., University of Washington
- Rounds, Jerald (1986) *Associate Professor of Construction*
 B.S.C.E., University of Colorado; Ph.D., University of Dundee
- Roux, Robert (1986) *Associate Professor of Music*
 B.M., Loyola University, New Orleans; M.M., D.M.A., University of Texas, Austin
- Rover, R. Craig (1952) *Professor Emeritus of Education*
 B.A., Upsala College; M.A., St. Lawrence University; Ph.D., Cornell University
- Rowe, Kenneth L. (1962) *Professor of Marketing*
 B.A., M.A., Northern Iowa University; Ph.D., Michigan State University
- Rowley, James (1986) *Associate Professor of Art*
 B.F.A., Kansas City Art Institute; M.F.A., University of Utah
- Roy, Asim (1983) *Assistant Professor of Management Science*
 B.E., Calcutta University; M.S., Case Western Reserve University; Ph.D., University of Texas, Austin
- 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) *Professor of Engineering*
 B.Sc., University of Calcutta; B.S., University of Jadavpur; M.S., University of Washington;
 M.Sc., Ph.D., University of California, Berkeley
- Ruch, William A. (1968) *Professor of Operations Management;*
 B.S., M.B.A., D.B.A., Indiana University *Chair, Department of Purchasing, Transportation, Operations*
- Rucker, Robert (1986) *Assistant Professor of Engineering*
 B.S., M.S., University of Miami; M.S., Ph.D., Arizona State University
- Ruff, Paul F. (1958) *Professor of Engineering*
 B.S.C.E., M.S.C.E., Case Western Reserve University
- Rummel, John R. (1975) *Associate Professor Emeritus of Architecture*
 B.A., M.S., Stanford University
- Ruppé, Reynold J. (1960) *Professor Emeritus of Anthropology*
 B.A., University of New Mexico; Ph.D., Harvard University
- Russell, Paul E. (1967) *Professor of Engineering;*
 B.S.E.E., B.S.M.E., New Mexico A&M University; *Director, School of Construction and Technology*
 M.S.E.E., Ph.D., University of Wisconsin, Madison; P.E.
- Russo, Nancy Felipe (1985) *Professor of Psychology; Director, Program for Women's Studies*
 B.A., University of California, Davis; Ph.D., Cornell University
- Rutherford, Robert B. Jr. (1976) *Professor of Special Education*
 B.S., M.Ed., University of Virginia; Ed.S., Ph.D., George Peabody College
- Rutowski, Ronald L. (1976) *Associate Professor of Zoology*
 B.A., University of California, Santa Cruz; Ph.D., Cornell University
- Sacks, Benjamin (1963) *Professor Emeritus of History*
 B.A., University of New Mexico; M.A., McGill University; Ph.D., Stanford University
- Sackton, Frank J. (1976) *Professor Emeritus of Public Affairs*
 B.S., University of Maryland; M.P.A., Arizona State University
- Sadalla, Edward K. (1974) *Associate Professor of Psychology*
 B.A., University of California, Berkeley; Ph.D., Stanford University
- Sadler, William E. (1975) *Assistant Professor of Design*
 B.S., M.S., Kent State University
- Saeks, Richard (1983) *Professor of Engineering; Chair, Department of Electrical and Computer Engineering*
 B.S.E.E., Northwestern University; M.S., Colorado State University; Ph.D., Cornell University

- Saldaña, Johnny (1981) *Associate Professor of Theatre*
B.F.A., M.F.A., University of Texas, Austin
- Salerno, Nicholas A. (1961) *Professor of English*
B.A. in Ed., M.A., Arizona State University; Ph.D., Stanford University
- Salmirs, Seymour (1981) *Associate Professor of Technology*
B.A.E., M.S.A.E., Georgia Institute of Technology
- Sanders, Bevie T. (1957) *Associate Professor Emeritus of Accountancy*
B.B.A., North Texas State University; M.S., Texas A&M University; Ph.D., University of Texas;
C.P.A., Arizona and Texas
- Sanderson, R. Thomas (1963) *Professor Emeritus of Chemistry*
B.S., Yale University; Ph.D., University of Chicago
- Sandler, Irwin (1975) *Professor of Psychology*
B.A., Brooklyn College; Ph.D., University of Rochester
- Sands, Kathleen M. (1977) *Professor of English*
B.A., Fort Wright College; M.A., Ph.D., University of Arizona
- Sankey, Otto F. (1982) *Associate Professor of Physics*
B.S., University of Missouri, St. Louis; M.S., Ph.D., Washington University
- Sansone, Fred J. (1965) *Associate Professor of Mathematics*
B.S.E., M.S.E., University of Michigan; M.S., Ph.D., Rutgers, The State University
- Sargent, Charles S. Jr. (1971) *Associate Professor of Geography*
B.A., University of Wyoming; M.A., Ph.D., University of California, Berkeley
- Saric, William (1984) *Professor of Engineering*
B.S., Illinois Institute of Technology; M.S., University of New Mexico; Ph.D., Illinois Institute of Technology
- Sater, Vernon E. (1962) *Professor of Engineering*
B.S.Ch.E., M.S.Ch.E., Ph.D., Illinois Institute of Technology
- Satterlie, Richard A. (1980) *Associate Professor of Zoology*
B.A., Sonoma State University; Ph.D., University of California, Santa Barbara
- Satterthwaite, Lester L. Jr. (1968) *Professor of Educational Media and Computers*
B.S., M.S., Ed.D., Indiana University
- Sattler, Howard E. (1967) *Professor of Education*
B.S., M.S., Ph.D., Arizona State University
- Savage, Nevin W. (1959) *Professor of Mathematics*
B.S., M.A., Pennsylvania State University; Ph.D., University of California, Los Angeles
- Schall, Merri H. (1960-66; 1967) *Associate Professor Emeritus of Elementary Education*
B.A., Albion College; M.S., Ed.D., Arizona State University
- Schaumburg, Donald R. (1953) *Professor Emeritus of Art*
B.A. in Art Ed., College of Arts and Crafts; M.F.A., Claremont Graduate College
- Scheatzle, David G. (1979) *Associate Professor of Architecture*
B.S., Kent State University; M.S.E., Arizona State University
- Schildgen, Thomas E. (1981) *Associate Professor of Technology*
B.S., M.S., Illinois State University; Ed.D., Northern Arizona University
- Schilit, Rebecca (1984) *Assistant Professor of Social Work*
A.B., M.S.W., Ph.D., University of Michigan
- Schlacter, John L. (1969) *Professor of Marketing*
B.B.A., Western Reserve University; M.B.A., Ph.D., Ohio State University
- Schlagenhauf, Don E. (1976) *Professor of Economics*
B.S., Marquette University; M.A., Ph.D., University of Illinois
- Schluntz, Roger L. (1980) *Professor of Architecture; Director, School of Architecture*
B.Arch., University of Nebraska; M.Arch., University of California, Berkeley
- Schmidt, Alfred H. (1960) *Professor Emeritus of Marketing*
B.S., University of Oklahoma; M.B.A., D.B.A., Indiana University

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- Schmidt, Jean M. (1966) *Professor of Microbiology*
 B.A., M.S., University of Iowa; Ph.D., University of California, Berkeley
- Schmidt, Peter A. (1978) *Associate Professor of Technology*
 B.S. in Ed., Northern Illinois University; M.A. in Ed., Ed.D., Arizona State University
- Schmidt, Randall B. (1968) *Associate Professor of Art*
 B.A., Hamline University, Minnesota; M.A., University of New Mexico
- Schneller, Eugene S. (1985) *Professor of Health Administration and Policy;*
Director, School of Health Administration and Policy
 B.A., C.W. Post College; Ph.D., New York University
- Schoen, Robert A. (1966) *Assistant Professor Emeritus of Technology*
 B.S., M.S., Arizona State University
- Schoenwetter, James (1967) *Professor of Anthropology*
 A.B., University of Chicago; M.S., University of Arizona; Ph.D., Southern Illinois University
- Schon, Isabel (1974) *Professor of Reading and Library Science*
 B.S., Mankato State College; M.A., Michigan State University; Ph.D., University of Colorado
- Schreier, Harold J. (1986) *Assistant Professor of Microbiology*
 B.S., California Polytechnic State University; Ph.D., Pennsylvania State University
- Schroder, Dieter K. (1981) *Research Professor of Engineering*
 B.S.E.E., M.S.E.E., McGill University; Ph.D., University of Illinois
- Schroeder, Milton R. (1969) *Professor of Law*
 B.A., Wesleyan University; J.D., University of Chicago
- Schuback, Gertrud B. (1966) *Instructor of German*
 B.A., M.A., Arizona State University
- Schultz, Joseph J. (1983) *Professor of Accountancy; Director, School of Accountancy*
 B.S., M.B.A., Mississippi State University; Ph.D., University of Texas, Austin; C.P.A., Mississippi
- Schwada, John W. (1971) *Professor Emeritus of Political Science; Past President of the University*
 B.S., Northeast Missouri State College; M.A., University of Missouri, Columbia; Ph.D., University of Texas, Austin
- Schwalm, David E. (1986) *Associate Professor of English; Director, First-Year English*
 B.A., Carleton College; M.A., Ph.D., University of Chicago
- Schwutke, Guenter (1983) *Professor of Engineering*
 B.S., Ph.D., University of Munich, Germany
- Scoular, David B. (1952) *Professor Emeritus of Music*
 B.A., Texas Christian University; B.M., Lawrence College; M.A., Columbia University
- Searfoss, Lyndon W. (1973) *Professor of Reading and Library Science; Associate Dean, College of Education*
 B.S., West Chester State College; M.A., Ph.D., Syracuse University
- Sehald, Hans (1963) *Professor of Sociology*
 B.A., Manchester College; M.S., Ph.D., Ohio State University
- Seban, Robert R. (1988) *Assistant Professor of Computer Science*
 B.E., City College of New York; M.S., Ph.D., Purdue University
- Sehested, Colene R. (1967) *Assistant Professor of Nursing*
 B.S., University of Arkansas; M.S.N., University of Maryland
- Seipp, Kenneth F. (1963) *Professor of Music*
 B.S., Hartwick College; M.M., Conservatory of Music, University of Kansas City; Mus.Ed.D., Indiana University
- Selleck, Herbert H. (1973) *Associate Professor Emeritus of Construction*
 B.S.C.E., Iowa State University
- Sen, Arunabha (1986) *Assistant Professor of Computer Science*
 B.E., Jadavpur University; Ph.D., University of South Carolina
- Senner, Wayne M. (1973) *Associate Professor of German*
 B.A., Portland State University; M.A., University of Washington; Ph.D., University of Illinois
- Sensibar, Judith (1985) *Assistant Professor of English*
 B.A., Vassar College; M.A., Ph.D., University of Chicago

- Seperich, George J. (1976) *Associate Professor of Agribusiness and Environmental Resources;*
 B.S., Loyola University, Chicago; *Director, School of Agribusiness and Environmental Resources*
 M.S., Ph.D., Michigan State University
- Shafer, Robert E. (1966) *Professor of English; Director, English Education*
 B.S., M.S., University of Wisconsin, Madison; Ed.D., Columbia University
- Shafer, Susanne M. (1966) *Professor of Social and Philosophical Foundations*
 A.B., Smith College; M.A., Syracuse University; Ph.D., University of Michigan
- Shah, Jami (1984) *Assistant Professor of Engineering*
 B.E., N.E.D., Engineering College; M.S., University of Pittsburgh; Ph.D., Ohio State University
- Sharer, Jon W. (1975) *Associate Professor of Art*
 B.A., Roosevelt University, Chicago; M.S., Illinois Institute of Technology; Ph.D., Ohio State University
- Shaw, Annapurna (1986) *Assistant Professor of Geography*
 B.A., Calcutta University; M.A., Jawaharlal Nehru University (India), Ph.D., University of Illinois
- Shaw, Milton C. (1978) *Professor Emeritus of Engineering*
 B.S.M.E., Drexel University; M.E.Sc., Sc.D., University of Cincinnati; Dr.H.C., University of Louvain
- Shell, Leon G. (1967) *Associate Professor of Counseling; Dean of Student Life*
 B.A., University of Colorado; A.M., Ed.D., University of Northern Colorado
- Sheller, Don (1986) *Assistant Professor of Technology*
 B.M.E., Ohio State University; M.S., Arizona State University
- Shen, C. C. (1982) *Associate Professor of Engineering*
 B.S.E.E., National Taiwan University; M.S., State University of New York, Stony Brook; Ph.D., Stanford University
- Sheppard, Douglas C. (1971) *Professor Emeritus of Spanish*
 B.A., Montana State University; M.A., Ph.D., University of Wisconsin, Madison
- Sheridan, Eleanor (1973) *Assistant Professor of Nursing*
 B.S.N., M.S.N., Wayne State University
- Sheridan, Michael F. (1966) *Professor of Geology*
 B.A., Amherst College; M.S., Ph.D., Stanford University
- Sherman, Thomas L. (1964) *Professor of Mathematics*
 B.A., University of California, Los Angeles; M.S., Ph.D., University of Utah
- Sheydayi, E. Yury (1973) *Associate Professor of Architecture*
 B.S.C.F., University of Arizona; M.S.C.E., Arizona State University
- Shin, Kwang (1983) *Assistant Professor of Engineering*
 B.S., Seoul National University; Ph.D., Northwestern University
- Shing, Chi-Lyang (1985) *Assistant Professor of Construction*
 B.S., National Taiwan Institute of Technology; M.S., Ph.D., University of Texas, Austin
- Shinn, Randall A. (1978) *Professor of Music*
 B.A., Southwestern Oklahoma State University; M.M., University of Colorado; D.M.A., University of Illinois
- Shinn, Thelma J. (1975) *Professor of English*
 B.A., Central Connecticut State College; M.A., Ph.D., Purdue University
- Shipp, Vernon E. (1966) *Assistant Professor of Art*
 B.S., Grand Canyon College; M.A., Arizona State University
- Shipper, Frank M. (1977) *Associate Professor of Management*
 B.S.M.E., West Virginia University; M.B.A., Ph.D., University of Utah
- Shofstall, Weldon P. (1950) *Professor Emeritus of Secondary Education*
 B.S. in Ed., Northeast Missouri State Teachers College; M.A., Ph.D., University of Missouri
- Shriver, Keith A. (1982) *Assistant Professor of Accountancy*
 B.S., Linfield College; M.S., Arizona State University; Ph.D., University of Texas, Austin; C.P.A., Arizona
- Shrock, David L. (1974) *Professor of Transportation; Associate Dean, College of Business*
 B.E.E., General Motors Institute; M.B.A., D.B.A., Indiana University
- Shuman, I. Gayle (1974) *Associate Professor of Justice Studies*
 B.S., M.A. in Ed., Ed.D., Arizona State University

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- Shunk, Dan L. (1984) *Associate Professor of Engineering*
B.S.I.E., M.S.I.E., Ph.D., Purdue University
- Silvaroli, Nicholas J. (1963) *Professor of Reading and Library Sciences;*
B.S. in Ed., State University of New York, Fredonia; *Program Coordinator, Reading and Library Sciences*
M.A., State University of New York, Buffalo; Ed.D., Syracuse University
- Silver, Benjamin (1971) *Associate Professor of Journalism and Telecommunication*
B.A., M.A., University of Iowa
- Simmons, Douglas J. (1963) *Assistant Professor of French*
A.B., Wabash College; M.A.T., Harvard University; Certificat de francais usuel, degreésupeieur;
Certificat de prononciation francaise, La Sorbonne (France)
- Simon, Sheldon (1975) *Professor of Political Science; Director, Center for Asian Studies*
B.A., University of Minnesota; M.A., Princeton University; Ph.D., University of Minnesota
- Singer, Stan (1987) *Assitant Professor of Theatre*
B.A., University of Evansville; M.A., Indiana University
- Singhal, Avi C. (1977) *Professor of Engineering*
B.Sc. Math., Agra University; B.Sc. Engr., B.Sc. Hons., St. Andrews University (Scotland)
S.M., C.E., Sc.D., Massachusetts Institute of Technology
- Sinha, Rajiv K. (1988) *Assistant Professor of Marketing*
B.A., M.A., Delhi University (India)
- Sinkov, Abraham (1964) *Professor Emeritus of Mathematics*
B.S., College of City of New York; M.S., Columbia University; Ph.D., George Washington University
- Sirkis, Murray D. (1968) *Professor of Engineering*
B.S., Massachusetts Institute of Technology; M.S., Ph.D., University of Illinois, Urbana
- Skibo, Edward B. (1982) *Assistant Professor of Chemistry*
B.S., M.S., Drexel University; Ph.D., University of California, San Francisco
- Skinner, James S. (1982) *Professor of Physical Education*
B.S., M.S., Ph.D., University of Illinois, Urbana
- Skoldberg, Phyllis (1977) *Professor of Music*
B.M., M.M., New England Conservatory of Music; M.M.E., D.M., Indiana University, Bloomington
- Smeltzer, Larry R. (1986) *Associate Professor of General Business*
B.S., University of Montana; M.Ed., University of Nebraska; Ed.D., Northern Illinois University
- Smith, A. Wade (1981) *Associate Professor of Sociology*
A.B., Dartmouth College; M.A., Ph.D., University of Chicago
- Smith, Andrew T. (1978) *Associate Professor of Zoology*
A.B., University of California, Berkeley; Ph.D., University of California, Los Angeles
- Smith, Arthur B. Jr. (1967) *Associate Professor of General Business*
B.S., Hardin-Simmons University; M.B.A., Ed.D., University of Houston
- Smith, Brad (1984) *Assistant Professor of Geology*
B.S., University of Washington, Seattle; M.A., Ph.D., University of California, Berkeley
- Smith, Charles B. (1964) *Professor Emeritus of General Business*
B.S., Drake University; M.S., New Mexico Highlands University; Ed.D., University of Northern Colorado
- Smith, David B. (1984) *Associate Professor of Accountancy*
B.A., Carleton College; M.B.A., University of Pennsylvania; Ph.D., University of Illinois; C.P.A., Illinois
- Smith, David J. (1984) *Professor of Physics and Center for Solid State Science*
B.Sc., Ph.D., University of Melbourne (Australia)
- Smith, Georgia A.F. (1985) *Assistant Professor of Zoology*
B.A., University of California, Santa Barbara; M.P.H., University of Michigan; Ph.D., University of California, Riverside
- Smith, Hal L. (1979) *Professor of Mathematics*
B.A., Ph.D., University of Iowa
- Smith, Harvey A. (1977) *Professor of Mathematics*
B.S., Lehigh University; M.S., A.M., Ph.D., University of Pennsylvania

- Smith, Janet Kiholm (1981) *Associate Professor of Economics*
B.S., University of Utah; M.S., Arizona State University; Ph.D., University of California, Los Angeles
- Smith, L. Christian (1971) *Assistant Professor of History*
B.A., Union College; M.A., Ph.D., University of Illinois
- Smith, Lehi T. (1959) *Professor of Mathematics*
B.S., M.A. in Ed., Arizona State University; Ed.D., Stanford University
- Smith, Marion W. (1952) *Associate Professor of Music*
B.S., in Mus. Ed., Capital University; M.M., American Conservatory of Music
- Smith, Mary Lee (1986) *Professor of Educational Administration and Supervision
and Social and Philosophical Foundations*
B.A., M.P.S., Ph.D., University of Colorado
- Smith, Ralph E. (1970) *Professor of Accountancy*
B.B.A., Washburn University; M.S., Ph.D., University of Kansas; C.P.A., Kansas
- Smith, Richard L. (1981) *Associate Professor of Finance; Chair, Department of Finance*
B.B.A., Southern Methodist University; M.B.A., Washington University;
M.A., Ph.D., University of California, Los Angeles
- Smith, Richard L. (1967) *Professor of Engineering; Acting Assistant Vice President for Academic Affairs*
B.S., Washington University; M.S., Ohio State University; Ph.D., Arizona State University
- Smith, Ronald D. (1963) *Associate Professor of History*
A.B., San Diego State College; Ph.D., University of Southern California
- Smith, Stanley E. (1977) *Associate Professor of Journalism and Telecommunication*
B.A., Colgate University; M.A., Purdue University
- Smith-Daniels, Dwight E. (1987) *Assistant Professor of Purchasing, Transportation, Operations*
B.B.A., University of Michigan, Ann Arbor; Ph.D., University of Arizona
- Smith-Daniels, Vicki (1987) *Assistant Professor of Purchasing, Transportation, Operations*
B.B.A., University of San Diego; Ph.D., Ohio State University
- Snow, Nancy E. (1987) *Assistant Professor of Philosophy*
B.A., M.A., Marquette University; Ph.D., University of Notre Dame
- Snow, Robert (1970) *Associate Professor of Sociology*
B.S., M.A., Ph.D., University of Minnesota
- Snyder, Ernest E. Jr. (1958) *Professor Emeritus of Physics/Science Education*
A.B., M.A., Colorado State University; Ed.D., New York University
- Snyder, Lester M. Jr. (1967) *Professor of Counseling Psychology*
B.S., Millersville State College; M.Ed., Western Maryland College; Ph.D., University of Michigan
- So, Ronald Ming Cho (1981) *Professor of Engineering*
B.Sc., University of Hong Kong; M.Eng., McGill University; M.A., Ph.D., Princeton University
- Sohie, Guy (1985) *Assistant Professor of Engineering*
Ph.D., Pennsylvania State University
- Somerville, Susan C. (1978) *Professor of Psychology*
B.A., University of New England (Australia); Ph.D., Australian National University
- Sommerfeld, Milton R. (1968) *Professor of Botany; Chair, Department of Botany*
B.S., Southwest Texas State College; Ph.D., Washington University
- Sparks, Charles F., Captain (1979) *Assistant Professor Emeritus of Military Science*
B.S., Oregon State University; M.S., Arizona State University
- Spence, John C. H. (1976) *Professor of Physics*
M.Sc., Ph.D., University of Melbourne (Australia)
- Spielman, Katherine A. (1987) *Assistant Professor of Anthropology*
A.B., Harvard University; M.A., Ph.D., University of Michigan
- Spinosa, Frank (1965) *Professor of Music*
B.M., M.A., Boston University; D.M.A., University of Illinois
- Squires, Rose L. (1981) *Associate Professor Emeritus of Nursing*
B.S., Duquesne University; M.A., Ed.D., Teachers College, Columbia University

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- St. Louis, Robert D. (1982) *Associate Professor of Management Science*
 A.B., Rockhurst College, M.S., Ph.D., Purdue University
- Stadmler, Jack E. (1963) *Associate Professor Emeritus of Industrial Technology*
 B.S., University of Utah; M.A., Arizona State University
- Stafford, Alfred B. (1958) *Professor Emeritus of Engineering*
 B.S.E.E., Carnegie Institute of Technology; M.A., University of Pittsburgh; Ph.D., University of Chicago
- Stafford, Kenneth R. (1957) *Professor Emeritus of Educational Psychology*
 B.A., M.Ed., Ph.D., University of Oklahoma
- Stahl, Robert (1978) *Associate Professor of Secondary Education*
 B.A., M.A., Ed.D., University of Florida
- Stahnke, Herbert L. (1941) *Professor Emeritus of Zoology*
 S.B., University of Chicago; M.A., University of Arizona; Ph.D., Iowa State University
- Staley, Frederick A. (1970) *Associate Professor of Elementary Education*
 B.A., M.A., Western Michigan University; Ph.D., Michigan State University
- Staley, Thomas R. (1985) *Assistant Professor of Aerospace Studies*
 B.S., Ohio State University; M.S., Troy State
- Stalzer, Frank S. (1955) *Associate Professor of Music*
 B.M.Ed., University of Kansas; M.M., Eastman School of Music
- Standridge, Lanny, Colonel (1984) *Professor of Military Science*
 B.S., Troy State University; M.S., Shippensburg State University
- Stange, Jean B. (1970) *Associate Professor Emeritus of Family Resources and Human Development*
 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) *Professor of Law*
 B.A., University of Minnesota; J.D., Ph.D., Stanford University
- Stark, Barbara L. (1972) *Professor of Anthropology*
 B.A., Rice University; M. Phil., Ph.D., Yale University
- Stark, John C. (1985) *Assistant Professor of Theatre*
 B.S., Wayne State College; M.F.A., University of Nebraska, Lincoln
- Starrfield, Sumner G. (1972) *Professor of Physics/Astronomy*
 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*
 B.S., University of Minnesota; Ph.D., Cornell University
- Steere, Caryl J. (1960) *Assistant Professor Emeritus of Education*
 B.A., Albion College; M.A., Arizona State University
- Steffl, Bernita M. (1961) *Professor of Nursing*
 B.S.N., M.P.H., University of Minnesota
- Steimle, Timothy C. (1985) *Assistant Professor of Chemistry*
 B.S., Michigan State University; Ph.D., University of California, Santa Barbara
- Steinmann, Wilbur L. (1959) *Associate Professor Emeritus of Engineering*
 B.S.E.E., University of Minnesota; M.S., University of Iowa
- Stephens, Nancy J. (1980) *Associate Professor of Advertising and Marketing*
 B.S., M.S., University of Illinois; Ph.D., University of Texas, Austin
- Stevenson, Harold W. (1967) *Professor Emeritus of Finance*
 B.S., University of Minnesota; M.B.A., Ph.D., University of Michigan; C.F.A.
- Steverson, Norris J. (1932) *Associate Professor Emeritus of Physical Education*
 B.A., Arizona State University; M.S., University of Southern California

- Stewart, Donald G. (1964) *Associate Professor of Mathematics*
B.A., M.S., University of Utah; Ph.D., University of Tennessee, Knoxville
- Stewart, Ernest I. (1959) *Professor Emeritus of Health Science*
B.S., M.S., Utah State University; Ph.D., Columbia University
- Stewart, Kenneth M. (1947) *Professor Emeritus of Anthropology*
A.B., M.A., Ph.D., University of California, Berkeley
- Stiles, Philip G. (1969) *Professor of Agribusiness and Environmental Resources*
B.S., University of Arkansas; M.S., University of Kentucky; Ph.D., Michigan State University
- Stillwell, Susan (1985) *Instructor of Nursing*
B.S., College of St. Teresa; M.S.N., University of Florida
- Sitcs, William H. (1954) *Professor Emeritus of Communication*
B.A., Louisiana Polytechnic Institute; M.A., Ph.D., University of Denver
- Stock, William A. (1973) *Professor of Education*
B.A., Blackburn College; M.S., Ph.D., Iowa State University
- Stocker, David Allen (1978) *Professor of Music*
B.S., Concordia Teachers College; M.M., Ph.D., Northwestern University
- Stone, Gregory O. (1986) *Assistant Professor of Psychology*
B.A., Harvard University; Ph.D., University of California, San Diego
- Stone, William J. (1967) *Professor of Physical Education*
B.S., Boston University; M.S., Florida State University; Ed.D., University of California, Berkeley
- Stoner, K. Lynn (1985) *Assistant Professor of History*
B.S., George Peabody College for Teachers; M.A., Ph.D., Indiana University
- Stookey, John A. (1976) *Associate 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 Educational Administration and Supervision*
B.A., Carleton College, Northfield, Minn.; Ph.D., University of Chicago
- Stowe, Noel J. (1967) *Associate Professor of History; Assistant Dean, Graduate College*
B.A., Ph.D., University of Southern California
- Strange, Richard E. (1974) *Professor of Music; Director, 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. (1967) *Associate Professor of Technology*
B.S.E.E., M.S.E.E., University of Illinois; Ph.D., Arizona State University
- Streufert, Hildegard (1961) *Associate Professor Emeritus of Design*
B.S., University of Minnesota; M.S., Iowa State University
- Strocchia, Sharon T. (1987) *Assistant Professor of History*
B.A., Stanford University; M.A., Ph.D., University of California, Berkeley
- Strojnik, Ales (1969) *Professor of Physics*
Diplom. Ing., Ph.D., University of Ljubljana (Yugoslavia)
- Strom, Robert D. (1969) *Professor of Elementary Education and Family Resources and Human Development*
B.S., Macalester College; M.A., University of Minnesota; Ph.D., University of Michigan
- Stuler, John H. (1962) *Professor of Art*
B.A., M.F.A., Arizona State University
- Stump, Edmund (1976) *Professor of Geology*
A.B., Harvard University; M.S., Yale University; Ph.D., Ohio State University
- Stumpf, Angela M. (1959) *Associate Professor Emeritus of Nursing*
B.S.N.E., Marquette University; M.A., University of Chicago

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- Stutsman, Paul S. (1967) *Associate Professor Emeritus of Chemistry*
 B.S., University of Illinois; Ph.D., University of Wisconsin, Madison
- Stutz, Jean C. (1981) *Associate Professor of Agribusiness and Environmental Resources*
 B.S., Ursinus College; M.S., University of Delaware; Ph.D., Pennsylvania State University
- Suggs, Robert E. (1987) *Associate Professor of Law*
 B.A., University of Michigan; J.D., Harvard
- Sullivan, Deborah (1976) *Associate Professor of Sociology*
 B.S., University of Massachusetts, Amherst; M.A., University of California, Irvine; Ph.D., Duke University
- Sullivan, Howard J. (1971) *Professor of Education: Acting Program Coordinator, Educational Technology*
 B.S., Oregon College of Education; M.Ed., Ph.D., University of Oregon
- Sullivan, John J. (1976) *Assistant Professor Emeritus of Education*
 B.A., Villanova University; M.A., Ph.D., Arizona State University
- Sundwall, Harry W. (1962) *Professor Emeritus of Education*
 B.S., Brigham Young University; Ph.D., University of California, Berkeley
- Sunkett, Mark E. (1976) *Associate Professor of Music*
 B.M., Curtis Institute of Music; M.M., Temple University
- Sushka, Marie E. (1984) *Professor of Finance*
 B.A., Sweet Briar College; M.A., Ph.D., Georgetown University
- Sutton, Robert K. (1986) *Assistant Professor of History*
 M.A., Portland State University; Ph.D., Washington State University
- Swafford, James R. (1971) *Assistant Professor of Microbiology*
 B.S., M.S., Arizona State University
- Swagert, S. Laird (1971) *Professor Emeritus of Political Science*
 B. in Ed., Western Illinois State Teachers College; M.A., Ph.D., University of Iowa
- Swaim, S. Daniel (1975) *Professor of Music*
 B.M., Cincinnati College Conservatory of Music; M.M.E., Indiana University; D.M.A., North Texas University
- Swartz, Teresa A. (1980) *Associate Professor of Marketing*
 B.S., M.B.A., Clarion State College; Ph.D., The Ohio State University
- Sweeney, J. Gray (1986) *Associate Professor of Art*
 B.A., University of New Mexico; M.A., Ph.D., Indiana University
- Swigert, Diane D. (1986) *Assistant Professor of Aerospace Studies*
 B.A., M.A., Brown University; M.S., University of Rhode Island
- Swimmer, Alvin (1963) *Associate Professor of Mathematics*
 B.S., Pennsylvania State University; M.S., New York University; Ph.D., University of California, Berkeley
- Swisher, Karen (1986) *Assistant Professor of Multicultural Education;*
Director, Mountain States Multifunctional Resource Center
 B.S., M.S., Northern State College;
 Ed.D., University of North Dakota
- Sylvester, Edward J. (1982) *Associate Professor of Journalism and Telecommunication*
 A.B., Princeton University; M.A., City College of New York
- Szarek, Stanley R. (1974) *Associate Professor of Botany*
 B.S., California State University, Pomona; Ph.D., University of California, Riverside
- Tambs, Lewis A. (1969) *Professor of History*
 B.S., University of California, Berkeley; M.A., Ph.D., University of California, Santa Barbara
- Tate, Donald J. (1958) *Professor Emeritus of General Business*
 B.S., Kansas State Teachers College; M.A., Ed.D., New York University
- Taylor, Jack J. (1960) *Professor of Art*
 B.S. in Art Ed., Kutztown University; M.Ed., Pennsylvania State University
- Taylor, Jacqueline (1984) *Professor of Nursing*
 B.S.N., University of Washington; M.S., University of North Carolina; Ph.D., University of Arizona
- Taylor, Janet R. (1977) *Professor of Art*
 B.F.A., Cleveland Institute of Art; M.F.A., Syracuse University

- Taylor, Thomas (1983) *Assistant Professor of Mathematics*
B.S., California State University; Ph.D., Harvard University
- Taysom, Elvin D. (1953) *Professor Emeritus of Agribusiness and Environmental Resources*
B.S., University of Idaho; M.S., Utah State University; Ph.D., Washington State University
- Tenney, Lester I. (1969) *Professor Emeritus of Finance*
B.A., University of Miami; M.A., San Diego State College; D.B.A., University of Southern California
- Tesón, Fernando R. (1984) *Associate Professor of Law*
J.D., Universidad de Buenos Aires (Argentina); I.L.M., Université Libre de Bruxelles (Belgium)
- Teye, Victor B. (1984) *Assistant Professor of Leisure Studies*
B.A., University of Ghana; M.A., Ph.D., University of Manitoba
- Theobald, Clarabelle (1962) *Associate Professor of Nursing*
B.S., Arizona State University; M.S., University of California, Los Angeles; Ph.D., Arizona State University
- Thomas, Keith J. (1975) *Associate Professor of Reading and Library Science*
B.S., Illinois State University; M.A., Loyola University; Ed.D., University of Arizona
- Thomas, M. George (1981) *Associate Professor of Sociology*
B.A., Arizona State University; M.A., Ph.D., Stanford University
- Thomason, Leslie L. (1969) *Professor Emeritus of Technology*
A.B., M.A., Ed.D., University of Oklahoma
- Thompson, Lee P. (1955) *Professor of Engineering*
B.A., Indiana University; M.S., Ph.D., Texas A&M University; P.E.
- Thompson, Truet B. (1959) *Professor Emeritus of Engineering*
B.S., B.S.E.E., Louisiana Polytechnic Institute; M.S., Oklahoma State University; Ph.D., Northwestern University
- Thomson, Jeffrey (1981) *Associate Professor of Theatre*
B.A., Ripon College; M.A., University of Washington; M.F.A., Wayne State University
- Thomson, Ronald G. (1947) *Professor Emeritus of Physical Education*
B.S., Springfield College; M.A., Arizona State University; Ed.D., University of Southern California
- Thomson, Tom R. (1961) *Professor Emeritus of Chemistry*
B.A., University of California, Berkeley; M.S., Ph.D., Kansas State University
- Thorne, Anita (1983) *Instructor of Nursing*
Diploma, Allegheny General Hospital; B.S.N.Ed., M.A., University of Pittsburgh
- Tice, Thomas E. (1967) *Professor of Engineering*
B.S.E.E., M.S.E.E., Ph.D., Ohio State University
- Tidwell, Victor H. (1971) *Professor of Accountancy*
B.S., Illinois College; M.B.A., D.B.A., Indiana University; C.P.A., Iowa and Arizona
- Tilden, Arnold (1937) *Professor Emeritus of History*
B.A., M.A., DePauw University; Ph.D., University of Southern California
- Tillery, Bill W. (1973) *Professor of Physics/Science Education*
B.S., Northeastern State College; M.A., Ed.D., University of Northern Colorado
- Tillman, Hoyt C. (1976) *Associate Professor of History*
B.A., Belhaven College; M.A., University of Virginia; A.M., Ph.D., Harvard University
- Ting-Toomey, Stella (1987) *Associate Professor of Communication*
B.A., M.A., University of Iowa; Ph.D., University of Washington
- Tippeconnic, John W. III (1976) *Associate Professor of Multicultural Education;*
B.S., Oklahoma State University; M.A., Ph.D., Pennsylvania State University *Director, Center for Indian Education*
- Tipton, Gary P. (1969) *Assistant Professor of Chinese*
B.A., Brigham Young University; Ph.D., Indiana University
- Tobiason, Sarah J. (1963-67; 1974) *Assistant Professor of Nursing*
B.S.N., Vanderbilt University; M.A., Columbia University
- Tong, Timothy (1986) *Associate Professor of Engineering*
B.S., Oregon State University; M.S., Ph.D., University of California, Berkeley
- Torrest, Robert S. (1980) *Associate Professor of Engineering*
B.S., Polytechnic Institute of Brooklyn; Ph.D., University of Minnesota

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- Towe, Bruce (1984) *Associate Professor of Engineering*
 B.S., M.S., Ph.D., Pennsylvania State University
- Towill, Leslie R. (1975) *Associate Professor of Botany*
 B.S., M.S., University of Wisconsin, Milwaukee; Ph.D., University of Michigan
- Tran, Zung V. (1986) *Assistant Professor of Physical Education*
 B.S., Clarkson University; M.Ed., Temple University; Ph.D., University of Colorado, Boulder
- Trantina, Debra (1984) *Instructor of Computer Science*
 B.S., M.S., Arizona State University
- Trelease, Richard N. (1971) *Professor of Botany*
 B.S., M.S., University of Nevada; Ph.D., University of Texas
- Trennert, Robert A. (1974) *Professor of History; Chair, Department of History*
 B.A., Occidental College; M.A., Los Angeles State College; Ph.D., University of California, Santa Barbara
- Trotter, William T. (1987) *Professor of Mathematics; Chair, Department of Mathematics*
 B.S., The Citadel; M.A., Ph.D., University of Alabama
- Tsen, Kong-Tong (1984) *Assistant Professor of Physics*
 B.S., Fu-Jen Catholic University; M.S., Ph.D., Purdue University
- Tsong, Ignatius S.T. (1981) *Professor of Physics*
 B.Sc., M.Sc., University of Leeds; Ph.D., University of London
- Tu, Eugenia Y. (1973) *Instructor of Chinese*
 B.Ed., Taiwan Normal University; B.A., Baylor Women's College; M.S., University of Arizona
- Tucker, Bonnie P., (1987) *Associate Professor of Law*
 B.S., Syracuse University; J.D., University of Colorado
- Tuma, Jan J. (1978) *Professor of Engineering*
 B.S., College of Engineering, Prague; M.S. Oklahoma State University; Ph.D., University of Colorado
- Turnbow, James W. (1959) *Professor Emeritus of Engineering*
 B.S.M.E., Texas Technological College; M.S.E.M., Ph.D., University of Texas
- Turner, Christy G., II (1966) *Professor of Anthropology*
 B.A., M.A., University of Arizona; Ph.D., University of Wisconsin, Madison
- Turner, Katharine C. (1946) *Professor Emeritus of English*
 B.Ed., Illinois State Normal; M.A., Ph.D., University of Michigan
- Tyburczy, James A. (1985) *Assistant Professor of Geology*
 B.A., Whitman College; Ph.D., University of Oregon
- Tylavsky, Daniel John (1982) *Assistant Professor of Engineering*
 B.S., M.S.E.E., Ph.D., Pennsylvania State University
- Umberger, Emily (1982) *Assistant Professor of Art*
 B.A., University of Pennsylvania; M.A., University of Texas; Ph.D., Columbia University
- Umberson, George E. (1977) *Professor of Music; Director, School of Music*
 B.M.E., Eastern New Mexico University; M.A., University of Iowa; Ed.D., University of Northern Colorado
- Underwood, Max (1985) *Assistant Professor of Architecture*
 B.S., University of Southern California; M.Arch., Princeton University
- Ung, Chginary (1987) *Associate Professor of Music*
 B.M., M.M., Manhattan School of Music; D.M.A., Columbia University
- Upchurch, Jonathan E. (1982) *Associate Professor of Engineering*
 B.S., M.S. University of Illinois; Ph.D., University of Maryland
- Valdivieso, L. Teresa (1971) *Professor of Spanish*
 B.A., M.A. in Ed., M.A., Ph.D., Arizona State University
- Valentine, Carol Ann (1975) *Associate Professor of Communication*
 B.A., M.A., University of Michigan; Ph.D., Pennsylvania State University
- Valentine, Kristin B. (1976) *Professor of Communication*
 B.S., University of Wisconsin; M.A., University of Washington; Ph.D., University of Utah

- Vallejo, Carlos J. (1976) *Associate Professor of Multicultural Education*
B.S., Chadron State Teachers College; M.A., Ed.D., University of Nebraska, Lincoln
- Van Der Mars, Hans (1986) *Assistant Professor of Physical Education*
Diploma, National Academy for Physical Education, Arnheim; M.S., Ithaca College; Ph.D., Ohio State University
- Van Hook, Barry L. (1976) *Associate Professor of General Business*
B.S., Illinois State University; M.S. in Ed., Ed.D., Northern Illinois University
- Van Orden, Guy C. (1987) *Assistant Professor of Psychology*
B.S., University of Oregon; M.A., Ph.D., University of California, San Diego
- Van Wagencn, R. Keith (1963) *Professor of Education*
B.A., Pacific Union College; M.A. in Ed., Arizona State University; Ph.D., University of Utah
- VanderMeer, Philip R. (1985) *Assistant Professor of History*
B.A., Calvin College; M.A., Ph.D., University of Illinois
- Varhue, Walter (1984) *Assistant Professor of Engineering*
B.S., University of Connecticut; M.S., Ph.D., University of Virginia
- Vasquez, Mary (1975) *Associate Professor of Spanish*
B.A., Florida State University; M.A., Ph.D., University of Washington
- Vaughan, Linda A. (1982) *Associate Professor of Family Resources and Human Development*
B.S., University of California, Davis; M.N.S., Cornell University; Ph.D., University of Arizona
- Veatch, Jeannette (1968) *Professor Emeritus of Education*
A.B., Western Michigan University; M.A., Ph.D., New York University
- Vellenga, David B. (1984) *Professor of Transportation*
A.B., Calvin College; M.B.A., University of Illinois, Urbana; Ph.D., Pennsylvania State University
- Venables, John (1986) *Professor of Physics*
B.A., Ph.D., University of Cambridge (England)
- Verdini, William A. (1976) *Associate Professor of Management Science*
B.S., Case Western Reserve University; M.B.A., D.B.A., Kent State University
- Vergis, John P. (1954) *Professor Emeritus of Education*
B.S., M.A., New York University; Ed.D., University of Southern California
- Vermaas, Willem F. J. (1986) *Assistant Professor of Botany*
Ph.D., Agricultural University, Wageningen (Netherlands)
- Vernon, Mitzi (1986) *Assistant Professor of Design*
B.S., University of North Carolina, Greensboro; M.A., Virginia Polytechnic Institute and State University
- Vestre, Norris D. (1972) *Professor of Psychology*
B.A., Ph.D., University of Minnesota
- Vining, David C. (1975) *Associate Professor of Theatre*
B.A., University of Redlands; M.F.A., University of Minnesota
- Viriden, Randy J. (1984) *Assistant Professor of Leisure Studies*
B.S., M.S., Arizona State University; Ph.D., Utah State University
- Virgillo, Carmelo (1965) *Professor of Romance Languages*
A.B., State University of New York, Albany; A.M., Ph.D., Indiana University
- Vogler, E. William (1987) *Assistant Professor of Physical Education*
B.A., Springfield College; M.A.T., New Mexico State University; Ed.D., University of Utah
- Volek, Emil (1975) *Professor of Spanish*
Prom. Phil., Ph.D., Charles University, Prague (Czechoslovakia)
- Von der Heydt, Alfred (1950) *Professor Emeritus of German*
Diploma, University of Frankfurt-on-the-Main (Germany); M.A., Yale University; Ph.D., Cornell University
- Voss, Howard G. (1964) *Professor of Physics*
A.B., Hope College; M.N.S., Arizona State University; M.S., Purdue University
- Votichenko, T. Alexander (1956) *Assistant Professor Emeritus of Philosophy*
A.B., Princeton University; M.A., Columbia University

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- Wagner, J. Bruce (1977) *Professor of Chemistry and Center for Solid State Science*
 B.S., Ph.D., University of Virginia
- Wagner, Ronald F. (1962) *Professor of Art*
 B.S., University of Wisconsin; M.F.A., University of Iowa
- Walker, Beth (1988) *Assistant Professor of Marketing*
 B.S., Virginia Polytechnic and State University; M.S., Pennsylvania State University
- Walker, Bruce J. (1974) *Professor of Marketing; Chair, Department of Marketing*
 B.A., Seattle University; M.B.A., D.B.A., University of Colorado
- Walker, John E. (1970) *Associate Professor of Educational Administration and Supervision*
 B.A., Albion College; M.A., Michigan State University; Ed.D., Utah State University
- Walker, Stephen G. (1969) *Professor of Political Science*
 A.B., Creighton University; M.A., Ph.D., University of Florida
- Wallace, Charles E. (1958) *Professor of Engineering;*
 B.S., Lewis and Clark College; *Assistant Dean, College of Engineering and Applied Sciences;*
 M.S., Oregon State University; Ph.D., Stanford University *Director, Special and Interdisciplinary Studies*
- Wallen, Carl J. (1973) *Professor of Elementary Education*
 B.A., University of California, Santa Barbara; M.A., San Francisco State College; Ed.D., Stanford University
- Walsberg, Glenn E. (1978) *Associate Professor of Zoology*
 B.S., California State University, Long Beach; Ph.D., University of California, Los Angeles
- Wamacks, Naomi W. (1968) *Associate Professor of Secondary Education;*
 B.A., M.A., Ed.D., Arizona State University *Program Coordinator, Secondary Education*
- Wang, Alan P. (1970) *Professor of Mathematics*
 B.A., Washington State University; M.A., Ph.D., University of California, Los Angeles
- Wang, Cecelia (1971) *Professor of Mathematics*
 B.A., Immaculate Heart College; M.A., Ph.D., University of California, Los Angeles
- Wang, Edward Y. (1979) *Professor of Engineering*
 B.S., Morningside College; M.S., Purdue University; Ph.D., Tufts University
- Ward, Jack W. (1964) *Associate Professor Emeritus of Construction*
 B.S.C.E., University of Idaho
- Ward, James C. (1986) *Assistant Professor of Marketing*
 B.A., M.B.A., Ph.D., University of Minnesota
- Warnicke, Retha M. (1973) *Professor of History*
 A.B., Indiana University; M.A., Ph.D., Harvard University
- Warren, Morrison F. (1968) *Professor Emeritus of Education; Director, College Relations and Development*
 B.A., M.A., Ed.D., Arizona State University
- Watkins, Thomas B. (1972) *Associate Professor Emeritus of Technology*
 B.S., University of Wyoming; M.S., Arizona State University
- Watson, Clyde W. (1971) *Associate Professor of Art*
 B.F.A., Bethany College; M.A., Kansas State University
- Watson, George L. (1969) *Associate Professor of Political Science;*
 B.A., Phillips University; M.A., Ph.D., Duke University *Acting Director, Faculty Development Program*
- Webb, L. Dean (1978) *Professor of Educational Administration and Supervision;*
 B.A., M.A.T., Ph.D., University of Florida *Associate Dean, College of Education*
- Weber, Sandra (1985) *Associate Professor of Construction*
 B.S.C.E., M.S.C.E., University of California, Berkeley
- Weeks, Lawrence B. (1983) *Clinical Professor of Law; Director, Civil Clinic*
 A.B., Harvard; J.D., University of Arizona
- Wegner, Artroll L. (1957) *Professor Emeritus of Physical Education*
 B.S., Wisconsin State College; M.S., University of Wisconsin, Madison; P.E.D., Indiana University
- Weigend, Guido G. (1976) *Professor of Geography*
 B.S., M.S., Ph.D., University of Chicago

- Weiner, Gordon M. (1968) *Assistant Professor of History*
A.B., Ph.D., University of Pennsylvania
- Weinstein, James (1986) *Associate Professor of Law*
B.A., J.D., University of Pennsylvania
- Weiss, Neil A. (1970) *Professor of Mathematics*
B.A., M.A., Ph.D., University of California, Los Angeles
- Weitz, Rose (1978) *Associate Professor of Sociology*
B.A., Lehman College, City University of New York; M.A., Ph.D., Yale University
- Welch, H. William (1967) *Professor Emeritus of Engineering*
B.A., DePauw University; M.S., Ph.D., University of Michigan, Ann Arbor; P.E.
- Wells, Barrie E. (1981) *Associate Professor of Music*
B.M., M.M., University of the Pacific; D.M.A., University of Oregon
- Wells, Christine L. (1976) *Professor of Physical Education*
B.S., University of Michigan; M.S., Smith College; Ph.D., Pennsylvania State University
- Wells, Valana L. (1987) *Assistant Professor of Engineering*
A.B., M.S., Ph.D., Stanford University
- Wentz, Richard E. (1972) *Professor of Religious Studies*
A.B., Ursinus College; B.D., Lancaster Theological Seminary; M.Phil., Ph.D., George Washington University
- Weschler, Louis F. (1980) *Professor of Public Affairs; Acting Dean, College of Public Programs*
B.A., California State University; M.A., Ph.D., University of California, Los Angeles
- West, Stephen G. (1981) *Professor of Psychology*
B.A., Cornell University; M.A., Ph.D., University of Texas
- Whiffen, Marcus (1960) *Professor Emeritus of Architecture*
B.A., M.A., University of Cambridge
- Whitam, Frederick L. (1966) *Professor of Sociology*
B.A., Millsaps College; A.M., Ph.D., Indiana University
- White, Harold C. (1966) *Professor of Management*
B.S., M.S., University of Oregon; Ph.D., University of Florida
- White, James R. (1981) *Associate Professor of Art*
B.F.A., M.F.A., Ohio University
- White, John P. (1963) *Professor Emeritus of Political Science*
A.B., University of Cincinnati; A.M., Ph.D., University of Chicago
- White, Michael J. (1974) *Professor of Philosophy*
B.A., Arizona State University; M.A., Ph.D., University of California, San Diego
- Whitehurst, Harry B. (1958) *Professor of Chemistry*
B.A., M.A., Ph.D., Rice University
- Whysong, Gary L. (1974) *Associate Professor of Agribusiness and Environmental Resources*
B.S., M.S., Montana State University; Ph.D., University of Wyoming
- Wigand, Rolf T. (1975) *Professor of Public Affairs*
B.B.A., M.A., Texas Tech University; Ph.D., Michigan State University
- Wilcox, Sidney W. (1955) *Professor Emeritus of Technology*
B.A., Bethany-Peniel College; M.A., University of Oklahoma
- Wild, Catherine E. (1986) *Assistant Professor of Art*
B.F.A., Concordia University, Quebec; M.F.A., University of Wisconsin, Madison
- Wilkins, Wendy (1986) *Assistant Professor of English*
B.A., M.A., Ph.D., University of California, Los Angeles
- Wilkinson, Joseph W. (1964) *Professor of Accountancy*
B.S., Carnegie Institute of Technology; M.B.A., Stanford University; D.B.A., University of Oregon; P.A., California
- Williams, Anne (1984) *Instructor of Nursing*
B.S.N., Cornell University; M.S., Ph.D., University of Arizona
- Williams, Frank G. (1975) *Associate Professor of Health Administration and Policy*
B.S., M.A., Oregon State University; M.A., Ph.D., University of Iowa

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- Williams, Peter (1981) *Professor of Chemistry*
 B.S., Ph.D., University of London, King's College
- Williams, Philip F. C. (1986) *Assistant Professor of Chinese*
 B.A., University of Arkansas; M.A., Ph.D., University of California, Los Angeles
- Williams, Robert C. (1978) *Associate Professor of Anthropology*
 B.A., M.A., University of Cambridge; B.A., M.A., Ph.D., University of Michigan
- Williamson, Madeline J. (1976) *Associate Professor of Music*
 B.Mus., Ohio Wesleyan University; M.M., Western Michigan University
- Willson, Loretta L. (1947) *Assistant Professor Emeritus of Communication*
 B.A., University of South Dakota; M.A., Northwestern University
- Wilson, Gail Eugene (1972) *Associate Professor of Music*
 B.S., Ohio State University; M.M., Arizona State University
- Wilson, Gloria N. (1961) *Associate Professor of General Business*
 B.A., Montclair State College; M.A., Ed.D., Columbia University
- Wilson, Jeffrey R. (1985) *Assistant Professor of Statistics*
 B.A., University of the West Indies; M.S., Ph.D., Iowa State University
- Wilson, L. A., II (1979) *Associate Professor of Public Affairs;*
 B.A., University of Nevada, Las Vegas; M.A., Ph.D., University of Oregon *Director, Center for Urban Studies*
- Wilson, Lee Ann (1980) *Associate Professor of Art*
 B.A., Beloit College; M.A., M.Phil., Ph.D., Columbia University
- Wilson, Lorna A. (1968) *Instructor Emeritus of French*
 B.Ed., University of Saskatchewan; M.A., Arizona State University
- Wilson, Patricia M. (1987) *Assistant Professor of Family Resources and Human Development*
 B.S., M.Ed., Iowa State University; Ph.D., Oklahoma State University
- Wilson, Vanessa (1986) *Assistant Professor of Social Work*
 B.S., Winston-Salem State University, North Carolina; M.S.W., D.S.W., Ohio State University, Columbus
- Wilt, Glenn A. Jr. (1963) *Associate Professor of Finance*
 A.B., Occidental College; M.B.A., Miami University; Ph.D., University of Michigan; C.F.A.
- Windhorst, Rogier A. (1987) *Assistant Professor of Physics*
 B.Sc., M.Sc., Ph.D., University of Leiden (Netherlands)
- Winer, Laurence H. (1983) *Professor of Law*
 B.A., Ph.D., Boston University; J.D., Yale University
- Winkelman, Richard D. (1965) *Associate Professor of Economics*
 A.B., Southern Illinois University; A.M., Ph.D., University of Illinois
- Winters, Jack (1985) *Assistant Professor of Engineering*
 A.B., University of California, San Diego; M.S., Ph.D., University of California, Berkeley
- Wirtz, Dorothy (1959) *Professor Emeritus of French*
 B.A., University of Iowa; M.A., Ph.D., University of Denver
- Wiseman, Douglas E. (1976) *Associate Professor of Special Education*
 B.S., M.A., Eastern Michigan University; Ph.D., University of Illinois
- Witt, Tom (1975) *Associate Professor of Design*
 B.A., M.A., M.F.A., University of California, Los Angeles
- Wixted, J. Timothy (1978) *Associate Professor of Asian Languages*
 B.A., University of Toronto; A.M., Stanford University; D.Phil., Oxford University
- Wochner, Raymond E. (1952) *Professor Emeritus of Education*
 B.S., York College; M.A., University of Nebraska, Lincoln; Ph.D., University of Wyoming
- Wolchik, Sharlene (1980) *Associate Professor of Psychology*
 B.A., Vassar College; M.S., Ph.D., Rutgers, The State University
- Wolf, Donald J. (1969) *Associate Professor of Political Science*
 B.A., M.A., Gonzaga University; S.T.M., University of Santa Clara; Ph.D., Georgetown University

- Wolf, George H. (1986) *Assistant Professor of Chemistry*
B.A., University of California, San Diego; M.S., Ph.D., University of California, Berkeley
- Wolf, Robert Lee (1985) *Professor of Design; Chair, Department of Design*
B.S. Design, Southern Illinois University; M.A. Interior Design, University of Missouri;
Cert. Konstindustriskolan, Goteborg (Sweden)
- Wollam, Owen A. (1964) *Associate Professor of French*
B.A., M.A., Montana State University; Ph.D., University of Washington
- Wong, Paul (1979) *Professor of Social Work*
B.A., M.A., Ph.D., University of California, Berkeley
- Wood, Billy G. (1977) *Associate Professor of Technology*
A.B., University of California; B.S. in Ed., Eastern Illinois University; M.S., University of Arizona
- Wood, Byard D. (1970) *Professor of Engineering; Director, Energy Systems Research Center*
B.S.M.E., M.S.M.E., Utah State University; Ph.D., University of Minnesota
- Wood, Harry (1954) *Professor Emeritus of Art*
B.A., M.A., University of Wisconsin, Madison; B.A., Ph.D., Ohio State University
- Wood, Steven D. (1975) *Professor of Decision and Information Systems; Associate Dean, College of Business*
B.S., M.A., California State University, San Diego; Ph.D., University of Wisconsin, Madison
- Woodbury, Neal W. (1987) *Assistant Professor of Chemistry*
B.S., University of California, Davis; Ph.D., University of Washington
- Woodfill, Marvin C. (1966) *Professor of Computer Science*
B.S., M.S., Ph.D., Iowa State University
- Wooding, Robert R. (1971) *Associate Professor Emeritus of Construction*
B.S., U.S. Naval Academy; B.C.E., M.C.E., Rensselaer Polytechnic Institute
- Woodman, Natalie J. (1969) *Associate Professor of Social Work*
B.A., Washington Square College of New York University; M.S.S., Smith College School of Social Work
- Woods, Roosevelt Jr. (1965) *Professor of Art*
B.S., M.A. in Ed., Arizona State University
- Woodward, Mark R. (1985) *Assistant Professor of Religious Studies*
B.A., M.A., Ph.D., University of Illinois, Champaign-Urbana
- Wooldridge, Charles B. (1959) *Associate Professor Emeritus of Engineering*
A.B., B.S., University of Kentucky; M.S., Ph.D., Purdue University
- Wooldridge, Mary C. (1959) *Assistant Professor Emeritus of Family Resources and Human Development*
B.S., M.S., University of Kentucky; Ph.D., Purdue University
- Woolf, Charles M. (1961-63; 1964) *Professor of Zoology*
B.S., M.S., University of Utah; Ph.D., University of California, Berkeley
- Woolverton, Michael W. (1981) *Associate Professor of Agribusiness and Environmental Resources*
B.S., M.B.A., Kansas State University; Ph.D., University of Missouri, Columbia
- Wooten, William W. (1959) *Associate Professor of History*
B.A., University of Chicago; M.A., University of Iowa; Ph.D., University of Minnesota
- Wrase, Jeffrey M. (1986) *Assistant Professor of Economics*
M.A., University of Wisconsin, Milwaukee; ABD, Brown University
- Wrean, C. Gilbert (1965) *Professor Emeritus of Counselor Education*
A.B., Willamette University; M.A., Ph.D., Stanford University; LL.D., Willamette University
- Wright, M. Lin (1973) *Professor of Theatre; Chair, Department of Theatre*
B.A., M.A., Ph.D., University of Minnesota
- Wu, HoFu (1984) *Assistant Professor of Architecture*
B.Arch., Tankang University, Taiwan; M.Arch., University of Illinois
- Wulk, Ned W. (1957) *Assistant Professor Emeritus of Physical Education*
B.S., Wisconsin State University; M.Ed., Xavier University
- Wurzell, Carol A. (1965) *Assistant Professor of Nursing*
B.S., Chico State College; M.S., University of Maryland

504 RESIDENT FACULTY

- Wyckoff, Susan (1979) *Professor of Physics/Astronomy*
B.A., Mount Holyoke College; Ph.D., Case Western Reserve
- Wyndelts, Robert (1974) *Associate Professor of Accountancy*
B.B.A., M.P.A., Georgia State University; Ph.D., University of Georgia; C.P.A., Georgia, Arizona
- Wytko, Joseph R. (1975) *Professor of Music*
B.M.E., West Virginia University; M.M., D.M., Northwestern University
- Yale, Francis G. (1952) *Associate Professor Emeritus of Physics/Science Education*
A.B., M.A., University of Northern Colorado; Ed.D., Columbia University
- Yao, Lun-Shin (1981) *Professor of Engineering*
B.S.E., Cheng Kung University; M.S., University of Texas; Ph.D., University of California, Berkeley
- Yeater, James W. (1958) *Professor of Theatre*
B.A., Baker University; M.A., University of Washington; Ph.D., University of Illinois
- Yeh, Der Yun (1985) *Assistant Professor of Computer Science*
B.S., M.S., National Chiao-Tung University; Ph.D., Northwestern University
- Young, Dennis L. (1975) *Professor of Mathematics*
B.S., St. Louis University; M.S., Ph.D., Purdue University
- Young, Hewitt H. (1967) *Professor Emeritus of Engineering*
B.S.M.E., M.S.I.E., Case Institute of Technology; Ph.D., Arizona State University
- Young, Joseph E. (1979) *Associate Professor of Art*
B.A., California State College; M.A., University of California, Los Angeles
- Young, Otis E. Jr. (1963) *Professor Emeritus of History*
A.B., A.M., Ph.D., Indiana University
- Young, Paul H. (1981) *Associate Professor of Technology*
B.S.E.E., M.S.F.E., San Jose State University
- Youngblood, Robert L. (1972) *Associate Professor of Political Science*
B.A., Willamette University; M.A., University of Hawaii; Ph.D., University of Michigan
- Yuen, George U. (1957) *Professor of Chemistry*
B.S., Arizona State University; Ph.D., University of Utah
- Zacher, Robert V. (1947) *Professor Emeritus of Advertising*
B.S. in B.A., M.S.B.A., University of Alabama
- Zaniewski, John (1986) *Assistant Professor of Engineering*
B.S.C.E., M.S.C.E., Ph.D., University of Texas, Austin
- Zaslow, Bertram (1956) *Professor of Chemistry*
B.A., Cornell University; M.S., University of Minnesota; Ph.D., Iowa State University
- Zatz, Marjorie S. (1982) *Assistant Professor of Justice Studies*
B.A., University of Massachusetts; M.A., Ph.D., Indiana University
- Zautra, Alex (1976) *Associate Professor of Psychology; Director, Clinical Program in Psychology*
B.A., Antioch College; M.S., Ph.D., University of Utah
- Zimmer, Carl R. (1959) *Associate Professor of Engineering*
B.S.E.E., Cornell University; M.S.E.E., Ph.D., Syracuse University
- Zomow, Ruth A. (1970) *Professor of Nursing*
B.S., Case Western Reserve University; M.Ed., Ed.D., Columbia University
- Zucker, Stanley H. (1975) *Professor of Special Education*
B.A., State University of New York, Stony Brook; M.S., Hofstra University; Ph.D., University of Missouri, Columbia
- Zwiebel, Imre (1979) *Professor of Engineering; Chair, Department of Chemical, Bio and Materials Engineering*
B.S., University of Michigan; M.S., Ph.D., Yale University
- Zygas, K. Paul (1984) *Assistant Professor of Architecture*
A.B., M.Archt., Harvard University; Ph.D., Cornell University

ASU West Campus Resident Faculty

- Baskin, Otis W. (1987) *Academic Director, Business and Administrative Services; Professor of Management*
B.A., Oklahoma Christian College; M.A., University of Houston, University Park; Ph.D., University of Texas, Austin
- Burt-Way, Barbara J. (1986) *Assistant Professor of Political Science*
B.A., Ph.D., University of California, Riverside
- Cardenas, Lupe (1986) *Assistant Professor of Spanish*
B.A., M.A., Ph.D., Arizona State University
- Connell, Charles W. (1987) *Acting Academic Director, Arts and Sciences*
B.A., M.A., University of Cincinnati; Ph.D., Rutgers, The State University
- Davids, Sharon L. (1986) *Coordinator, Nursing Program; Acting Academic Director, Human Services*
B.S., University of Illinois; M.S., Northern Illinois University
- Dix, Clarence L. (1979) *Coordinator, Social Work*
B.S., Buena Vista College; M.S., University of Chicago
- Eder, Robert W. (1987) *Assistant Professor of Management*
B.A., The Colorado College; M.S., Case Western Reserve University; D.B.A., University of Colorado
- Elawar, Maria Cardelle (1987) *Faculty Associate of Education*
B.S., Instituto de Mejoramiento Profesional del Magisterio; M.S., University of Southern California;
Ph.D., Stanford University
- Eribes, Richard A. (1976) *Assistant Vice President for Planning and Facilities Development,*
B.Arch., M.Arch., Ph.D., University of Southern California
Professor of Planning
- Felder, B. Dell (1985) *Dean of Faculty; Professor of Education*
B.S., M.S., Ph.D., University of Texas, Austin
- Garver, George G. (1987) *Acting Academic Director, Education*
B.A., Iowa State Teachers College; M.A., University of Michigan; Ed.D., Michigan State University
- Gundersen, Dennis F. (1986) *Assistant Professor of Communication*
B.A., Bowling Green State University; M.A., Arizona State University; Ph.D., University of Texas, Austin
- Haas, Nancy S. (1986) *Assistant Professor of Instructional Design*
B.A., M.Ed., Ph.D., Arizona State University
- Haladyna, Thomas M. (1986) *Associate Professor of Educational Research and Measurement*
B.A., Illinois State University; M.A., San Jose State University; Ph.D., Arizona State University
- Iverson, Peter (1986) *Professor of History*
B.A., Carleton College; M.A., Ph.D., University of Wisconsin, Madison
- Knopf, Richard C. (1986) *Associate Professor of Leisure Studies*
B.A., M.A., University of Minnesota; Ph.D., University of Michigan
- Malekzadeh, Ali R. (1987) *Assistant Professor of Management*
B.S., M.B.A., University of Denver; Ph.D., University of Utah
- Metz, Elayne R. (1986) *Assistant Professor of Music*
B.A.Ed., Temple University; M.M., Ed.D., Arizona State University
- Mueller, Carol M. (1988) *Assistant Professor of Sociology*
B.A., University of California, Berkeley; M.A., Rutgers, The State University; Ph.D., Cornell University
- Nahavandi, Afsaneh (1987) *Visiting Assistant Professor of Management*
B.A., University of Denver; M.A., Ph.D., University of Utah
- Nolen, Susan B. (1986) *Assistant Professor of Learning Theory*
B.A., Portland State University; M.Ed., Lewis and Clark College; Ph.D., Purdue University
- Novak, Gayle J. (1986) *Visiting Assistant Professor of Art*
B.F.A., M.F.A., Arizona State University
- Pyne, Stephen J. (1986) *Associate Professor of History*
B.A., Stanford; M.A., Ph.D., University of Texas, Austin
- Schabacker, Joseph C. (1963) *Professor of Management; Special Assistant for Academic Affairs*
B.S., Temple University; M.B.A., Ph.D., University of California, Los Angeles
- Schade, Thomas V. (1976) *Coordinator, Justice Studies; Associate Professor of Justice Studies*
B.A., Hope College; M.A., Ph.D., Western Michigan University

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- Shirreffs, Janet H. (1977) *Acting Academic Director, Arts and Sciences; Professor of Health Science*
B.S., Ithaca College; M.S., Syracuse University; Ph.D., Texas Woman's University
- Smith, Jack (1986) *Professor of Engineering*
B.S.E.E., M.S.E.E., Ph.D., University of Arizona
- Stryker, Linda L. (1987) *Program Coordinator, Math/Science; Faculty Associate*
B.A., Whitier College; B.A., M.S., San Diego State University; M.A., Los Angeles State University; Ph.D., Yale University
- Svoboda, William S. (1969) *Acting Academic Director, Education and Human Services;*
Professor of Education
B.S., M.S., Ed.D., University of Kansas
- Vaughan, Suzanne (1987) *Assistant Professor of Sociology*
B.A., Roanoke College; M.A., University of New Mexico; Ph.D., Ohio State University
- Williams, Dudley A. (1986) *Lecturer in Communication*
B.A., University of Maryland; M.A., University of Hawaii; Ph.D., University of Ohio
- Wilson, Daniel (1986) *Associate Professor of Engineering*
B.S., Drexel University; M.S.E., Ph.D., Arizona State University

Associated Faculty

INTERCOLLEGIATE ATHLETICS

- Brock, James L. (1971) *Instructor; Head Baseball Coach*
B.A., M.A., Ed.D., Arizona State University
- Douglas, Bobby E. (1974) *Lecturer; Wrestling Coach*
B.S., Oklahoma State University; M.A., Arizona State University
- Littlewood, Mary L. (1965) *Assistant Professor; Softball Coach*
B.S., Miami University; M.S., University of Colorado
- Robinson, Don R. (1968) *Instructor of Sports Psychology; Men's Gymnastics Coach*
B.A., University of Northern Colorado; M.S., Eastern New Mexico University
- Young, Troy L. (1971) *Instructor; Head Trainer*
B.S., Fort Hays State College; M.S., Indiana University

VISITING PROFESSORS

- Alabau, Fatiha (1987) *Visiting Assistant Professor of Mathematics*
Ph.D., Université Pierre et Marie Curie, Paris
- Anderson, Wyatt W. (1987) *Distinguished Visiting Professor of Mathematics*
- Bilimoria, Karl D. (1987) *Visiting Assistant Professor of Engineering*
B.Tech., Kanpur, India; M.S., Ph.D., Virginia Polytechnic Institute and State University
- Britten, Dennis (1987) *Visiting Assistant Professor of Theatre*
B.A., M.A., State University of New York, Stony Brook
- Britton, David (1987) *Visiting Assistant Professor of Music*
- Chamberlain, Raymond E. III (1987) *Visiting Assistant Professor of Chemistry*
B.A., M.A., Northern Michigan University; Ph.D., University of Nevada, Reno
- Cohen, Moss (1987) *Visiting Assistant Professor of Dance*
B.A., Bennington College
- Coke, VanDeren (1987) *Distinguished Visiting Professor of Art*
M.F.A., University of Kentucky; post M.F.A., Harvard University
- Cook, Paul (1987) *Invitational Lecturer of English*
B.A., Northern Arizona University; M.A., Arizona State University; Ph.D., University of Utah
- Cree, Dale R. (1987) *Visiting Associate Professor of Construction*
B.S., M.S., Michigan State University; Certificate of Business Management, University of California, Los Angeles
- Dietrich, Suzanne W. (1987) *Visiting Assistant Professor of Computer Science*
B.S., M.A., Ph.D., State University of New York

- Dubno, Judy R. (1987) *Visiting Professor of Speech and Hearing Science*
M.S., Ithaca College-New York; Ph.D., City University of New York
- Granger, Percy (1986) *Visiting Lecturer in Theatre*
B.A., Harvard College
- Hacker, Thomas O. (1986) *Distinguished Visiting Professor of Architecture*
M.Arch., University of Pennsylvania
- Helszajn, Joseph (1987) *Distinguished Visiting Professor of Engineering*
M.S.B.E., University of California; Ph.D., University of Leeds, England
- Herald, Cherry L. (1986) *Visiting Associate Professor of Cancer Research Institute*
Ph.D. Arizona State University
- Hilger, Mark W. (1987) *Visiting Instructor of Physical Education*
B.S., Northern Illinois University, M.S., Arizona State University
- Hornung, Ulrich (1987) *Visiting Professor of Mathematics*
Ph.D., Munster
- Hunt, Blanche Sherman (1985) *Visiting Assistant Professor of Education*
B.S., State University of New York, Buffalo; M.A., Ph.D., Arizona State University
- Ikegami, Kazukuni (1981) *Visiting Assistant Professor of Architecture*
B.S.E., Osaka Institute of Technology; M.Arch., University of Texas, Austin
- Islam, Obaidul (1980) *Visiting Professor of Engineering*
B.Sc. (M.E.), University of Dacca; M.S., Texas A&M University; Ph.D., Arizona State University
- Jackiewicz, Zdzislaw (1987) *Visiting Associate Professor of Mathematics*
M.Sc., Technical University of Gdansk; M.Sc., Ph.D., University of Gdansk
- Jefferson, David A., (1987) *Visiting Professor, Center for Solid State Science*
Ph.D., Selwyn College, Cambridge
- Keefer, Donald L. (1987) *Visiting Associate Professor of Decision and Information Systems*
B.S., Carnegie-Melon University; M.S., Stanford University; M.S., Ph.D., University of Michigan
- Knight, George P. (1986) *Visiting Associate Professor of Psychology*
B.A., Macalester College; M.A., Ph.D., University of California, Riverside
- Kroloff, Reed A. (1987) *Visiting Assistant Professor of Architecture*
B.A., Yale University; M.Arch., University of Texas, Austin
- Lessner, Richard (1983) *Visiting Assistant Professor of Religious Studies*
B.A., Pacific Christian; M.Div., Southern Baptist Theological Seminar; Ph.D., Baylor University
- Matt, Kathleen S. (1987) *Visiting Assistant Professor of Zoology*
M.S., University of Delaware; Ph.D., University of Washington
- Musgrave, Ted R. (1985) *Visiting Assistant Professor of Chemistry*
Ph.D., University of Colorado
- Myers, Barton (1986) *Distinguished Visiting Professor of Architecture*
M.Arch., University of Pennsylvania
- Nelson, Edwin S. (1983) *Visiting Assistant Professor of Religious Studies*
B.A., Platte Valley Bible College; M.A., Gordon-Conwell Theological Seminary; Ph.D., Boston University
- Olszewski, Deborah I. (1987) *Visiting Assistant Professor of Anthropology*
B.A., Colorado State University; M.A., Ph.D., University of Arizona
- Pittsley, Janice M. (1987) *Visiting Associate Professor of Art*
M.F.A., University of Georgia
- Predock, Antoine (1980) *Distinguished Visiting Professor of Architecture*
M.Arch., Columbia University
- Saddler, Ivan R. (1984) *Visiting Assistant Professor of Technology*
B.S.E.E., University of Texas, El Paso
- Saile, David G. (1987) *Visiting Associate Professor of Architecture*
M.Arch., University of Illinois; Ph.D., Newcastle upon Tyne
- Seely, Gilbert (1986) *Visiting Research Professor of Chemistry*
B.A., Harvard University; Ph.D., University of California, Berkeley

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- Serwint, Nancy (1987) *Visiting Assistant Professor of Art*
M.A., University of Chicago; Ph.D., Princeton
- Sheorey, Rekha S. (1984) *Visiting Assistant Professor of Chemistry*
B.S., Northern Illinois University; M.A., Ph.D., Columbia University
- Smith, Jeffrey B. (1987) *Visiting Instructor in Music*
M.M., University of Illinois, Urbana
- Spence, Clark (1987) *Distinguished Visiting Professor of History*
M.A., University of Colorado; Ph.D., University of Minnesota
- Spritzer, Ralph S. (1986) *Visiting Professor of Law*
B.S., U.L.B., Columbia University
- Sutton, John C. (1986) *Visiting Assistant Professor of Technology*
B.A., Indiana University; M.A., University of Central Arkansas; Ph.D., University of Tennessee
- Tang, Betty (1987) *Visiting Assistant Professor of Mathematics*
Ph.D., University of Southern California
- Tao, Jing-Guang (1987) *Visiting Professor of Chemistry*
- Vandenberg, Edwin (1983) *Visiting Research Professor of Chemistry*
M.E., Stevens Institute of Technology
- Walker, Lawrence R. (1987) *Visiting Associate Professor of Business*
M.B.A., Ph.D., Temple University
- Wittenberg, George K. (1980) *Visiting Assistant Professor of Chemistry*
Ph.D., Arizona State University
- Woodward, Mark R. (1985) *Visiting Assistant Professor of Religious Studies*
B.A., M.A., Ph.D., University of Illinois
- Woolsey, D. Kristine (1987) *Visiting Assistant Professor of Architecture*
B.S., Georgia Institute of Technology; M.Arch., Arizona State University
- Zetzer, Alfred (1987) *Visiting Professor of Music*
B.M., Cleveland Institute of Music

LECTURERS

- Alexander, James (1984) *Lecturer of Public Affairs*
B.A., University of Missouri; M.B.A., Arizona State University
- Becker, M. Ray (1987) *Lecturer of Public Affairs*
B.A., Indiana University; M.P.A., Golden Gate University
- Counts, Richard (1985) *Lecturer of Public Affairs*
A.B., Williams College; J.D., University of Chicago
- Debolske, John J. (1978) *Lecturer of Public Affairs*
B.S., Loyola University, Los Angeles; M.P.A., University of California, Los Angeles
- DesJardin, Margaret E. (1949) *Lecturer Emeritus of Dance*
- Driggs, Ken (1984) *Lecturer of Public Affairs*
B.A., M.S., Brigham Young University
- Ferrall, J. Eleanor (1969) *Lecturer of Public Affairs*
A.B., Heidelberg College; M.A., Arizona State University
- Gale, Betty J. (1982) *Lecturer of Nursing*
Diploma, Evangelical Deaconess Hospital; B.S.N., M.S., Arizona State University
- Gibbs, Christine (1980) *Lecturer of Public Affairs*
B.A., University of Arizona; M.P.A., Arizona State University
- Herzik, Mary D. (1988) *Lecturer of Public Affairs*
B.A., M.A., University of North Carolina, Chapel Hill
- Horwitch, Arnold M. (1974) *Lecturer of Humanities*
Ph.B., University of Chicago; M.A., Arizona State University; M.S., Lowell Technological Institute

- Ingraham, Leonard W. (1973) *Lecturer Emeritus of Education*
 B.S., City College of City University; M.A., Ed.D., Teachers College, Columbia University
- Jamieson, Bill Jr. (1980) *Lecturer of Public Affairs*
 B.A., University of Arizona; M.S., Georgia State University
- Kastenbaum, Beatrice (1982) *Lecturer of Nursing*
 B.S.N., University of Michigan; M.S.N., Wayne State University
- Krings, Elizabeth L. (1985) *Lecturer of Manufacturing Technology*
 B.A., College of St. Mary; M.A., University of Nebraska, Omaha
- Landrith, David (1984) *Lecturer of Public Affairs*
 B.A., Arizona State University; M.P.A., Harvard University
- Lea, John H. (1980) *Lecturer of Management*
 B.S., M.B.A., Arizona State University
- Luey, Beth (1980) *Senior Lecturer of History; Director, Historical Editing and Publishing*
 B.A., Radcliffe College; A.M., Harvard University
- Manion, Patrick W. (1980) *Lecturer of Public Affairs*
 B.A., M.P.A., Arizona State University
- Martin, Lawrence L. (1987) *Lecturer of Public Affairs*
 B.S., Arizona State University; M.I.M., American Graduate School of International Management;
 M.S.W., Ph.D., Arizona State University
- Nelson, Gordon L. (1983) *Lecturer of Technology*
 B.S., M.S., Oklahoma State University; M.A.A., University of Washington
- Olson, Clark D. (1984) *Lecturer of Communication; Director, Forensics*
 B.A., Iowa State University; M.S., University of Utah; Ph.D., University of Minnesota
- Roberts, Nancy (1987) *Lecturer in Economics*
 B.A., University of Texas, Arlington; B.S., M.S. Arizona State University
- Twist, Steve (1980) *Lecturer of Public Affairs*
 B.A., J.D., Arizona State University
- Vanacour, Martin (1987) *Lecturer of Public Affairs*
 B.A., State University of New York, Buffalo; M.P.A., New York University
- Weidemaier, William (19__) *Lecturer in The University Honors Program*
 B.A., Northern Arizona University; M.A., Ph.D., Arizona State University
- Wiggins, Harry B. (1986) *Senior Lecturer of Purchasing, Transportation and Operations*
 B.S., U.S. Merchant Marine Academy; B.S., University of Vermont; M.B.A., Harvard
- Wright, Lewis J. (1985) *Senior Lecturer of General Business;*
 B.A., Mt. Union College *Director, Hahn Center for Entrepreneurship and Innovation*

ADJUNCT AND OTHER FACULTY

- Adams, Lori (1987) *Faculty Associate of Theatre*
 B.A.E., Wayne State College; M.F.A., University of Nebrasks
- Andrade, Edna W. (1986) *Adjunct Professor of Art*
 B.F.A., Pennsylvania Academy of the Fine Arts and University of Pennsylvania
- Askin, Walter M. (1986) *Adjunct Professor of Art*
 B.A., M.A., University of California, Berkeley
- Ayres, James E. (1982) *Adjunct Instructor of Anthropology*
 B.A., Fresno State University; M.A., University of Arizona
- Bacon, Roxana C. (1987) *Faculty Associate of Law*
 B.A., J.D., University of California, Berkeley
- Bales, W. Scott (1987) *Faculty Associate of Law*
 B.A., Michigan State University; J.D., Harvard University
- Bjotvedt, George (1987), *Adjunct Professor of Bioengineering*
 B.S. Widner University; V.M.D., University of Pennsylvania

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- Breunig, Robert G. (1982) *Adjunct Assistant Professor of Anthropology*
 B.A., Indiana University, Bloomington; Ph.D., University of Kansas, Lawrence
- Campbell, David G. (1987) *Faculty Associate of Law*
 B.S., J.D., University of Utah
- Canby, William C., Jr. (1967) *Faculty Associate of Law*
 A.B., Yale University; L.L.B., University of Minnesota
- Close, Richard A. (1985) *Adjunct Professor of Architecture*
 M.Arch., University of Wisconsin, Milwaukee
- Conaway, Mary Ellen (1985) *Adjunct Assistant Professor of Anthropology*
 B.A., University of California, Riverside; M.A., University of Wisconsin, Milwaukee; Ph.D., University of Pittsburgh
- Costilow, Ralph N. (1982) *Adjunct Professor of Microbiology*
 B.A., West Virginia University; M.S., North Carolina State College; Ph.D., Michigan State College
- Coursen, Jerry (1987) *Adjunct Associate Professor of Bioengineering*
 B.S., M.S., Arizona State University; Ph.D., University of Arizona
- Cox, Jerry R. (1984) *Adjunct Associate Professor of Agriculture*
 B.S., M.S., New Mexico State University; Ph.D., University of Wyoming
- Cree, Dale R. (1987) *Visiting Associate Professor of Construction*
 B.S., M.S., Michigan State University
- Cross, James (1986) *Adjunct Professor of Art*
 B.A., University of California, Los Angeles
- Dahlberg, Albert A. (1981) *Adjunct Professor of Anthropology*
 B.S., Loyola University, Chicago; D.D.S., Loyola University, Chicago
- Daspit, C. Phillip (1981) *Adjunct Associate Professor of Speech and Hearing Science*
 B.S., M.D., Louisiana State University
- DeBano, Leonard F. (1983) *Adjunct Associate Professor of Agriculture*
 B.S., Colorado State University; M.S., Utah State University; Ph.D., University of California, Berkeley
- Dockstader, Frederick J. (1983) *Adjunct Professor of Art*
 A.B., M.A., Northern Arizona University; Ph.D., Western Reserve University
- Dover, C. J. (1982) *Adjunct Professor of Communication*
 B.A., Kent State University; M.A., Western Reserve University
- Downs, Catherine A. (1983) *Faculty Associate of Clinical Laboratory Sciences*
 B.S., Arizona State University; M.A., Central Michigan University
- Doyel, David E. (1985) *Adjunct Associate Professor of Anthropology*
 B.A., University of Arizona; M.A., Ph.D., California State University, Chico
- Dragos, Stephen G. (1984) *Adjunct Professor of Architecture*
 B.Arch., University of Notre Dame
- Duane, Drake D. (1987) *Adjunct Professor of Speech and Hearing Science*
 A.B., University of Michigan, M.D., Wayne State University
- Eggers, W. P. Eberhard (1986) *Adjunct Professor of Art*
 Freie Waldorf Schule (Gymnasium), Hannover, West Germany
- Euler, Robert C. (1983) *Adjunct Professor of Anthropology*
 B.A., M.A., Northern Arizona University; Ph.D., University of New Mexico
- Fisk, R. Leighton (1979) *Adjunct Professor of Bioengineering*
 B.S., M.S., Ph. D., University of Alberta
- Ford, George H. (1981) *Adjunct Assistant Professor of Anthropology*
 A.B., Kansas University, Lawrence; M.A., Ph.D., Arizona State University
- Foster, Joyce (1972) *Adjunct Professor of Zoology*
 B.A., M.A., DePauw University; Ph.D., Arizona State University
- Gemmill, Robert M. (1983) *Adjunct Professor of Zoology*
 B.A., University of Connecticut; Ph.D., Cornell University
- Gerbert, Elaine (1981) *Faculty Associate of Japanese*
 B.A., University of California, Berkeley; M.A., University of Chicago

- Gibbs, W. R. (1987) *Adjunct Professor of Physics*
 B.S., M.A., University of Texas; Ph.D., Rice University
- Glick, Paul C. (1982) *Adjunct Professor of Sociology*
 B.A., Depauw University; M.A., Ph.D., University of Wisconsin, Madison
- Glicken, Virginia (1987) *Faculty Associate of Nursing*
- Glover, Michael R. (1987) *Faculty Associate of Law*
 B.A., Stanford University; J.D., University of California, Berkeley
- Gustavson, Carl R. (1983) *Adjunct Associate Professor of Center for Environmental Studies*
 B.S., M.S., Ph.D., University of Utah
- Hammond, Lawrence A. (1987) *Faculty Associate of Law*
 B.A., J.D., University of Texas
- Hecht, Frederick (1978) *Adjunct Professor of Zoology*
 B.A., Dartmouth College; M.D., University of Rochester
- Hendrix, Donald Louis (1981) *Adjunct Associate Professor of Botany; Plant Physiologist,*
 B.A., Central Washington University; *U.S.D.A. Agricultural Research Service*
 M.S., University of Washington; Ph.D., Washington State University
- Hild, Nicholas R. (1984) *Adjunct Associate Professor of Center for Environmental Studies*
 B.S., M.S., University of Iowa; Ph.D., Union Graduate School
- Horton, Paul B. (1983) *Adjunct Professor of Sociology*
 B.A., Kent State University; Ph.D., Ohio State University
- Hueffner, Debra (1986) *Faculty Associate, Audiology Supervisor of Speech and Hearing Science*
 B.S., University of Iowa; M.S., University of Arizona
- Hunt, Chester L. (1985) *Adjunct Professor of Sociology*
 A.B., Nebraska Wesleyan University; M.A., Washington University, St. Louis; Ph.D., University of Nebraska, Lincoln
- Idso, Sherwood B. (1984) *Adjunct Professor of Botany; Research Physicist,*
 B.S., M.S., Ph.D., University of Minnesota *U.S.D.A. Agricultural Research Service*
- Johnson, Randall A. (1984) *Adjunct Associate Professor of Agriculture*
 B.S., California State Polytechnic University, Pomona; M.S., Ph.D., University of Missouri, Columbia
- Johnston, Hubert (1986) *Clinical Associate Professor of Social Work*
 B.S., Cheyney State College; M.A., Central Michigan University; Ph.D., Cornell University
- Kehrer, Laura (1982) *Faculty Associate of Nursing*
 B.S., Alverno College; M.S., Arizona State University
- Kenny, Kathryn W. (1979) *Adjunct Lecturer in Speech and Hearing Science;*
 B.S., M.S., Arizona State University *Clinical Supervisor, Speech and Hearing Clinic*
- Kiessling, George C. (1987) *Faculty Associate of Construction*
 B.S.Ch.E., M.S.Ch.E., Rensselaer Polytechnic Institute
- Kimerer, Karen (1976) *Faculty Associate of Education*
 B.A., California State University; M.A., Ed.D., Arizona State University
- Kirk, W. Max (1987) *Faculty Associate of Construction*
 B.A.E., Eastern Washington University; B.S., Washington State University
- Kisslinger, Leonard S. (1982) *Adjunct Professor of Physics*
 B.S., St. Louis University; M.S., Ph.D., Indiana University
- Koff, Theodore H. (1982) *Adjunct Assistant Professor of Social Work*
 M.S., Columbia University; Ed.D., University of Arizona
- Koeneman, James B. (1984) *Adjunct Professor of Bioengineering*
 B.S., University of Minnesota; M.S., Ph.D., Case Western Reserve University
- Livingston Jr., Donald E. (1987) *Faculty Associate of Foreign Languages*
 M.A., University of Arizona
- Lopez, Patricio P., III (1987) *Faculty Associate of Law*
 B.A., University of Arizona; J.D., Stanford University
- Lutz, Robert E. (1979) *Faculty Associate of Construction*
 B.S.M.E., Texas A&M University

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- Maez, Lento F. (1987) *Faculty Associate; Assistant Director of Mountain State Resource Center*
Ph.D., University of California, Santa Barbara
- Maresca, Robert L. (1977) *Adjunct Associate Professor of Speech and Hearing Science*
B.A., Yale University; M.D., Albany Medical
- Marsh, Paul C. (1980) *Adjunct Associate Professor of Zoology*
B.A., M.S., University of Connecticut; Ph.D., University of Minnesota
- Mass, Diana (1974) *Faculty Associate of Clinical Laboratory Sciences*
B.S., University of Texas, Austin; M.S., Central Michigan University
- Maxwell, Kenneth L. (1984) *Adjunct Professor of Political Science*
B.A., Denisen University; M.Div., Colgate Rochester Divinity School; Ph.D., Yale University
- McCaw, Barbara K. (1978) *Adjunct Professor of Zoology*
B.A., M.A., Stanford University; Ph.D., University of Oregon
- Meneses, Eloise H. (1986) *Adjunct Assistant Professor of Anthropology*
B.A., University of Washington, Seattle; M.A., Ph.D., University of San Diego
- Mennuti, Louis (1987) *Faculty Associate of Foreign Languages*
M.A., Arizona State University; M.A., University of Missouri
- Meyerson, Bruce E. (1987) *Faculty Associate of Law*
B.S., Arizona State University; J.D., Georgetown University
- Mintz, Sandra L. (1986) *Faculty Associate; Audiology Supervisor of Speech and Hearing Science*
B.A., Indiana University; M.S., University of Arizona
- Mogey, John M. (1987) *Adjunct Professor of Sociology*
B.A., M.A., D.Sc., Queen's University, Belfast (Northern Ireland)
- Mudgett, Carol A. (1983) *Adjunct Assistant Professor of Anthropology*
B.A., M.A., Ph.D., University of Nebraska, Lincoln
- Nabham, Gary (1987) *Adjunct Professor of Botany*
B.A., Prescott College, M.S., Ph.D., University of Arizona
- Obitz, Fred (1975) *Adjunct Assistant Professor of Psychology*
B.A., University of Colorado; M.A., Ph.D., University of Utah
- Osmon, Fred L. (1983) *Adjunct Professor of Architecture*
M.Arch., University of Pennsylvania
- Osmond, Eric (1979) *Faculty Associate of Construction*
Fellow, Construction Survey Institute, London
- OSSIPov, Helene (1987) *Instructor of Foreign Languages*
M.A., University Of Indiana
- Pace, Karen (1987) *Faculty Associate of Nursing*
B.S.N. Southern Illinois University; M.S.N., St. Louis University
- Patton, David R. (1984) *Adjunct Associate Professor of Agriculture*
B.S., West Virginia University; M.S., Virginia Polytechnic Institute; Ph.D., University of Arizona
- Perrell, Richard C. (1976) *Clinical Assistant Professor of Architecture*
B.A., Christian Brothers College
- Pizziconi, Vincent B. (1987) *Faculty Associate of Bioengineering*
B.S., University of Lowell; M.S., Ph.D., Arizona State University
- Platero, Paul R. (1986) *Adjunct Assistant Professor of Anthropology*
M.S., Ph.D., Massachusetts Institute of Technology
- Prather, William F. (1980) *Adjunct Professor of Speech and Hearing Science*
B.A., University of California; M.A., Ph.D., University of Iowa
- Radin, John W. (1982) *Adjunct Professor of Botany; Plant Physiologist, U.S.D.A. Agricultural Research Service*
B.S., Ph.D., University of California
- Raudebaugh, Robert A. (1987) *Faculty Associate of Industrial Technology*
B.S., M.A., Northern Arizona University; Ed.D., Arizona State University
- Raudzens, Peter A. (1986) *Adjunct Associate Professor of Speech and Hearing Science*
M.D., Queen's University, Kingston, Ontario (Canada)

- Roberts, Lauren C. (1984) *Faculty Associate of Clinical Laboratory Sciences*
 B.S., St. Norbert College; M.S. University of Illinois, Chicago
- Saar, David (1987) *Faculty Associate of Theatre*
 B.A., Valparaiso University; M.A., Arizona State University
- Saegusa, Kyoko (1981) *Faculty Associate of Foreign Languages*
 B.A., Japan Women's University, Tokyo; M.A., Arizona State University
- Sample, Tish (1978) *Adjunct Associate Professor of Anthropology*
 A.B., Whitman College; M.A., University of California; Ph.D., University of Wisconsin
- Severson, Kieth E. (1983) *Adjunct Associate Professor of Agriculture*
 B.A., University of Minnesota; M.S., Ph.D., University of Wyoming
- Sievers, Gary (1987) *Faculty Associate of Theatre*
 B.S., Northwestern University; M.A., University of California, Los Angeles
- Smith, Linda Wheeler (1982) *Adjunct Assistant Professor of Anthropology*
 A.B., Oberlin College, Ohio; M.A., Ph.D., Arizona State University
- Snyder, Richard C. (1979) *Adjunct Professor of Political Science*
 A.B., Union College, Schenectady; M.A., Ph.D., Columbia University
- Soleri, Paolo (1975) *Adjunct Professor of Architecture*
 D.Arch., Politecnico di Torino
- Spaulding, Glenn (1986) *Adjunct Associate Professor of Bioengineering*
 B.S. Monmouth College; M.S., Southern Illinois University; M.D., University of Illinois
- Stark, Louisa R. (1981) *Adjunct Professor of Anthropology*
 B.A., Barnard College; M.A., Columbia University; Ph.D., New York University
- Stott, Brian (1983) *Adjunct Professor of Engineering*
 B.S., M.S., Ph.D., University of Manchester (Great Britain)
- Sutton, Samuel J. (1975) *Faculty Associate of Law*
 B.A., B.S., University of Arizona; J.D., George Washington University
- Szivek, John (1986) *Adjunct Associate Professor of Bioengineering*
 B.A.S.C., M.A.S.C., Ph.D., University of Toronto
- Thomsen, Jean (1987) *Faculty Associate of Theatre*
 B.A., Macalester College; M.A., Arizona State University; M.F.A., University of Arizona
- Vaughan, Carl R. (1987) *Faculty Associate of Construction*
 B.A., Dennison University; B.S., Carnegie-Mellon University; M.S., Arizona State University
- Van Egmond, Warren (1987) *Faculty Associate of Philosophy and the University Honors Program*
 B.A., University of Michigan; M.A., Ph.D., Indiana University
- Von Dreele, Robert B. (1971) *Adjunct Professor of Chemistry*
 B.S., Ph.D., Cornell University
- Wachtel, Thomas L. (1985) *Adjunct Professor of Bioengineering*
 A.B., Case Western Reserve University; M.D., St. Louis University
- Watson, Sandra L. (1986) *Faculty Associate of Clinical Laboratory Sciences*
 B.S., University of Nebraska Medical Center
- Wehinger, Peter A. (1981) *Research Specialist, Physics*
 B.S., Union College, Schenectady; M.S., Indiana University, Bloomington; Ph.D., Case Institute of Technology
- Weinstein, Allan M. (1983) *Adjunct Professor of Bioengineering*
 B.S., M.S., Ph.D., Polytechnic Institute of Brooklyn
- Welsh, Peter H. (1986) *Adjunct Assistant Professor of Anthropology*
 B.A., Northern Arizona University; M.A., Ph.D., University of Pennsylvania, Philadelphia
- Westie, Frank R. (1983) *Adjunct Professor of Sociology*
 B.S., Central Michigan University; Ph.D., Ohio State University
- Whaley, Patricia (1975) *Adjunct Lecturer in Speech and Hearing Science; Director, Speech and Hearing Clinic*
 B.S., M.Ed., University of Georgia B.A., Beloit College
- Wilson, Gregory P. (1979) *Faculty Associate of Construction*
 B.S., M.S., Arizona State University

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- Zettler, Hugo F. (1977) *Faculty Associate of Law*
B.S., Arizona State University; J.D., University of Arizona
- Zylla, Julie M. (1979) *Faculty Associate of Family Resources and Human Development*
B.S., South Dakota State University; M.S., Arizona State University

University Libraries

- Anderson, Marcia L. (1986) *Associate Librarian, Acquisitions*
A.B., University of Michigan; M.S., Wayne State University
- Biblarz, Dora (1980) *Associate University Librarian, Collection Development*
B.A., M.L.S., University of California, Los Angeles; M.A., University of California, Davis
- Blouin, Deborah K. (1971) *Associate Librarian, Reference Service*
B.A., Cedar Crest College; M.L.S., State University of New York, Albany
- Borovansky, Vladimir R. (1968) *Librarian; Head, Noble Library*
M.L.S., Charles University, Prague (Czechoslovakia)
- Bray, Sandra (1987) *Assistant Librarian, Acquisitions*
B.A., Ottawa University; M.L.S., Indiana University
- Brownson, Charles W. (1980) *Associate Librarian, Collection Development*
B.A., South Dakota State University; M.A., University of Oregon; M.L.S., University of California, Berkeley
- Brunning, Dennis R. (1984) *Assistant Librarian, Reference Service*
B.A., University of Iowa; M.A., M.L.S., University of Illinois, Urbana-Champaign
- Burke, Rebecca J. (1981) *Assistant Librarian, Government Documents Service*
B.A., San Jose State University; M.L.S., University of Arizona
- Casey, Donis (1984) *Assistant Librarian; Head, Government Documents Service*
B.S., University of Tulsa; M.L.S., University of Oklahoma
- Conrow, Jane A. (1968) *Assistant University Librarian, Space Management and Planning*
B.A., M.L.S., Indiana University
- Corey, Constance H. (1973) *Assistant University Librarian, Management Services*
B.A., Denison University; M.L.S., University of Arizona; M.B.A., Arizona State University
- DeFato, Rosalinda (1970) *Associate Librarian, Reference Service*
B.A., St. John's University; M.L.S., University of California, Los Angeles
- Dusenbury, Carolyn A. (1980) *Librarian; Head, Reference Service*
B.S., University of California, Santa Barbara; M.L.S., University of California, Los Angeles
- Ferrall, J. Eleanor (1969) *Librarian, Reference Service*
A.B., Heidelberg College; M.A., Arizona State University
- Friedman, Catherine (1983) *Assistant Librarian, Reference Service*
A.B., M.S., University of Illinois
- Howard, Pamela F. (1986) *Assistant Librarian, Reference Service*
B.A., San Diego State University; M.A., M.L.S., University of California, Los Angeles
- Knepp, Kenneth B. (1968) *Associate Librarian, Original Cataloging*
B.A., University of the Pacific; B.D., Garrett Theological Seminary; M.A., University of Denver
- Leibold, Anne M. (1977) *Associate Librarian, Reference Service*
M.A., University of Paris
- Loechell, Jan L. (1987) *Assistant Librarian, Science Reference Service*
B.A., University of Colorado, Boulder; M.A., University of Denver
- Machovec, George S. (1977) *Head of Library Technology and Systems*
B.S., M.L.S., University of Arizona
- Marin, Christine N. (1985) *Assistant Archivist*
B.A., M.A., Arizona State University
- McColgin, Rhonda L. (1970) *Associate Librarian, Original Cataloging*
B.A., Arizona State University; M.S.L.S., University of Southern California

- McDonald, Arlys L. (1970) *Associate Librarian; Head, Music Library*
B.Mus., St. Mary of the Plains College; M.Mus., University of Illinois
- McGehee, Shelley (1985) *Assistant Librarian, Music Library*
B.Mus., Converse College; M.Mus., M.L.S., University of Alabama
- Milam, Sheila A. (1986) *Assistant Librarian, Original Cataloging*
A.B., Indiana State University; M.L.S., University of Alabama
- Miller, Rosanna (1974) *Associate Librarian; Head, Map Service*
B.A., M.A., Arizona State University; M.L.S., University of Arizona
- Mulvihill, Josepha Anne (1983) *Assistant Librarian, Reference Service*
B.S., University of Kansas; M.L.S., Emporia State University
- New, Frances Y. (1986) *Assistant Librarian, Science Reference Service*
B.S., Seattle Pacific University; M.L.S., University of Arizona
- Oetting, Edward (1983) *Associate Archivist; Head, Archives and Manuscripts*
B.A., University of Michigan; M.A., University of Illinois; M.S.L.S., Wayne State University
- Palais, Elliot S. (1959-62; 1966) *Librarian, Collection Development*
B.A., Bowdoin College; A.M.L.S., University of Michigan
- Pinckard, Mary-Margaret (1982) *Associate Librarian; Head, Science Reference Service*
B.S., University of New Hampshire; M.L.S., University of Arizona
- Potter, William G. (1985) *Librarian, Technical Services, Automation and Systems*
B.A., Southern Illinois University, Edwardsville; M.A., M.S., Ph.D., University of Illinois, Urbana-Champaign
- Redman, Betsy J. (1988) *Assistant Librarian, Acquisitions*
B.S., M.L.S., University of Arizona
- Reneker, Maxine H. (1985) *Associate University Librarian, Public Services*
B.A., Carleton College; A.M., University of Chicago
- Rhodes, Diane B. (1980) *Assistant Librarian, Original Cataloging*
B.S., College of William and Mary; M.L.S., University of Wisconsin, Madison
- Rich, Stephen K. (1976) *Assistant Librarian, Reference Service*
B.A., Amherst College; M.L.S., Indiana University
- Richardson, Jeanne M. (1985) *Associate Librarian, Collection Development*
B.A., Lawrence University; M.A., M.S., Columbia University
- Riggs, Donald E. (1979) *University Librarian*
B.A., Glenville State College; M.A., West Virginia University; M.L.S., University of Pittsburgh;
Ed.D., Virginia Polytechnic Institute and State University
- Ruppe, Carol V. (1962) *Librarian Emeritus, Reference Service*
B.A., University of New Mexico; M.A., University of Denver
- Sager, Harvey M. (1977) *Assistant Librarian, Library Instructional Services*
B.A., San Francisco State College; M.A., California State University, Chico; M.A., University of Denver
- Schneberger, Lois I. (1969) *Librarian; Head, Original Cataloging*
B.A., Viterbo College; M.L.S., Kansas State Teachers College
- Shackle, Linda A. (1984) *Assistant Librarian, Science Reference Service*
B.A., State University of New York, Oswego; M.L.S., State University of New York, Albany
- Stern, H. David (1984) *Assistant Librarian, Science Reference Service*
B.S., University of Connecticut; M.L.S., M.A., Indiana University
- Stewart, Douglas J. (1982) *Assistant Librarian, Reference Service*
B.A., M.A., University of Colorado; M.A., University of Denver
- Swaty, Mary A. (1968) *Associate Librarian, Original Cataloging*
B.A., University of Missouri; M.L.S., Indiana University
- Sylvester, Virginia R. (1981) *Assistant Librarian, Access Services*
B.A., Hobart and William Smith Colleges; M.L.S., Rutgers University
- Thau, Richard (1986) *Assistant Librarian, Reference Service*
B.A., Queens College, City University of New York; M.L.S., Indiana University, Bloomington

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Vanderhoff, Barbara A. (1968)	<i>Associate Librarian, Acquisitions; Head, Serial Records</i>
B.A., Fort Hays Kansas State College; M.A., University of Denver		
Varca, Susan (1984)	.....	<i>Associate Librarian; Head, Library Instructional Services</i>
B.A., Florida State University; M.L.S., Louisiana State University		
Voth, Annette (1978)	.....	<i>Associate Librarian, Music Library</i>
B.Mus., University of Kansas. Lawrence; M.L.S., M.A., University of California, Berkeley		
Walters, Sheila A. (1971)	.....	<i>Associate Librarian, Science Reference Service</i>
B.A., University of Oklahoma; M.L.S., Louisiana State University		
Williams, Jenny L. (1967)	.....	<i>Associate Librarian, Original Cataloging</i>
B.A., M.A., Indiana University		
Wu, Ai-hwa (1964)	.....	<i>Associate Librarian, Original Cataloging</i>
B.A., National Taiwan University; M.L.S., University of Washington		
Wurzburger, Marilyn J. (1960)	.....	<i>Associate Librarian; Head, Special Collections</i>
B.A., MacMurray College		
Yao, Winberta M. (1975)	.....	<i>Associate Librarian, Reference Service</i>
B.A., University of California; M.S., Columbia University		

Law Library

Alcorn, Marianne S. (1981)	.....	<i>Associate Librarian, Reference</i>
B.A., University of Washington; M.L.S., University of Southern California		
Au, Chih-Chun (1970)	.....	<i>Librarian; Head, Technical Services</i>
B.A., National Taiwan University; M.A., University of Chicago		
Chase, Marcelle P. (1983)	.....	<i>Associate Librarian, Reference/International Law</i>
M.L.S., Ball State University; J.D., University of Brussels (Belgium)		
Firestone, Sharon A. (1977)	.....	<i>Librarian, Acquisitions and Serials</i>
B.A., M.L.S., University of Washington; M.A., Arizona State University		
Larson, Donna Rae (1972)	.....	<i>Librarian, Government Documents</i>
B.A., M.A.L.S., University of Michigan		
Nash, Richard M. (1976)	.....	<i>Assistant Director, Law Library</i>
B.A., University of Missouri, Kansas City; M.A.L.S., University of Denver; J.D., Drake University		

University Academic Organization

Academic Administration

Vice President for Academic Affairs	.....	<i>C. R. Haden</i>
Associate Academic Vice President	.....	<i>Elmer R. Gooding</i>
Assistant Academic Vice President (Acting)	.....	<i>Paul Hubbard</i>
Assistant Academic Vice President (Acting)	.....	<i>Richard L. Smith</i>
Assistant Academic Vice President	.....	<i>Maurine A. Fry</i>
Assistant Academic Vice President	.....	<i>Miguel Montiel</i>
Assistant to the Vice President for Academic Affairs	.....	<i>Linda Van Scoy</i>
Fiscal Operations Administrator	.....	<i>Dianne Lux Wigand</i>
Manager, Academic Facilities	.....	<i>Jack Shafer</i>
Manager, Academic Scheduling	.....	<i>Madelyn Wright</i>

Colleges and Schools

College of Architecture and Environmental Design	.....	<i>John Meunier, Dean</i>
College of Business	.....	<i>John Kraft, Dean</i>
College of Education	.....	<i>Gladys S. Johnston, Dean</i>
College of Engineering and Applied Sciences	.....	<i>George C. Beakley, Jr., Dean</i>

College of Fine Arts	<i>Seymour L. Rosen, Dean</i>
College of Law	<i>Paul Bender, Dean</i>
College of Liberal Arts and Sciences	<i>Samuel A. Kirkpatrick, Dean</i>
College of Nursing	<i>Janelle C. Krueger, Dean</i>
College of Public Programs	<i>Louis F. Weschler, Acting Dean</i>
School of Social Work	<i>Jesse F. McClure, Dean</i>
ASU West Campus	<i>B. Dell Felder, Dean</i>
Graduate College	<i>Brian L. Foster, Dean</i>

ASU West Campus

ADMINISTRATION

Vice President for ASU West Campus	_____
Dean of Faculty	<i>B. Dell Felder</i>
Assistant Vice President for Planning and Facilities Development	<i>Richard A. Eribes</i>
Assistant Vice President for Administrative Services	<i>Barry R. Grans</i>
Special Assistant for Academic Affairs	<i>Joseph C. Schabacker</i>
Academic Director, Applied Sciences, Engineering, and Technology	_____
Acting Academic Director, Arts and Sciences	<i>Charles W. Connell</i>
Academic Director, Business and Administrative Services	<i>Otis W. Baskin</i>
Acting Academic Co-Directors, Education and Human Services	<i>George G. Garver, Sharon L. Davids</i>
Acting Director, Student Services	<i>Mary Hayden-John</i>
Associate Librarian and Director, West Campus Library	<i>Helen L. Gater</i>
Director, External Affairs and Marketing	<i>Donald R. Campbell</i>
Director, Operations	<i>Steffany K. Knirsch</i>
Director, Planning and Institutional Research	<i>Sheila L. Ainlay</i>

The University Honors Program

University Honors Program	<i>Ted Humphrey, Director</i>
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Instruction Units

Accountancy, School of	<i>Joseph Schultz Jr., Director</i>
Aeronautical Technology	_____, Chair
Aerospace Studies	<i>Col. Larry Carrigan, Chair</i>
Agribusiness and Environmental Resources, School of	<i>George Seperich, Director</i>
Anthropology	<i>Charles Redman, Chair</i>
Architecture, School of	<i>Roger L. Schluntz, Director</i>
Art, School of	<i>Leonard Lehrer, Director</i>
Botany	<i>Milton R. Sommerfeld, Chair</i>
Chemical, Bio and Materials Science Engineering	<i>Imre Zwiebel, Chair</i>
Chemistry	<i>William Glaunsinger, Chair</i>
Civil Engineering	<i>Charles O'Bannon, Chair</i>
Communication	<i>Robert Goyer, Chair</i>
Computer Science	<i>Robert Barnhill, Chair</i>
Construction and Technology, School of	<i>Paul E. Russell, Director</i>
Construction	<i>William Badger, Chair</i>
Curriculum and Instruction, Division of	<i>Betty Greathouse, Director</i>
Elementary Education	<i>William Ray, Program Coordinator</i>
Early Childhood Education	<i>Joan Moyer, Program Coordinator</i>
Reading and Library Science	<i>Nicholas Silvaroli, Program Coordinator</i>
Multicultural Education	<i>Annanelle Hardt, Program Coordinator</i>
Media/Computer Based Education	<i>Gary Bitter, Program Coordinator</i>
Special Education	<i>Kenneth Howell, Program Coordinator</i>
Secondary Education	<i>Naomi Wamacks, Program Coordinator</i>
Post-baccalaureate Program	_____, Program Coordinator

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Dance	<i>Elizabeth C. Lessard, Chair</i>
Decision and Information Systems	<i>Craig Kirkwood, Chair</i>
Design	<i>Robert Wolf, Chair</i>
Economics	<i>William Boyes, Chair</i>
Educational Leadership and Policy Studies, Division of	<i>Nicholas Appleton, Director</i>
Higher Education	<i>Robert Huff, Program Coordinator</i>
Social and Philosophical Foundations	<i>Michael Belok, Program Coordinator</i>
Education Administration and Supervision	<i>Thomas Metos, Program Coordinator</i>
Electrical and Computer Engineering	<i>Richard Saeks, Chair</i>
Electronic and Computer Technology	<i>Albert McHenry, Chair</i>
Engineering, School of	<i>George C. Beakley, Jr., Director</i>
Engineering Core and Special and Interdisciplinary Programs	<i>George C. Beakley, Jr., Director/Dean</i>
English	<i>Gretchen M. Bataille, Chair</i>
Family Resources and Human Development	<i>Gary Peterson, Chair</i>
Finance	<i>Richard Smith, Chair</i>
Foreign Languages	<i>Peter Horwath, Chair</i>
General Business	<i>Lohnie J. Boggs, Chair</i>
Geography	<i>Patricia Gober, Chair</i>
Geology	<i>Ronald Greeley, Chair</i>
Health and Physical Education	<i>Robert Pangrazi, Chair</i>
Health Administration and Policy, School of	<i>Eugene Schneller, Director</i>
History	<i>Robert Trennert, Chair</i>
Industrial and Management Systems Engineering	<i>J. Bert Keats, Acting Chair</i>
Industrial Technology	<i>Louis J. Pardini, Chair</i>
Journalism and Telecommunication, Walter Cronkite School of	<i>Douglas A. Anderson, Director</i>
Justice Studies, School of	<i>John Hepburn, Director</i>
Leisure Studies	<i>Arthur Haley, Chair</i>
Management	<i>Larry Penley, Chair</i>
Marketing	<i>Bruce Walker, Chair</i>
Manufacturing Technology	<i>Donald Kelley, Chair</i>
Mathematics	<i>William T. Trotter, Chair</i>
Mechanical and Aerospace Engineering	<i>Donovan L. Evans, Chair</i>
Microbiology .....	....., Chair
Military Science	<i>Col. Lanny Standridge, Chair</i>
Music, School of	<i>George Umberson, Director</i>
Philosophy	<i>Gregory Fitch, Chair</i>
Physics	<i>Richard Jacob, Chair</i>
Planning	<i>Richard Lai, Acting Chair</i>
Political Science	<i>Ruth Jones, Chair</i>
Psychology	<i>Stanley Parkinson, Chair</i>
Clinical Psychology	<i>Paul Karoly, Director</i>
Psychology in Education, Division of	<i>Gerry Helmstadter, Director</i>
Counseling Psychology	<i>John Horan, Program Coordinator</i>
Educational Psychology	<i>Gerry Helmstadter, Program Coordinator</i>
Educational Technology	<i>Howard Sullivan, Program Coordinator</i>
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APPENDIX A



MEMORANDUM _____

Office of the President
965-5057

July 1, 1987

TO : The Arizona State University Community
 RE : Equal Employment Opportunity and Affirmative Action

Arizona State University has come a long way towards achieving our goals in affirmative action, but clearly, we still have a long way to go. Though it is a long and winding road, I am personally committed to the goal of equal employment opportunity and affirmative action.

The Affirmative Action Plan for 1987/88 is designed to further diversify the representation of women and minorities in several key job groups: executive, administrative, managerial, faculty, professional, clerical and administrative support, technical, skilled crafts, and service and maintenance. University wide, we are underutilized in these job groups, meaning women and minorities are not fully represented in each respective job group. The plan sets forth the policy guidelines and standards for achieving the stated goals in recruiting and selecting women and minorities. In addition, action-oriented programs of commitment show how these goals will be achieved.

Another important feature of the plan for 1987/88 addresses the issues surrounding the retention of women and minorities in the workforce. It is not enough for us to recruit and hire women and minorities; every effort must be made to retain them.

Although goals are not required for other protected class members, i.e., the aged, handicapped, Vietnam era veterans, and disabled veterans, equal opportunity and consideration will be given to these protected class members.

To demonstrate my personal commitment to equal opportunity and affirmative action, I will implement the following activities within the next fiscal year:

1. Hire an employment recruiter who will specialize in developing program resources to attract qualified women and minority candidates to ASU.
2. Examine additional means to expand the participation of women and minorities in the planning and construction phases of the main and west campuses. This examination will be completed by the university's general counsel and its director of purchasing.
3. Hire a consultant or consulting firm to conduct a review of recruiting and retention plans, policies, procedures, and practices for ASU faculty, staff, and students of diverse social and ethnic backgrounds.
4. Continue to incorporate equal employment opportunity and affirmative action efforts and results into each manager's annual objectives and performance evaluation.

It is my expectation that every member of my staff will make substantive efforts to assure that our Affirmative Action Program exceed any efforts made in the past. In addition the office of Assistant to the President for Equal Employment Opportunity and Affirmative Action will continue to advise the staff and monitor each activity through to completion.

And finally, I am requesting that you, the university community, join me in removing barriers that hinder equal opportunity and establish an environment that clearly says, *We care for all of our people at Arizona State University.*

J. Russell Nelson
 President

APPENDIX B

**UNIVERSITY POLICY
FOR
STUDENT APPEAL PROCEDURES
ON GRADES**

Informal: The steps outlined below, beginning with Step A, must be followed by any student seeking to appeal a grade. Student grade appeals must be filed in the regular semester immediately following the issuance of the grade in dispute, regardless of whether the student is enrolled at the university. It is university policy that students filing grievances and those who are witnesses will be protected from retaliation. Students who believe they are victims of retaliation should immediately contact the dean of the college in which the course is offered.

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 send its recommendations to 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 are recommended) may 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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Cover

Photo / Student Services Building by John C. Phillips.

Production

Composition and Typesetting / Katty Samchuck, ASU Program Coordinator; Bruce Long, Editorial Assistant; Rogelio Corella; Juanita Hernandez.

ASU Editorial Coordination / Linda Van Scoy.

Production Coordination / Publication Design Center.

Printing / Evans Press, Fort Worth, Texas.

Photos

ASU Media Production—Pages 9, 19, 77, 316, 413; Conley Photography—Pages 21, 69, 169; Cusumano Photography—Page 371; Hans DeBano Photos—Pages 100, 182, 306; Roger Dube Photo—Page 195; Engineering Graphics Department Photo—Page 283; Pat Fenn Photos—Pages 227, 409; John C. Phillips Photos—Pages 75, 223, 377; David Ragsdale Photo—Page 418; Jim Thomson Photo—Page 95; Eric Yeater Photo—Page 403; Larry Woodall Photo—Page 365; Lenny Zbiegien Photo—Page 20.

