

The General Studies requirements for students in the College of Engineering and Applied Sciences include *approved* selections made from the areas of study listed below. Students in the Divisions of Agriculture, Construction, and Technology should consult their advisor for a list of approved selections. *Students in the School of Engineering* should make selections as approved by their advisor in accordance with the additional provisions given under *General Studies in the School of Engineering*.

	<i>Semester Hours</i>
BEHAVIORAL AND SOCIAL SCIENCES	8
<i>Aerospace studies, anthropology, business administration, criminal justice, cultural geography, economics, education (educational and social and philosophical foundations), engineering, health education, history, home economics, mass communications, military science, political science, psychology, sociology.</i>	
HUMANITIES AND FINE ARTS	8
<i>Architecture, art, dance, theatre, English for foreign languages, interdisciplinary humanities, music, philosophy, speech.</i>	
SCIENCES AND MATHEMATICS	8
<i>Agriculture, biology, botany, chemistry, engineering, geology, mathematics, physical geography, physics, psychology, zoology.</i>	
GENERAL STUDIES ELECTIVES	12

General Studies in the School of Engineering. The humanities and social science requirements for students pursuing a baccalaureate program in engineering are more closely structured than for other degree programs, as follows:

1. Total hours required for humanities and social studies
2. A minimum of 8 semester hours in humanities and 8 semester hours in social sciences is required.

3. It is recommended that at least 6 of the 17 semester hours total be 300- or 400 level courses.
4. It is recommended that the student select two courses from the same department (6 hours or more) from either Group A or Group B.
5. ECN 201 Principles of Economics is a *required* selection in the social studies category.
6. Sciences, mathematics and the General Studies electives requirements are met by the Engineering Core.
7. Special interests of the students may be satisfied by selection of courses from Groups A and B below:

GROUP A:

Humanities and Fine Arts

Art History: ARH 101, 102, 300, 400, 401, 402, 403, 404, 405, 406, 407

Architectural Philosophy: APH 100, 313, 314

English: ENG literature courses only

Foreign Language: literature courses in the 300 or 400 level series

Humanities: HUM 101, 102, 301, 302, 303, 304, 320, 321, 401, 402

Music: MUS 107

Philosophy: PHI 301, 302, 330, 340

GROUP B:

Behavioral and Social Sciences

Analysis and Systems (Engineering): ASF 402, 403

Anthropology: ASB 102, 311, 315, 321, 322, 323, 333, 335, 351, 355, 414, 415, 416, 421, 479

Civil Engineering: CEE 371, 471

Cultural Geography: CUG 121, 141, 251, 253, 352, 361, 362, 441

Economics: ECN 100, 201, 202, 305, 311, 331, 336, 341, 441, 473

History: HIS 100, 101, 102, 103, 104, 303, 304, 331, 332, 333, 337, 338, 339, 401, 403, 404, 405, 406, 407, 408, 409, 410, 411, 417, 418, 419, 433, 434, 449

Mechanical Engineering: MEE 201, 300, 301, 302, 401

Political Science: POS 100, 250, 260, 300, 431, 432, 435, 437, 438, 439, 440, 441, 442, 470

Psychology: PGS 100, 315, 341, 350, 414, 458

Sociology: SOC 101, 250, 251, 301, 332, 352, 432, 452, 453, 454, 455, 456, 483, 485

Division of Agriculture

R. R. CHAIQUYST, D.V.M., Ph.D., *Director*

Purpose

The Division of Agriculture provides the foundation for professional development in four fields of specialization: ag-industry, bio agricultural sciences, engineering of agricultural systems, and environmental resources in agriculture. Bio-agricultural sciences and environmental resources in agriculture have a scientific orientation, whereas ag-industry and engineering of agricultural systems are functional, industry oriented fields. The more traditional study of the life cycle of animals and plants is expanded to include analysis of the effects of environment, either to enhance or inhibit desired production of a particular agricultural organism. The ag-industry field focuses on the operational functions and management of the broad spectrum of agriculturally related industries (from the sup

ply of resources and services needed by producers of agricultural commodities, to the processing and marketing of raw agricultural products, to the management of food and fiber processing plants). The multi disciplinary curricula integrate the fundamentals of physical, biological and social sciences with mathematics, engineering and business, and broaden the student's scope within either: (a) modern, agricultural science and environmental resources, or (b) relevant ag industry. Unique opportunities are available to study the relationship of agriculture to warm, and climatic conditions and to the rural urban interface

The Division also provides relevant agricultural courses for those already in ag-industry positions but who have had little or no college level work in agriculture, as well as for those enrolled in other colleges and departments who are planning to go into ag industry positions.

Organization

The Division of Agriculture is composed of students, faculty, administrators, staff and physical facilities including the ASU Field Laboratory. Subject matter is organized in the following manner: ag industry, bio agricultural sciences, engineering of agricultural systems, and environmental resources in agriculture. These fields of specialization involve areas of emphasis described below from which a student is to make selection.

Degrees

Bachelor of Science (B.S.). A minimum of 126 semester hours of credit, including University General Studies, the Division and field cores, and area of emphasis courses lead to the Bachelor of Science de

gree. Forty percent of the semester hours required for graduation must be upper division.

Master of Science (M.S.). Curricula leading to the Master of Science degree are offered. Requirements for this degree are given in the Graduate College catalog.

Curricula in Agriculture

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

Agriculture Core

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

		<i>Semester Hours</i>
BAS 130	Plant Science	3
BAS 150	Animal Science	3
ERA 325	Soils	3
ERA 346	Conservation of Renewable Resources	3
AGI 380	Government Regulations in Agriculture	3
	<i>Total</i>	<u>15</u>

Fields of Specialization with areas of emphasis

Four fields of specialization are provided within which several areas of emphasis are permitted. Each field includes a specified core of courses. Further, each area of em-

phasis will require specialized agricultural courses, a selection of additional hours from a list of supporting courses, and enough electives to complete the program. All of these are to be selected in consultation with an advisor.

AC INDUSTRY: (Agribusiness Management, International Agriculture)

BIO AGRICULTURAL SCIENCES: (Nutritional Sciences, Physiological Sciences, Pre Veterinary Medicine)

ENGINEERING OF AGRICULTURAL SYSTEMS

ENVIRONMENTAL RESOURCES IN AGRICULTURE: (Environmental Horticulture, Natural Resource Management)

Ag-Industry. The ag-industry field of specialization covers the management and operational functions of the broad spectrum of agricultural industries. These include the supply of resources and services needed by producers of agricultural commodities, the processing and marketing of raw agricultural products and the management of food and fiber processing plants. It is designed to give the student academic knowledge regarding food and fiber production and marketing in a form that can be applied to the business and operational aspects of agricultural industries. Included in this field are courses to prepare graduates to enter jobs with companies providing supplies to the farm and those who process the products of the farm. It also embodies preparation for government regulatory agencies, quality control specialties and many technical positions related to agricultural production, distribution and food manufacturing.

Students selecting ag-industry as a field of specialization are required to take the following courses:

AG-INDUSTRY CORE

		<i>Semester Hours</i>
ECN	201 Principles of Economics	3
CHM	101 Introductory Chemistry	4
AGI	312 Agricultural Marketing	3
BAS	350 Nutritional Science	3
AGI	364 Food Technology	3
AGI	402 Farm Cooperatives	3
AGI	443 Agribusiness Management	3
AGI	453 World Agricultural Resources	3
<i>Total</i>		25

Areas of emphasis in this field are:

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

International Agriculture relates world wide agricultural resources to the food and fiber requirements and production potentials of the various nations. Particular emphasis is given to agricultural production in arid countries and to international trade organizations. This area is specifically designed to train either the U.S. or foreign student to work in the development of agricultural potential in the world. It provides a basic knowledge of U.S. agricultural techniques and extends to the global aspects of agriculture. Graduates in this area should be particularly qualified to aid in the development of the world's agricultural potential to provide food to meet the world's food

needs. Jobs exist in the commercial agricultural industry sector, U.S. government agencies and foreign government agencies

Bio-Agricultural Sciences. The bio-agricultural sciences field of specialization is concerned with the study of the scientific aspects of agriculture. It focuses on the biological functions of domestic animals and plants. These functions include the study of birth, growth, development, nutrition, reproduction, and adaptation to the various environmental factors.

Students selecting bio-agricultural sciences as a field of specialization are required to take the following courses:

BIO AGRICULTURAL SCIENCES CORE:

		<i>Semester Hours</i>
MAT	141 Mathematics for the Social, Life and Management Sciences	4
CHM	113 General Chemistry	4
BIO	101 Biological Principles and Processes	4
CHM	231 Elementary Organic Chemistry or CHM 331 and 335 General Organic Chemistry (4)	4
CHM	361 and 367 Elementary Biochemistry	4
BAS	350 Nutritional Science	3
<i>Total</i>		23

Areas of emphasis in the field are:

Nutritional Sciences concerns the study of nutrients, their requirements, metabolism and uses for animals, plants and man. This area also permits the student to select greater depth of learning in animal nutrition, plant nutrition, or foods for man. It is a broad based nutritional area designed to prepare students for future graduate work or to accept jobs in the agricultural industry,

government, or, very importantly, in solving the food crisis of the world.

Physiological Sciences concentrates on the study of the biological functions and their control in animals and plants. These functions are studied under normal conditions as well as their adaptation to environmental changes and adverse conditions, such as stress and disease. This area of emphasis is based on the physiological functions of both animals and plants but does permit selection by the student for greater depth in either. It is intended to prepare students for future graduate work or to accept scientifically related jobs in the agricultural industry, medicine, government or colleges.

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. It is also designed to provide the completion of all requirements for a Bachelor of Science degree in Agriculture at Arizona State University by completing additional credits, if desired. A pre veterinary medicine student who elects to earn a Bachelor of Science degree in the Division of Agriculture may do so by taking three years at ASU, completing 94 semester hours of credit, with a minimum of 60 semester hours at ASU, and by completing the agriculture and General Studies requirements. The student may then receive a written statement from the Dean of the College of Engineering and Applied Sciences giving senior in absentia privileges. The student will be eligible to receive the B.S. degree after the Registrar's Office receives a recommendation from the dean of the professional school and a transcript of credit indicating the student has completed

a total of 126 semester hours with a cumulative index of 2.00 or better.

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

Engineering of Agricultural Systems. The engineering of agricultural systems is a field of specialization that combines the engineering sciences with agriculture. Agriculture has become highly automated, particularly under the intensified management systems currently practiced. Engineering knowledge is vital to design and maintain the automated equipment from the planting of the seed to the packaging of processed foods. Graduates can enter a challenging field of engineering with ample opportunities in the agricultural industry or governmental agencies.

Students selecting engineering of agricultural systems as a field of specialization are required to take the following courses:

ENGINEERING OF AGRICULTURAL SYSTEMS CORE:		<i>Semester Hours</i>
CHM 113	General Chemistry for Engineers	4
	or CHM 114 General Chemistry for Engineers	4
	or ECE 118 Chemical Foundations of Engineering (4	4
MAT 120	and 121 Calculus I and II	10
MAT 212	Calculus III	5
ECE 102	Introduction to Engineering	2
ECE 104	Engineering Graphics and Design	2
ECE 122	Computer Programming	2
ECE 201	Mechanics and Heat	4

ECE 202	Electrical Science	4
AGI 364	Food Technology	3
ERA 326	Soils Laboratory	1
ERA 333	Water Resources, Quality and Utilization	3
<i>Total</i>		40

Environmental Resources in Agriculture.

Agricultural success depends largely on the available environmental resources, such as air, water, soil and others related to plant and animal life. Variations in these resources, both natural and man made, are considered. Four different environments are identified. These include the rangelands, cultivated croplands, urban landscapes and controlled environments. Students in this field should acquire a fundamental understanding of the functions of air, water, soil and other resources in their relation to plant and animal life. This field is designed for students interested in the management of our resources and their role in the environmental crisis.

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

ENVIRONMENTAL RESOURCES IN AGRICULTURE CORE:		<i>Semester Hours</i>
BIO 101	and 102 Biological Principles and Processes	8
MAT 141	Mathematics for the Social, Life and Management Sciences	4
CHM 113	General Chemistry	4
ERA 326	Soils Laboratory	1
BAS 360	Crop Physiology	3
ERA 333	Water Resources, Quality and Utilization	3
ERA 501	Recent Advances in Environmental Resources	1

ERA 548	Plants, Soils and Environmental Quality	3
<i>Total</i>		27

Areas of emphasis in this field are:

Environmental Horticulture is designed to help beautify the areas around homes, gardens, industry and the general landscape. Increased urbanization results in a very different plant population than existed on farms. The lawns, shrubs, trees, flowers and home gardens involve specific requirements for plants, seeds, fertilizers, pesticides and machinery. Specialized plant knowledge by the homeowner as well as for trained nurserymen and individuals skilled in plant maintenance and landscaping is required. Public areas, particularly parks and golf courses, require skilled management by superintendents. Production of crops in climate controlled greenhouses is emphasized as an important agricultural enterprise in arid and urban areas. Skilled production on small areas, be it for food, beauty or recreation, is the focal point. Graduates of this area are particularly qualified for employment in nurseries, parks, and greenhouse enterprises.

Natural Resource Management emphasizes application of ecological principles for description, development, and conservation of a variety of resource systems. Major systems considered include rangelands, forests, deserts and agricultural lands. Planning and management of land areas receiving potentially heavy and often conflicting utilization are considered. Undergraduate majors are advised to obtain a broad education emphasizing man's use of natural resources and the impact of these uses on the environment. Participating students are well prepared for an active role in today's society as well as for a career in environmental resource management. Students interested in

range management can qualify as range conservationists by selecting appropriate supporting courses. Students planning to emphasize timber management should enroll in this area for their pre-forestry curriculum.

Students taking 300- and 400 level courses as part of their approved graduate program must indicate the graduate credit option in the appropriate location on the Course Request Option form.

Agriculture

Professors:

CHALQUEST (AG 221), BARRETT, MILLER
MONTY MOODY RICHARDSON, ROBINSON
STILES, TAYSOM

Associate Professors:

LYTLE, RASMUSSEN

Assistant Professors:

BRADY, HAUGEBAK, WHYSONG

AG-INDUSTRY

AGI 236 Agricultural Practices. Supervised experience in agricultural projects. Especially intended for students wishing to acquire or improve agricultural techniques. One lecture 6 hours laboratory Credit, 3 hours

262 Beginning Equitation. Care, selection, handling and riding of horses. Both Western and English offered. One lecture 3 hours laboratory. May be repeated for credit. Credit 2 hours

263 Intermediate Equitation. Training handling and riding of horses. Both Western and English offered. One lecture 3 hours laboratory. May be repeated for credit. Credit, 2 hours

300 Livestock Production and Management. Methods of production livestock enterprises economics loss prevention and marketing. Prerequisite BAS 150 Credit 3 hours

310 Crop Production and Management. Crop production factors and their application to farm manage-

ment. Crop plans are prepared for crop production enterprises. Credit 3 hours

312 Agricultural Marketing. An overview of marketing arrangements for agricultural products. Credit 3 hours

325 Farm Power and Mechanization. Mechanical solutions to agricultural production problems in the U.S. and abroad together with selection evaluation on field operation and servicing of production harvesting and pest control equipment. One lecture 3 hours laboratory. Credit 2 hours

333 Agribusiness Purchasing. Working with supplies for agribusiness including standards, inventories and records. Credit 2 hours

343 Fruit and Vegetable Crops. Production of crops in fields orchards vineyards and greenhouses. Emphasis on subtropical fruits and winter vegetables. Prerequisite: BAS 130. Two lectures 3 hours laboratory. Credit, 3 hours

350 Livestock Marketing. Livestock marketing functions including commodities trading and hedging. Credit 3 hours.

351 Livestock and Carcass Evaluation. Evaluation of the physical appearance of livestock and carcasses. Two lectures 3 hours laboratory. Credit 3 hours

363 Veterinary Practices. Observation of and participation in veterinary medicine and surgery supervised by local veterinarians. Four hours per week seminar. Open to advanced pre-veterinary students only. Credit 2 hours

364 Food Technology. Processing and preservation of food products. Two lectures 3 hours laboratory. Credit 3 hours

370 Advanced Equitation. Techniques of dressage, hunter and jumper training and riding. Open to advanced equitation students only. Six hours laboratories. Credit, 2 hours

372 Horse Production. Management of horses as a business operation. Prerequisite: BAS 150. Credit 2 hours.

375 Horse Breeding and Management. Considers current methods of improving genetic traits and reproductive performance of horses. Two lectures 3 hours laboratory. Credit, 3 hours

376 Horse Feeding and Nutrition. Ration formulation to meet nutrient requirements for growth reproduction of horses and performance. Credit 2 hours.

380 Government Regulations in Agriculture. Government agencies the format and administration of

regulations affecting agriculture. Credit 3 hours.

402 Farm Cooperatives. Organization operation and management of agricultural cooperatives. Credit, 3 hours

403 Agribusiness Public Relations. The image of agriculture including consideration of the agricultural press. Prerequisite: AG 312. Credit 3 hours.

430 Range Livestock Management. Operation and management of beef cattle and sheep emphasizing range conditions. Prerequisites: ERA 401, AGI 300. Credit, 3 hours.

431 Intensified Livestock Management. Principles operations and management techniques in high density animal growing units. Prerequisite: AG 300. Three lectures 3 hours laboratory. Credit, 4 hours

432 Feedlot Management. Management aspects of feedlot operation. Case studies and management problem analysis will be included. Credit 3 hours

440 Food Marketing. Food packaging distribution and retailing. Prerequisite: AG 364. Credit 3 hours.

441 Meat Technology. Processing and utilization of meat products. Prerequisite: BAS 370. Two lectures 3 hours laboratory. Credit 3 hours.

443 Agribusiness Management. Application of management principles to agriculturally oriented businesses. Credit 3 hours

444 Agribusiness Analysis. Identification of the size scope and organization of the various agriculturally oriented industries. Credit 3 hours.

445 Advanced Crop Management. Latest techniques in producing harvesting and utilizing the major field crops with emphasis on those grown under irrigated environments. Prerequisites: BAS 130 AG 310. Two lectures 3 hours laboratory. Credit 3 hours

452 World Food Dynamics. Transition and development of raw agricultural commodities into nutritional food products. Emphasis given to food expansion in developing countries. Credit 3 hours.

453 World Agricultural Resources. World production and consumption of agricultural products international relationships and agencies concerned with world agricultural development problems. Credit 3 hours

454 International Agricultural Trade. Dimensions of categories methods and changes of international trade in agricultural products. Credit 3 hours

501 Recent Advances in Agribusiness. Reports and discussions of current topics and problems associated with agribusiness. May be repeated for credit. Credit 1 hour

502 Recent Advances in International Agriculture. Reports and discussions of current topics and problems associated with international agriculture. May be repeated for credit. Credit, 1 hour.

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

510 Advanced Agribusiness Management. Review of management functions in agribusiness. Case studies and problem analysis. Prerequisite: MGT 301 or AGI 443. Credit, 2 hours.

516 International Agricultural Techniques. Coordination of production and marketing techniques to consumption on objectives with agricultural products in foreign countries. Credit, 3 hours.

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

519 Animal Production in Arid Regions of the World. Selection, nutrition, marketing and utilization of animals in arid countries. Credit, 3 hours.

520 Crop Production in Arid Regions of the World. Major field crops in arid climates and their potential for supplying the future need for food and fiber. Credit, 3 hours.

521 Soil Management in Arid Regions of the World. Soil science and soil management practices for maintenance of the fertility reservoir, physical condition and productivity as related to tillage, irrigation and conservation in arid regions. Credit, 3 hours.

Special Courses: AG 494, 498, 499, 500, 580, 584, 590, 591, 592, 594, 598, 599. See pages 48-49.)

BIO-AGRICULTURAL SCIENCES

BAS 130 Plant Science. Plant growth and development in the rural and urban environment. Two lectures, 3 hours; laboratory, Credit, 3 hours.

150 Animal Science. Comparative growth, development and propagation of farm animals. Two lectures, 3 hours; laboratory, Credit, 3 hours.

350 Nutritional Science. Energy and nutrients in living systems. Credit, 3 hours.

351 Nutritional Science Laboratory. Experimental trials involving the principles of nutrition and the physiological roles of nutrients in metabolism. Corequisite: BAS 350. Three hours; laboratory, Credit, 1 hour.

353 Applied Animal Nutrition. Feedstuffs, feeding standards and their application in meeting nutritional

needs of animals producing food and fiber. Prerequisite: BAS 350. Credit, 3 hours.

360 Crop Physiology. Physiology of crop plants with emphasis on plant nutrition and environmental factors. Prerequisite: BAS 130. Three lectures, 3 hours; laboratory, Credit, 4 hours.

370 Meat Science. Basic science of muscle and meat in animal production, processing and utilization. Prerequisite: BAS 150 or FON 142. Credit, 3 hours.

450 Experimental Feeding. Nutritional applications related to maximum production in livestock. Prerequisite: BAS 353. Two lectures, 3 hours; laboratory, Credit, 3 hours.

451 Composition of Agricultural Products. Composition and nutritive values of feedstuffs and foods. Prerequisite: BAS 350. Two lectures, 3 hours; laboratory, Credit, 3 hours.

452 Comparative Nutrition. Nutrient utilization and metabolism in animals based on biochemical and physiological phenomena. Prerequisites: BAS 350, CHM 231. Credit, 3 hours.

453 Ruminant Nutrition. Ruminant digestive system, rations, fermentation products and their metabolism. Prerequisites: BAS 350, CHM 231. Credit, 3 hours.

454 Physiology of Nutrition. Metabolism of nutrients in the life processes. Prerequisites: BAS 353 or FON 142, CHM 231. Credit, 3 hours.

456 Animal Breeding. Genetics applied to animal breeding. Prerequisites: ZOL 100, BIO 340 or ZOL 341. Credit, 3 hours.

460 Animal Physiology I. Control and function of the nervous, muscular, cardiovascular, respiratory and renal systems of domestic animals. Prerequisites: CHM 113, BIO 101. Three lectures, 3 hours; laboratory, Credit, 4 hours.

461 Animal Physiology II. Control and function of the endocrine, digestive and reproductive systems of domestic animals. Principles of adaptation of animals to their environment. Prerequisite: BAS 460 or ZOL 360. Credit, 3 hours.

462 Animal Physiology Laboratory. Selected physiological experiments to accompany BAS 461. Three hours; laboratory, Credit, 1 hour.

463 Physiology of Animal Reproduction. Development, function and control of the reproductive system of domestic animals. Prerequisite: BAS 150. Three lectures, 3 hours; laboratory, Credit, 4 hours.

471 Diseases of Domestic Animals. Control and prevention of infectious and non-infectious diseases of domestic animals. Prerequisite: BAS 460. Credit, 3 hours.

472 Diseases of Wild Animals. Identification and control of infectious diseases of wild animals. Prerequisite: MIC 201. Credit, 3 hours.

501 Recent Advances in Nutritional Sciences. Discussion and critical evaluation of current topics in nutrition and metabolism research. May be repeated for credit. Credit, 1 hour.

502 Recent Advances in Physiological Sciences. Discussion and critical evaluation of current topics in physiological research. Credit, 1 hour.

557 Advanced Animal Physiology. Advanced concepts of the control and function of physiological processes. Prerequisites: BAS 460 and BAS 461. Credit, 3 hours.

560 Endocrinology. Functions of the endocrine glands in the regulation of animal physiological processes. Prerequisite: BAS 460 or ZOL 360. Credit, 3 hours.

564 Experimental Physiology. Classical and modern techniques of physiological investigation. Prerequisite: BAS 460. Two lectures, 3 hours; laboratory, Credit, 3 hours.

Special Courses: BAS 494, 498, 499, 500, 580, 584, 590, 591, 592, 594, 598, 599. See pages 48-49.)

ENVIRONMENTAL RESOURCES IN AGRICULTURE

ERA 325 Soils. Fundamental properties of soils, their relation to plant growth and the nutrition of man and animals. Relation of soils to environmental quality. Prerequisite: CHM 101 or equivalent. Credit, 3 hours.

326 Soils Laboratory. Selected exercises to broaden the background and understanding of basic soil principles. Corequisite: ERA 325. Three hours; laboratory, Credit, 1 hour.

330 Soil Fertility. Use of fertilizers, crop rotations and water in the management of soils. Prerequisite: ERA 325. Two lectures, 3 hours; laboratory, Credit, 3 hours.

331 Agricultural Utilization of Rural and Urban Wastes. Problems of waste disposal and their solution by using soil and crop production as the recycling system. Credit, 3 hours.

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

333 Water Resources, Quality and Utilization. Sources, supplies and water resource development.

emphasizing arid regions. Water quality and utilization in agriculture and urban areas. social and economic considerations of water resource use and conservation. Credit 3 hours.

346 Conservation of Renewable Resources. Ecological principles underlying the rational use of natural resources to provide a high quality of living for mankind. Credit 3 hours.

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

380 Environmental Horticulture. Plant culture and use in urban agriculture. Prerequisite: BAS 130. Credit 3 hours.

381 Plant Propagation. Principles and skills in propagation of plants using seeds, cuttings, and grafting. Prerequisite: BOT 100. Two lectures 3 hours laboratory. Credit 3 hours.

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

383 The Science of Home Gardening. Use of natural systems in food production. Two lectures 3 hours laboratory. Credit 3 hours.

400 Forest and Range Ecosystems. Dynamics of forest and range ecosystems, their structure, function, and development. Integrated management of resources, use of simulation on models. Prerequisite: ERA 440 or equivalent. Three lectures 3 hours laboratory or field trip. Credit 4 hours.

401 Range Management. Principles of proper use of range ecosystems. Prerequisite: ERA 440 or equivalent. Two lectures 3 hours laboratory or field trip. Credit 3 hours.

402 Range Improvements. Principles of range ecosystem manipulation. Prerequisite: ERA 401. Two lectures 3 hours laboratory or field trip. Credit 3 hours.

410 Natural Resource Populations. Interactions among domestic and wildlife populations and their habitat. Simulation of population dynamics as influenced by competition and natural resource management. Prerequisites: ERA 400 and 401 or equivalent. Three lectures, one weekend field trip. Credit 3 hours.

440 Crop Ecology. Environmental factors affecting the adaptation and distribution of crops. Prerequisite: BAS 130. Credit, 3 hours.

446 Soil Conservation. Soil conservation and its re-

lationship to renewable resources. Prerequisite: ERA 325. Credit, 3 hours.

463 Hydroponics and Greenhouse Management. Principles and techniques of growing plants in nutrient culture under controlled environmental conditions. Prerequisite: ERA 325. Two lectures 3 hours laboratory. Credit, 3 hours.

501 Recent Advances in Environmental Resources. Current literature and significant developments involving environmental resources. May be repeated for credit. Credit, 1 hour.

503 Advanced Soil Science. Soil chemistry, soil physics and soil microbiology and their interaction in development and functioning of soil systems and other plant growth media. Credit 3 hours.

510 Photosynthesis and Environmental Quality. Environmental effects on plants, emphasizing methods of measurement and modification through changes in rate of photosynthesis. Two lectures 3 hours laboratory. Credit 3 hours.

515 Environmental Effects on Plants. Response of plants to contaminants in the environment from air, soil, and water sources, and the economic evaluation of plant injury caused by contaminants. Credit 2 hours.

548 Plants, Soils, and Environmental Quality. Effects of air quality on plants and soils and the role of plants and soils in removing undesirable contaminants from the atmosphere. The problem of concentrating contaminants in food chains. Prerequisite: ERA 325. Credit 3 hours.

550 Natural Resource Measurements. Principles of natural resource inventory. Description of the biotic community and its environment. Models in analysis and interpretation of data. Prerequisite: ERA 350 or equivalent. Three lectures 3 hours laboratory or field trip. Credit 4 hours.

552 Natural Resource Planning. Principles and techniques of planning for management and conservation of wildland ecosystems. Preparation of a management plan. Prerequisite: ERA 550. Two lectures 3 hours laboratory or field trip. Credit 3 hours.

560 Analysis of Range Ecosystem Dynamics. Quantitative description and analysis of ecosystem structure and function. Emphasis on techniques for describing interaction of ecosystem components through simulation on modeling. Prerequisites: 6 hours in ecological studies, ERA 350 or equivalent. Two lectures, 3 hours laboratory or field trip. Credit 3 hours.

Special Courses: ERA 494, 498, 499, 500, 580, 584, 590, 591, 592, 594, 598, 599. (See pages 48-49.)

Division of Construction

VERNON L. HASTINGS, M.S.I.E., *Director*

Purpose

The central purpose of the Construction program remains, as it has since 1957, to prepare students directly for positions of leadership and functional responsibility in the construction industry. Toward these ends instructional programs have been developed from fundamental architectural, business, construction and engineering curricula. To ensure a balanced understanding of the philosophic, technical and professional standards which distinguish modern-day constructors and builders, advisory groups representing leading associations of builders and contractors provide counsel in curriculum development.

General Information

Scholarships. Apart from those given by the University generally, a number of scholarships are awarded from the construction industry on the basis of academic progress and work done in the construction program.

Externship (Work study). As an adjunctive part of the program, participating contractors and builders may provide summer jobs and offer part-time or work-study arrangements to aid and encourage students to augment theory with practical work experience.

Degree

Bachelor of Science in Construction

Students seeking a Bachelor of Science Degree in Construction must satisfactorily

complete a curriculum of not less than 126 hours. Those students who have omissions or deficiencies in subject matter preparation may be required to complete additional university credit course work which may not be applied toward a construction degree. One or more of the courses MAT 117, 118; PHY 101—are usually required to satisfy omissions or deficiencies.

Construction careers are so broadly diversified that no single curriculum will entirely fit the student for universal entry into all fields. As an example, engineering contractors usually place more emphasis on technical and engineering science skills than do residential constructors, who usually prefer a greater depth of knowledge in management and urban science. Nevertheless, construction has a common behavioral, management and engineering science core upon which students may build defined fields of specialization to suit individual backgrounds, aptitudes and objectives. These fields of specialization are not absolute but generally match major divisions of the construction industry.

Fields of Specialization:

- General Building Construction
- Heavy Construction
- Construction Office Operations

(Should the student be undecided as to his career pattern, the Heavy Construction field of specialization is recommended as permitting the greatest flexibility in a later choice.)

Each field of specialization is arranged to develop management, leadership and competitive qualities in the student and accents requisite technical skills. Prescribed are a combination of: General Studies; a broad range of theoretical and applied management science subjects fundamental to the business side of contracting; and technical

courses basic to the execution of engineering and architectural construction work.

Not only must the student be educated to survive heavy demands for explicit technical performance during his initial career years he should also understand the functions of his employers and the industry whose agency he serves. For the long run, the student should achieve a pattern of self growth and learning which, when combined with experience, will eventually qualify him for top positions of leadership and authority.

Students in specialization fields other than office operations will be required to complete a core of science based engineering and management courses. Since the credit hours vary for some alternative courses in the core, any differences will be made up in the required courses in the selected option to achieve a minimum of 126 hours.

Construction Core

(FOR ALL FIELDS OF SPECIALIZATION EXCEPT OFFICE OPERATIONS)

			<i>Semester Hours</i>
ECE	122	Computer Programming	2
ACC	101	Elementary Accounting . . .	3
MAT	120	Calculus I	5
ECE	104	Engineering Graphics and Design	2
	<i>or</i>	IND 111 Technical Graphics (2)	
ECE	201	Mechanics and Heat	4
PHY	112	Physics (Electricity, Light and Magnetism)	4
IND	360	Applied Dynamics	3
QSY	221	Quantitative Analysis and Statistics	3
FCE	400	Engineering Communications	3
ECN	201	Principles of Economics	3
FCN	202	Principles of Economics . . .	3

ADS	305	Business Law	3
CEE	241	Surveying	3
CON	128	Construction Calculations . . .	2
	<i>or</i>	ECE 102 Introduction to Engineering (2)	
CON	221	Static Mechanics	3
	<i>or</i>	ECE 211 Engineering Mechanics: Statics (2)	
CON	243	Systems Building Design . . .	3
	<i>or</i>	CHE 211 Chemical Process Calculations (3)	
CON	252	Construction Equipment . . .	2
EEE	273	Electrical Construction	3
CON	323	Strength of Materials	3
	<i>or</i>	ECE 313 Mechanics of Materials (4)	
CON	331	Construction Safety Engineering	2
CON	345	Mechanical Systems	3
CON	366	Construction Methods	3
CON	374	Construction Systems Management	2
CON	383	Construction Estimating . . .	3
CON	389	Construction Finance	3
CON	394	Construction Scheduling . . .	2
CON	453	Construction Labor Management	2
CON	496	Contract Administration Seminar	3
APH	100	Introduction to Architecture . .	2
COM	100	Introduction to Human Communication	3
	<i>or</i>	COM 300 Group Communication (3)	

Core Minimum Hours . . . 85

Construction Fields of Specialization:
One field to be elected by the student.

GENERAL BUILDING CONSTRUCTION. The gen

eral building field of specialization provides an educational basis 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 industrialized building systems required for the mass development and production of large scale, turnkey projects and structures. General construction is treated as a complete administrative process from initial conception through delivery of completed facilities to users.

Required Courses: GLG 101 or GLG 301; CEE 310, 380, 450; CON 424, 463, 471; MKT 300; REA 251, 411, and approved electives to total a minimum of 126 credit hours

HEAVY CONSTRUCTION. The heavy construction field of specialization prepares students for careers with contracting organizations building transportation, utility, defense, sanitary and other engineered service systems. Typical projects are roads and highways, railroads, airports, irrigation, and rapid transit systems, harbor and waterfront construction, pipelines, dams, tunnels, bridges, canals, sewerage and water works, mass earthwork, and other heavy public works.

Required Courses. GLG 101 or GI G 301; ADS 306; CEE 310, 380, 450; CON 424, 463, 484; MKT 300, and approved electives to total a minimum of 126 credit hours.

CONSTRUCTION OFFICE OPERATIONS. This field of specialization is designed to provide graduates capable of organizing, operating, managing and effecting the unique and demanding systems, procedures and services in both construction field office and general office operations. Included are accounting, procurement, finance, records, labor re-

lations, personnel, statistics, data processing, office methods and services. This field of specialization prepares students for construction office management careers in any type or size construction firm.

Required Courses: ACC 101, 102, 201, 202; APE 100; ADS 233, 305, 306, 431; CON 128, 243, 252, 331, 364, 374, 383, 389, 453, 455, 496; ECN 201, 202; ECE 400; MGT 355, 434, 455, 463; MAT 141, 142; MKT 300; OFA 351; PHY 101; PHI 100; PGS 100; COM 100 or 300; QSY 161, 221, 302, and electives to total 126 credit hours.

Students taking 300 and 400 level courses as part of their approved graduate program must indicate the graduate credit option in the appropriate location on the Course Request Opscan form.

Construction

Professor:

HASTINGS (ECA 302)

Associate Professors:

BURTON, MICHELS PETERMAN WARD
WOOD NG

Instructor:

K PP

Lecturer:

SELLECK

CON 128 Construction Calculations. Basic computation techniques side rule and calculator operations Credit, 2 hours.

221 Static Mechanics. Forces that act on structural members Force systems, centroids equilibrium friction section properties and Mohr's circle. Prerequisites: ECE 201 MAT 120 Credit 3 hours

243 Introduction to Construction Materials and Specifications. Conventional construction (building) materials and components. Emphasis on material descriptions usages and incorporation into structures Laboratory consists of architectural drafting assignments

ments and reviews of material specifications Field trips Six hours lecture and laboratory Prerequisites: architectural or engineering drafting or graphics (ECE 104 or equivalent) and CON 128 or equivalent Credit 3 hours

252 Construction Equipment. Characteristics, capabilities limitations and employment of general building and heavy construction equipment Field operations maintenance programs Field trips. Credit, 2 hours

323 Strength of Materials. Analysis of strength and rigidity of structural members resting applied forces Stress strain shear moment deflections combined stresses connections. Field trips Prerequisite CON 221 or equivalent Credit 3 hours.

331 Construction Safety Engineering. Economics of accident prevention Hazard analysis Design for safe field practice. Protective equipment and devices. Worker education. Occupational disease Occupational Safety and Health Act. Field trips Credit 2 hours

345 Mechanical Systems. Acoustic and climatic systems for buildings Sanitary and water piping layout and sample design. Field trips Five lectures laboratory Prerequisite EEE 273 Credit 3 hours

366 Construction Methods. Analysis of construction projects for the determination of the most appropriate and economic methods. Preparing of field operations Job organization and site layout. Field trips Prerequisites CON 252 243, or approval of the instructor Credit 3 hours

374 Construction Systems Management. Organization and systems theory for construction Socio-technical origins and foundations Elements of leadership and human direction Industry management functions and processes. Prerequisite, junior standing or approval of the instructor. Credit, 2 hours.

383 Construction Estimating. Theories and systems of building estimating Quantity survey techniques, standard formats classification and analysis of work organization of detail unit cost determinations simulated bids Requires a knowledge of computer programming prior to admission Field trips Prerequisites ECE 122 or equivalent CON 243 Construction majors only or approval of instructor. Four lectures laboratory Credit 3 hours

387 Building Construction Estimating. Commercial and residential building estimating. Types of estimates Quantity surveys Analysis and organization of a building estimating details Unit and total cost determination Prerequisite ADE 422, or approval of instructor Four lectures laboratory Credit 3 hours.

389 Construction Cost Accounting and Control. Nature of construction costs. Investment models, depreciation and tax theory variable equipment costs Cash flow theory profitability analysis Funding sources and arrangements Requires a knowledge of FORTRAN. Prerequisite: ACC 101, CON 383. Credit 3 hours.

392 Field Study. Work experience and field study of an actual construction project The work experience requires certification for 500 hours of acceptable construction employment A written report of on-going construction operation including drawings photographs and appropriate criticalisms required (May be repeated for credit upon approval of Division Director) Credit 1 hour

395 Construction Planning and Scheduling Techniques. Analysis of unit operations in the construction process and the preparation and modification of schedules as an administration and controlling work progress Various scheduling techniques with emphasis on CPM Field trips Prerequisites: CON 243 252, 383. Credit 2 hours

411 Construction Operations Analysis. Project decision theory Risk and contingency evaluation competitive bidding strategies Cost benefit analysis optimization theory. Prerequisite: CON 383, 389. Corequisites: CON 366 453 Credit 3 hours

424 Structural Design. Economic use of steel reinforced concrete and wood in building and engineering structures Elastic plastic and ultimate strength design Student design projects. Field trips Prerequisite: CON 323 Credit 3 hours

453 Construction Labor Management. Union structure, history and practice emphasizing building and construction trades. Work customs and project environments. Applicable laws and government regulations. Area productivity differentials Labor goals economic power, jurisdictional disputes grievance procedures. Prerequisite: ECN 202 Credit 2 hours

455 Construction Office Methods. Administrative systems and procedures for the construction company office including methods improvement and work simplification office layout business forms and design, office manuals Prerequisites: ACC 102 OFA 351 Credit 3 hours

462 Project Planning and Control. Planning and scheduling of resources and operations Manpower and equipment allocation Linear programming network analysis CPM PERT cost time relationships Prerequisite: CON 411. Credit, 3 hours

463 Foundations and Concrete Structures. Sub-surface construction theory and practice for founda-

tions of buildings and engineered facilities. Underpinning piling, dry and wet excavating, dewatering, cofferdams caissons soil stabilization Concrete form design for foundations and structural frames Field trips Prerequisite: CON 323 Credit 3 hours.

471 Industrialized Building. Administrative processes and systems management for urban building and development Program control techniques Production design marketing economic and financial requirements for mass housing Consumer needs and trends Case studies Prerequisite: senior standing Credit 3 hours.

482 Cost Engineering. Emphasis on the time-value of money as a resource. Comparison of alternatives replacement analysis break-even analysis Depreciation methods and impact on taxes Lease vs. buy and methods of financing construction on projects Prerequisite: CON 389 Credit 3 hours

484 Heavy Construction Estimating. Methods analysis and cost estimation for construction of highways, pipelines, bridges, tunnels, dams and other engineering works. Prerequisite: CON 383 or approval of instructor Four lectures, laboratory Field trips Credit 3 hours

485 Mechanical Construction. Estimating and construction methods for plumbing piping heating and air conditioning in building construction Prerequisite: CON 383 Credit 3 hours

486 Electrical Construction. Industrial electrical construction practical for residential commercial and industrial projects Materials, methods and estimating Prerequisite: CON 383. Credit, 3 hours

496 Contract Administration Seminar. Case studies Ethical practice, social responsibility licensing codes and public regulation of contracting Quality control requirements Technical and financial requirements payments and changes Bonding insurance indemnification procedures Prerequisite: senior standing Credit 3 hours

531 Economics of the Construction Industries. Development of linear programming and other types of models of the construction industries including an investigation of the types and sources of available data Analysis of the factor and product markets by use of these models Prerequisites: CON 411 or ECN 401 and 402 Credit 3 hours

532 Construction Project Generation. Socio-economic political engineering and architectural parameters of the demand for structures and the reliance upon the dependency relationships between construction projects Credit 3 hours

551 Facilities Operation and Maintenance. Analysis

of maintenance work Structure of the maintenance work. Structure of the maintenance organization Contract maintenance and force account economics Maintenance control and supervision of operations Credit, 3 hours.

577 Construction Systems Engineering. Application of the systems approach to the planning and management of the construction process including the adaptation of information systems for construction. Credit, 3 hours

Special Courses: CON 494, 498 499 (See pages 48 49)

School of Engineering

L. P. THOMPSON, PH.D., *Director*

Purpose

The Engineering program of study seeks the attainment by each graduate of certain broad objectives. It is designed to make effective a philosophy of education for careers of leadership in applied science, engineering and industry. Society's needs in the decades ahead call for engineering talent on a scale not previously seen. Engineering education should, therefore, provide an opportunity for the optimum development of a wider variety of activities, aptitudes and interests, including moral, ethical and professional concepts. Students 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 system orientation in the subject matter of engineering education 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 program; (4) those who desire pre engineering for the purpose of deciding which program to undertake or those who desire to transfer to another college or university; (5) those who wish to take certain electives in engineering while pursuing another program in the University.

General Information

Admission. Students who wish to be admitted to full freshman standing in Engineering should present certain secondary school units in addition to the minimum University requirements. A total of 3½ units is required in mathematics. Included must be: advanced algebra, geometry and trigonometry. Calculus is recommended. The laboratory sciences chosen must include at least one unit in physics and one unit in chemistry. One unit of biology is strongly 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 and 113 General Physics, ENG 101 First Year English, CHM 101 Introductory Chemistry are usually taken to satisfy omissions or deficiencies.

Program of Study. The program of study

in engineering is based on the engineering core which consists of a highly correlated group of courses of fundamental importance and basic concern to engineers. The core provides a broad base of science, mathematics and engineering upon which the various programs are founded. A number of fields of specialization, which are extensions beyond the engineering core, are offered to provide variety in the program of study, and each student is allowed considerable latitude in developing an area of emphasis to fit his particular interests. In each of the several fields of specialization, the scientific knowledge and techniques are applied and further developed through analysis, synthesis, systems, and design as related to a specific engineering discipline. For convenience, the traditional fields of specialization offered are designated as CEE, CHE, EEE, ESE, IEE and MEE. In addition, the Interdisciplinary and Special Programs in Engineering accommodate those students (1) who desire an undergraduate specialization in industrial engineering, or engineering mechanics, materials or measurements, and (2) those whose educational objectives require more flexibility than is possible in the other fields.

Well prepared students can usually 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. 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.

All the undergraduate fields of special

ization—chemical, civil, electrical, mechanical, and the interdisciplinary and special programs in engineering are accredited by the Engineers' Council for Professional Development. Master of Science in Engineering programs are accredited by ECPD in the fields of electrical, civil, and industrial engineering, and in the engineering mechanics specialization within engineering science.

Degrees

Bachelor of Science in Engineering (B.S.E.) and Bachelor of Science (B.S.).

The satisfactory completion of an approved program of study of a minimum of 127 semester hours, including General Studies, the engineering core, and both required and elective courses, leads to either the degree Bachelor of Science (B.S.) or Bachelor of Science in Engineering (B.S.E.). Where omissions or deficiencies exist, i.e., in chemistry, English, physics or mathematics, the student will need to complete more than the minimum of 127 semester hours.

The programs of study in engineering are devoted to the basic sciences, mathematics, the fundamentals of engineering science, and their application to the solution of engineering problems. The courses are not training courses for any of the mechanical or manipulative skills, but rather are planned to provide preparation for development, design, practice, research, graduate work, and, with certain electives, for operation, production, testing, maintenance and management.

Integrated B.S.E.-M.S.E. Program.

(This program is described on pages 184-187.)

Engineering Core. The engineering core presents unifying concepts of engineering in a group of engineering oriented, science

based courses and a sequence of supporting courses in basic science and mathematics fundamental to the field of engineering. The objectives are twofold:

- (1) To provide the student with an understanding of idealized models in the context of realistic engineering situations.
- (2) To provide the student with an understanding of the relative utility of mathematical and empirical approaches in predicting the consequences of physical interactions and in solving realistic engineering problems.

Course content is designed to introduce the student to these two aspects of engineering in sufficient depth to provide him with a basis for: (a) his chosen career; (b) extending himself into engineering activity outside his chosen career; and (c) choosing his technical electives to emphasize preparation for his career in engineering application or research.

Engineering Core Requirement

(82 hours minimum)

		<i>Semester Hours</i>
ECE 102	Introduction to Engineering ..	2
ECE 104	Engineering Graphics and Design	2
ECE 122	Computer Programming	2
MAT 120	Calculus I	5
MAT 121	Calculus II	5
MAT 212	Calculus III	5
or	FCE 345 Methods in Engineering Analysis Approved Mathematics Elective	3
CHM 114	General Chemistry	4
or	CHM 115 and CHM 116 General Chemistry and Lab	
or	ECE 118 Chemical Foundations of Engineering	
ECE 201	Mechanics and Heat	4

ECE 202	Electrical Science	4
ECE 203	Engineering Wave Phenomena	2
or	PHY 115, 116, 117 and 118 University Physics	
ECE 211	Engineering Mechanics, Statics	2
ECE 300	Economic Analysis for Engineers	2
or	ECE 304 Atomic and Nuclear Principles	
ECE 312	Engineering Mechanics, Dynamics	3
ECE 313	Mechanics of Materials	4
FCE 330	Electrical Networks	4
ECE 331	Electronic Engineering	4
or	ECE 361 Measurement Systems Engineering	
or	ECE 364 Chemical Process Instrumentation	
ECE 350	Structure and Properties of Materials	3
ECE 371	Fluid Mechanics	4
ECE 381	Thermodynamics	3
ECE 400	Engineering Communications	3

In addition to the requirements shown above, the program of study must include, from the field of specialization, a minimum of 6 hours of engineering sciences content and a minimum of 6 hours of synthesis, systems, or design content.

Since the credit hours on some alternate core courses vary from the stated hour requirement, any differences will be adjusted in the approved technical electives.

Except as noted below, the engineering core is common to all fields of specialization. This arrangement gives the student time to become adjusted, and to choose that for which he is best adapted. The counseling previously described is provided in order to aid the student in making his choices

To obtain the necessary chemical science background, chemical engineers may use the following alternatives: CHM 117, 118 for ECE 118; CHM 417, 418 for ECE 350 and ECE 304; CHE 331 for ECE 371; and CHE 342 for ECE 381.

Chemical and Bio Engineering

The chemical engineer is generally concerned with processes involving a chemical change or separation. He applies chemistry as well as physics for the development, design and operation of processes and equipment. Mathematics is applied in computer analysis and design with economics as a practical guide. Since chemistry is involved in most activities, the chemical engineer is found in a diversity of industries which manufacture conventional chemicals, metals, ceramics, space propellants, solid state devices, petroleum products, plastics, foods, drugs and health care equipment. Training in chemical engineering provides a broad background which prepares one for a variety of occupations including environmental control, extractive metallurgy, energy and material transformation, oceanography, biomedical, and nuclear engineering. Although the bachelor's degree has sufficed for the majority, research and development activities often make graduate study desirable. Students expecting to undertake a graduate program should consult with their advisor before the senior year to obtain the best selection of courses for an integrated Master of Science in Engineering program.

Living systems represent the most complicated chemical processes requiring analysis. In order to provide instruction for the growing interaction between engineering and life sciences, interdisciplinary options

of bioengineering are given for all engineering majors.

CHEMICAL ENGINEERING CORE

Since CHM 114 is a terminal course not designed to prepare for advanced courses, its selection by chemical engineering majors is not recommended. The following courses are normally required for chemical engineering students as part of the engineering core requirements:

	<i>Semester Hours</i>
CHM 441, General Physical	
442 Chemistry	6
CHE 331 Transport Processes	4
CHE 342 Applied Chemical Thermodynamics	3
ECE 364 Chemical Process Instrumentation	3
ECE 448 Applied Mathematical Analysis	3
The following additional courses are normally required for the chemical engineering core:	
CHM 331, 332, 335, 336 General Organic Chemistry with Laboratory	8
CHM 443 Physical Chemistry Laboratory	1
CHE 211 Chemical Process Calculations	2
CHE 332 Chemical Engineering Operations	4
CHE 333 Transport Phenomena Labora- tory	1
CHE 442 Chemical Reactor Design . . .	3
CHE 451 Chemical Engineering Laboratory	4
CHE 461 Process Control	3
CHE 462 Process Design	4
CHE 496 Professional Seminar	0
Approved Technical Electives	7

The chemical engineering core is fundamentally chemical process engineering. Appropriate technical electives are chosen

with the advice and consent of the advisor to allow some specialization in a field of interest. When greater specialization seems desirable a maximum of two courses in the chemical engineering core may be replaced by selected courses meeting engineering education standards if approved by the advisor and faculty chairman.

CHEMICAL ENGINEERING AREAS OF EMPHASIS. Technical electives which may be selected to emphasize areas of interest are:

BIOMEDICAL. CHE 411, 413, 415, 492, 513, 515, 517; IEE 425, 520, 521; BAS 460; ZOL 201, 202.

CHEMICAL PLANT ADMINISTRATION. CHE 553, 581; ECN 202; ADS 305; MKT 300; MGT 301; CEE 564.

COMPUTERIZED DESIGN AND MODELING. CHE 581; ASE 422, 425, 549.

ENERGY AND MATERIALS CONSERVATION. CHE 523, 527, 553, 571; MEE 487.

ENVIRONMENTAL CONTROL. CHE 553, 555, 557; CEE 361, 362, 564, 567.

NUCLEAR. CHE 521, 581; MEE 411, 412, 413.

SIMULATION AND SYSTEM CONTROL. CHE 562, 581; IEE 463; MEE 465; EEE 480.

Civil Engineering

Civil engineers are responsible for the planning, design, construction, research and management of many structural, urban and environmental projects which form the basis of our modern civilization. These include buildings, bridges, highways, dams, canals, irrigation projects, water and waste treatment plants and various multipurpose sys-

tems. Education in this field is established on scientific fundamentals with extensive training and practice in one or more areas of emphasis.

In addition to the engineering core, the civil engineering program requires the completion of the courses listed below. In so doing, the student may choose a course of study leading to a bachelor's or master's degree by means of an integrated bachelor's-master's program.

	<i>Semester Hours</i>
CIVIL ENGINEERING CORE	
CEE 241 Surveying	3
CEE 312 Engineering Materials	2
CEE 321 Structural Mechanics	4
CEE 322 Fundamentals of Structures . . .	4
CEE 351 Soil Mechanics	3
CEE 361, Environmental 362 Engineering	5
CEE 372 Transportation Engineering . . .	3
CEE 381 Hydraulic Engineering	3

Bachelor's Degree Program. Requirements for the bachelor's degree include the completion of the civil engineering core courses and one of the seven elective areas listed below. Course selection should be made by the student with the approval of his advisor and must include at least one design option course (CEE 423, 452, 466, 475, 481). In addition, certain areas can be strengthened by choosing General Studies courses from the recommended lists. HUM 101 and 102 or HUM 301 and 302 are recommended for all elective areas. To insure completion of a degree in the minimum number of hours, students are advised to select their elective area and file their program of study at least one semester before taking such courses.

Civil Engineering Elective Areas

Required semester hours 10

GENERAL (1) Two or more design option courses, (2) approved 300 level, or above, technical electives.

URBAN SYSTEMS—*City Planning, Transportation Highways*. CEF 371, 466, 481, 571, 574; IEE 473, (ECE 300; ECE 340). *General Studies*. ANT 101; SOC 301, PGS 100, CUG 361; ECN 451.

ENVIRONMENT—*Sanitary Engineering, Public Health Industrial Hygiene*. CEE 461, 466, 481, 563, 564, 571; MIC 201; CHM 231; BIO 320; (ECF 340). *General Studies*. ANT 101; PGS 100; SOC 301.

WATER RESOURCES *Hydraulics Hydrology, Water Systems, Analysis*. CEE 466, 481, 495, 563; IEE 473; GLG 301; (ECE 300; ECE 340). *General Studies*. ECN 451; POS 100, 425; SOC 301, 432.

GEOTECHNICS—*Soil Mechanics, Foundations Geological Engineering*. CEE 452, 552, 573; GLG 301, 310, 321, 324, 410, 418, 435, 446; (ECE 300; ECE 448).

STRUCTURES *Architectural, Aerospace, Structural Mechanics*. CEE 423, 521, 531, 538; ATE 445, 446; GIG 301; MEE 450, 551; (ECE 444, 446); ESE 415, 524.

CONSTRUCTION CEE 344, 452, 475; ECE 300; GLG 301; CON 374; 383, 411, 462, 484. *General Studies*. APH 100.

Integrated Bachelor's-Master's Program.

Because of the greater technical complexity and expanding responsibilities of the civil engineer, increasing emphasis is being placed on the master's degree as the first professional degree. To accomplish this objective in an efficient manner, the inte-

grated bachelor's-master's degree program is offered to qualified students. Upon acceptance into the program, the student is assigned a faculty committee to assist in selecting the appropriate courses for both bachelor's and master's degrees. These courses include the civil engineering core and culminate in an individually prepared professional degree program using one of the undergraduate elective areas for its foundation.

Electrical Engineering

The professional activities of electrical engineers directly affect the lives of most of the world's population every day. Electrical engineers are responsible for the production and transmission of the vast quantities of electrical energy that our industrial society requires for its operation, and for the analysis, design and development of systems to control automatically the machines and processes of our factories. Electrical engineers are responsible for the design and development of complex signal processing systems, such as telephone, radar, television, and analog and digital computers. Indeed, an electrical engineer is likely to be involved whenever power is utilized, intelligence is transmitted, or control of a physical process is required.

In recent years a rapidly increasing number of electrical engineers have devoted more and more of their talent to computer engineering. Computer engineering encompasses a broad spectrum of engineering design activities, from the design of tiny digital integrated circuits to the design of large digital computer systems. The spectrum of activities includes digital circuit design, switching design, digital systems requiring integrated hardware software de-

sign, computer algorithms, and computer languages.

Recent advances in digital integrated circuits, which have made possible devices such as digital watches and shirt-pocket size digital calculators, have resulted in lower computer costs and in the microcomputer. The consequence of this is a drastic expansion of the applications of computer engineering and a continuing demand for electrical engineers to do such engineering work.

The curriculum in electrical engineering at Arizona State University is based upon the fundamental principles of mathematics, science, and engineering developed in the engineering core. In addition to the engineering core, each student completes the electrical engineering core. Approved technical electives then provide him with an opportunity to study in greater depth technical subjects in which he has special interests.

ELECTRICAL ENGINEERING CORE

The following courses are required for electrical engineering students as part of the engineering core.

		<i>Semester Hours</i>
MAT 212	Calculus III	5
MAT 362	Advanced Mathematics for Engineers (Applied Mathematics)	3
ECE 304	Atomic and Nuclear Principles	2
ECF 33	Electronic Engineering I	4

In addition, the following courses are required to fulfill the electrical engineering core requirements:

		<i>Semester Hours</i>
EEE 302	Electrical Networks	3
EEF 332	Electronic Engineering II (Synthesis, Systems, Design)	4

EEF 320	Digital Computer Fundamentals or EEE 333 Semiconductors and Devices Engineering Sciences)	3
EEF 341	Engineering Electromagnetics (Engineering Sciences)	3
EEE 362	Electromechanics (Synthesis, Systems, Design)	4
FEE 401	Distributed Parameter Networks	4
FFF 480	Feedback Systems	4
EEF 496	Professional Seminar	0

Approved Technical Electives

(Minimum total 12 semester hours)

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

ANTENNAS AND MICROWAVES. EEE 441, 443, 445.

BIO MEDICAL ELECTRONICS. EEE 485, 486, 487, 488, 495; CHE 411, 413, 517.

COMPUTER LANGUAGES. ASE 422, 423; FEE 514, 516

COMPUTER PROGRAMMING. ASE 322, 324, 422, 423, 424, 425; EEE 420.

CONTROLS. FEE 420, 427, 428, 455, 462, 482; MEE 451

DIGITAL CIRCUIT DESIGN. EEE 425, 426, 427, 431, 525.

DIGITAL COMPUTER SYSTEMS DESIGN. FFE 420, 427, 520; ASE 423.

ELECTRICAL COMMUNICATIONS. EEE 455, 456; ASE 441.

ELECTRICAL NETWORKS. EEF 402, 405, 406, 428, 445.

ENGINEERING MATH. FCF 340; ASE 441,

444, 545, 546; EEE 434; MAT 342, 461, 462, 463, 464, 465.

LASERS AND COHERENT OPTICS. FEE 434, 448, 548, 549

POWER SYSTEMS AND MACHINERY. EEE 461, 462, 470, 471, 472; MEE 411, 413; ECN 451; (CUG 364 recommended for Social Sciences).

SOLID STATE ELECTRONICS. EEL 425, 426, 431, 432, 433, 434, 435, CHE 523.

With the approval of the student's faculty advisor, technical electives may also be chosen from other courses in engineering, mathematics, the sciences and business administration at or above the 300 level. Both EEE 320 and 333 are highly recommended for every student, either to satisfy the electrical engineering core or as a technical elective.

Engineering Science

The Engineering Science curriculum emphasize the fundamentals of the engineering sciences and mathematics and their application in solving important technological problems of society. This fundamental education gives an engineer the flexibility and understanding necessary for the utilization of new developments and techniques. Additionally, these backgrounds will prepare the student for career opportunities in research, development, and consulting positions in governmental and industrial organizations and in teaching and research positions in universities. These curricula also offer advanced courses for engineers in such fields as civil, electrical and mechanical engineering who find that their work demands a greater depth of understanding in engineering mechanics, materials science, measurement systems, or other areas of engineering science.

Graduate students in either engineering mechanics, materials science or measurement systems pursue individual programs of study which are planned with the student's undergraduate background in mind, to provide a proper balance in mathematics, the basic and engineering sciences, and design, synthesis and systems. Areas of emphasis include: acoustics and noise control, astronautics and aeronautics, bio mechanics, continuum mechanics, dynamic meteorology, engineering mechanics, engineering mathematics, engineering science, geophysical fluid mechanics, materials science, measurement systems engineering, physical metallurgy, vehicle and structural mechanics.

Undergraduate programs, appropriate for entrance into the engineering science graduate programs, are offered in the School of Engineering Special and Interdisciplinary Programs (see page 188), including: engineering mechanics, engineering science, astronautics and aeronautics, engineering mathematics, materials science, physical metallurgy and measurement systems engineering. It is also customary for students from other fields in engineering to pursue graduate degrees in engineering science.

The degrees awarded in engineering science include Master of Science in Engineering, the Master of Science and the Doctor of Philosophy. The Master of Science in Engineering (M.S.E.) degree program in Engineering Mechanics is accredited by the Engineers' Council for Professional Development at the advanced level.

Integrated B.S.E.-M.S.E. Program

This program is for academically qualified undergraduate engineering students who desire a more efficient integration of their undergraduate and graduate programs.

Qualified students are assigned a faculty committee to assist them in selecting appropriate courses for both the bachelor's and master's degrees.

Industrial Engineering

Industrial engineering provides a multi-discipline approach for analyzing, understanding and resolving operational problems within organizations. Emphasis is on objective and analytical procedures for structuring problems to facilitate sound decision making. The IE approach to decision making is to formulate an objective and the constraints imposed on the decision maker and then to evolve decisions that accomplish the objective while meeting the constraints. The method for accomplishing the objective can involve physical theories, management concepts and or mathematical and computer models.

Modern industrial engineering approaches for designing effective operational systems are universally applicable to all forms of enterprise. Students must gain competence in several areas and be capable of understanding complex systems through the integrated application of knowledge from these areas. The primary areas are applied statistics and reliability, computer science, human factors, industrial systems, operations research, and organizational control.

The purpose of the industrial engineering field of specialization, therefore, is to provide each student with an understanding of (1) how operational systems are designed, (2) how each component of a system contributes to overall system effectiveness, (3) the methodologies of systems analysis, (4) the probabilistic nature of events and decision outcomes, (5) the human being as a complex system component, and (6) organization to facilitate planning and control.

Economics plays an important role in the evaluation of system effectiveness and in the decision making process.

Undergraduate students interested in industrial engineering begin their studies in the School of Engineering Special and Interdisciplinary Programs by pursuing one of the following: industrial engineering; computer science; information systems; operations research.

These programs, described on pages 188-192, require the selection of ECE 300 Engineering Economy, and ECE 340 Probability and Statistics for Engineers (as the approved mathematics elective), in the engineering core. The programs also include basic course work related to industrial engineering in the areas of computer systems, engineering administration, operations research, probability and statistics, scheduling and control, and systems design.

For the well qualified undergraduate student who seeks both the B.S.E. and the M.S.E. degrees in an integrated five year study plan, an advanced degree program in industrial engineering is available. The advanced degree program builds on the 90 semester hours of humanities, social sciences and engineering core work normally taken in the first 2½-3 years of study, and it culminates in the Master of Science in Engineering degree with Industrial Engineering specialization. Admission to this program is normally at the junior or senior level and requires an application to the Dean through the faculty and the chairman. Admission does not automatically qualify the student for admission to the fifth year graduate program, but it is expected that qualified students in this program will complete both the B.S.E. and M.S.E. degrees within a five-year term of full time study in engineering.

The advanced degree program includes

the requirements of the Special Engineering Program in Industrial Engineering.

Industrial Engineering Undergraduate Core

FOR THE MASTER OF SCIENCE IN ENGINEERING DEGREE PROGRAM		<i>Semester Hours</i>
ACC 300	Survey of Accounting	3
ASE 322	Advanced FORTRAN with Systems Applications	
	or IEE 475 Computer Systems and Techniques	3
MEE 332	Production Processes	
	or IEE 362 Industrial Engineering Analysis	3
IEE 422	Information Acquisition	3
IEE 431	Engineering Administration	3
ASE 441	Probability for Engineers	
	or ASE 442 Engineering Statistics	3
IEE 461	Planning, Scheduling and Control of Resources	3
IEE 473	Foundations of Linear Programming	
	or IEE 476 Operations Research Models	3
ASE 492	Project in Design and Development	3
Technical Electives		10
<i>Total</i>		37

The 30 semester hours of graduate work builds on the above 37 hour undergraduate core of IEE course work to provide an integrated and efficient path to the M.S.E. degree. The fifth (graduate) year provides design patterns in applied statistics, computer science, human factors, industrial systems, operations research, organization control and reliability. Composition of the fifth year includes:

FIFTH YEAR M.S.E. PROGRAM	<i>Semester Hours</i>
Probability Statistics Mathematics Selection	3
Operations Research Selection	3
Management or Economic Analysis Selection	3
Engineering Design and Systems Selection	9
Electives	9
IEE 592 Engineering Report	3
<i>Total</i>	30

Mechanical Engineering

Mechanical Engineering as a profession is broadly concerned with energy, including its transformation from one form to another as well as its transmission and utilization. This includes, for example, the conversion of chemical, nuclear or solar energy into mechanical work, the transmission of energy via heat exchangers, pipe lines and mechanical systems, and the harnessing of energy to perform useful tasks. Mechanical engineers are employed by every kind of industry to seek new knowledge through research, to do creative design and development and to build and control the modern devices and systems needed by society.

The undergraduate mechanical engineering field of specialization includes a foundation of basic mathematics, physics and engineering core courses common to all branches of engineering. Advanced mechanical engineering courses provide for the analytical study of the fundamental laws governing the use of energy, the principles of design, and the principles and use of measurement and control devices. Laboratory experiments illustrate the application of these principles in practical devices. The field of specialization emphasizes the re-

search and design aspects of mechanical engineering. At the undergraduate level, mechanical engineering students may elect to specialize in a variety of areas of emphasis: aerospace, biomechanical, computer methods, controls and measurement systems, design, energy conversion and power systems, environmental, manufacturing, nuclear, thermosciences, and vehicular engines. In addition, a general area of emphasis can be used to generate a pre-approved sequence that is of particular interest to the student.

MECHANICAL ENGINEERING CORE

The following courses are required for mechanical engineering students as part of the engineering core requirements:

	<i>Semester Hours</i>
CHE 114 General Chemistry for Engineers	4
ECE 304 Atomic and Nuclear Principles	2
ECE 331 Electronic Engineering	4
or ECE 361 Measurement Systems Engineering	
ECE 446 Methods in Engineering Analysis	3

In addition, the following courses are required to fulfill the requirements of the mechanical engineering core:

	<i>Semester Hours</i>
ESE 415 Vibration Analysis	3
ESE 422 Mechanics of Materials	2
MEE 365 Control System Principles	2
MEE 372 Fluid Mechanics	3
MEE 382 Thermodynamics	2
MEE 441 Principles of Design I	3
MEE 445 Engineering Design	3
MEE 488 Heat Transfer	3
MEE 491 Experimental Mechanical Engineering	3
MEE 492 Mechanical Engineering Projects	2
Approved area of emphasis electives	11

Mechanical Engineering Areas of Emphasis

In each area, a course in numerical analysis or computer programming (at 300 level, at least) may also be used.

AEROSPACE: Select 11 hours from the following: ESE 414, 427; MEE 450, 451, 453, 455, 471, 487, 493.

BIOMECHANICAL: Select 11 hours from the following: EEE 302, 362; ESE 462, 463; CHE 411, 413 (recommended); MEE 321, 412.

COMPUTER METHODS: Select 11 hours from the following: ASE 322, 425, 441, 442, 544; ECE 340, 444, 448; IEE 475; CHE 581; MAT 464, 465; MEE 471.

CONTROLS AND MEASUREMENT SYSTEMS: Select 11 hours from the following: EEE 302, 320, 325, 341; ESE 462 or 463 (recommended); ECE 331, 340; MEE 451, 465 (recommended), 487, 493.

DESIGN: Select 11 hours from the following: ASE 402; ESE 351, 413, 425, 427, 462; ECE 331, 340, 361; MEE 321, 332, 432, 442, 465, 487, 493.

ENERGY CONVERSION AND POWER SYSTEMS: Select 11 hours from the following: EEE 302, 362, 461, 470, 471, 472; MEE 383, 411, 415, 455, 456, 457, 487.

ENVIRONMENTAL: Select 11 hours from the following: BIO 320; CEE 361, 362, 461, 563, 564, 565; ESE 471; MEE 386, 412, 456.

MANUFACTURING: Select 11 hours from the following: ESE 455; ECE 300; IEE 411, 431, 461, 463; MEE 321, 332, 432, 442, 465, 493.

NUCLEAR: Select 11 hours from the following: EEE 341, 434; MEE 411 (recom-

mended), 412, 413, 415, 417, 457, 465, 487.

THERMODYNAMICS. Select 11 hours from the following: ESE 471; MEE 383, 386, 411, 450, 453, 455, 457, 471, 487, 489, 493.

VEHICULAR ENGINES. Select 11 hours from the following: EEE 302, 362, 461; MEE 383, 455, 465, 487, 493.

GENERAL. Student must submit a detailed plan consisting of 11 hours of related courses for approval by the Mechanical Engineering Curriculum Committee.

School of Engineering Special and Interdisciplinary Programs

The School of Engineering special and interdisciplinary programs accommodate students whose education objectives require more curricular flexibility than traditional engineering fields of specialization generally permit. For many students, engineering studies form the basis of preparation for professional engineering work where proficiency in the application of science and the physical and social technologies are brought to bear on problems of large scope. The necessary breadth that these students seek often is not obtainable by branching from existing engineering fields. Rather, especially designed programs of course work that merge the required principles and approaches drawn from all fields of engineering and other pertinent disciplines are desired. As an answer to this need, two types of course arrangements are available: (1) the Bachelor of Science in Engineering degree special programs; and (2) interdisciplinary programs that lead to the degree Bachelor of Science.

The B.S.E. programs are designed primarily for students intending to pursue engineering careers at a professional level in

industry or graduate studies. The 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 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 Engineers' Council for Professional Development under the category *Engineering Science*.

Bachelor of Science in Engineering Special Programs

Astronautics and Aeronautics. Those engineering sciences that relate directly to the design, control, and missions of aerospace and high speed ground transportation systems are emphasized. The aerospace industry is a major employer of engineering talent. Additionally, the field of high speed transportation is a young, developing field with many needs for imaginative engineering innovation. This program recognizes the variety of directions in which the aerospace and transit industries must move in order to solve many of the important problems of society, and prepares the student to operate effectively in the future in new and unanticipated problem situations. A professional orientation of aerospace engineering is acquired by the student in studying those topics most pertinent to the industry.

	<i>Semester Hours</i>
Required courses: MEE 365, 372, 450, 453; ESE 413, 414, 415, 422, 427, ASF 492 (ECE 304, 361, and 446 required in the engineering core)	26
Approved engineering electives from an area of emphasis	11

Bioengineering. Bioengineering bridges the engineering, physical, and life sciences. Engineers, physicists and mathematicians routinely join with the biologist and physician in developing techniques, equipment and materials. The multidisciplinary approach to solving problems in medical treatment and research has evolved from exchanges of information between specialists of the concerned areas. Advanced study beyond the bachelor's degree is acutely needed in bioengineering, requiring a depth of knowledge from at least two diverse disciplines. This program is designed for entry into this type of work.

	<i>Semester Hours</i>
Required courses: CHM 331, 332, 335, 461; BAS 460, IEE 425; CHE 411, 413, ASE 492 (ECE 304 and 361 or 364 required in the engineering core)	26
Approved engineering electives from an area of emphasis (one course must be of engineering sciences type content)	11

Computer Science. Computer technology has had a significant impact on our way of life in general and on engineering education and engineering practice in particular. This impact may even be greater in the future as the full potential of modern computing systems and techniques is realized. The computer science program gives emphasis to the structure of information, the nature of information processing systems, and the use of computers in the solution of a broad range of engineering and non-engineering problems.

	<i>Semester Hours</i>
Required courses: FEE 320; 325 (or IEF 463); IEE 473 (or 476), 475, ASE 322 (or ECF 444 or MAT 464); ASE 422 (or 324), 423; 441 (or 442); 492 (ECE 300 and 340 required in the engineering core)	27

Approved engineering electives from an area of emphasis 10

Engineering Mathematics. The engineer of the future will continue to utilize mathematics in much of his work. In research, design, production or even in the solution of social problems, the rapidly decreasing time lag between discoveries and applications imposes ever increasing demands upon the mathematical preparation of the engineer. What was thought to be abstract or pure mathematics only 15 years ago is routinely used by engineers today. An engineer interested in the applications of mathematics must have preparation in the abstract fields of modern mathematics; therefore, pure mathematics, applied mathematics, and courses from a field of specialization are combined in this program.

Semester Hours

Required courses: MAT 342 (or ASE 544), 370, 461 (or ASF 545), 462 (or ASF 546), 470; ECF 444 (or MAT 464), ASE 441 (or 442); 492 (ECF 340, 361 and 446 required in the engineering core) 24

Approved engineering electives from an area of emphasis (one course must be of engineering sciences type content and one of design type content) 13

Engineering Mechanics. This program strengthens the student's understanding of the basic fundamentals of mechanics and mathematics and their application to a number of important problems of society such as transportation, noise abatement, and vehicle crashworthiness. Such an education enables the engineer to adapt more easily to a rapidly changing technology and to utilize new concepts and techniques as they arise.

This area of emphasis makes available to the student a wide range of employment possibilities in various fields of engineering and also establishes an excellent foundation for graduate study.

Semester Hours

Required courses: ESE 410, 413, 415, 422, 425, 450, 471, MAT 342 (or ASE 544), ASE 492 (ECF 304, 361 and 446 required in the engineering core) 25

Approved engineering electives from an area of emphasis 12

Engineering Science. For students who desire a fundamental and multidisciplinary undergraduate engineering education this area of emphasis includes course work associated with many of the contemporary challenges of society such as acoustics and noise control, oceanography, energy sources and conversion, man's environment, water resources and distribution, and nuclear reactor systems. The student can choose to continue this broad based engineering education or to specialize in one of several fields of engineering or other disciplines by the nature of his choice of the approved electives. By proper choice of electives the engineering science graduate can be prepared for a multitude of jobs in industry or for specialized graduate work in engineering or non engineering fields.

Semester Hours

Required courses: CEE 361; EFE 341; ESE 410, 471, 474, MEE 411, 487, ASE 492 (ECF 361 required in the engineering core) 23

Approved engineering electives from an area of emphasis 14

Industrial Engineering. For students wishing to pursue an industrial engineering career concerned with the design, improve-

ment, and installation of integrated systems of men, materials and equipment, this area of emphasis provides a strong engineering and mathematical foundation. The ability to analyze systems for improvement and to predict the consequences of decisions prior to their implementation is built upon this foundation. The term "industrial" is used in its broadest sense, and is applicable to a wide spectrum of activities, typical of which would be transportation optimization, bank activity analysis, hospital procedures improvement, manufacturing systems, and processing activities.

Semester Hours

Required courses: ACC 300; MEE 332 (or IEE 362), IEE 422 (or 570); 431, 461, 476 (or 473), ASE 322, 442 (or 441), ASE 492 (ECE 300 and 340 required in engineering core) 27

Approved engineering electives from an area of emphasis 10

Information Systems. Modern management systems are highly dependent upon the timely flow of accurate information. There is a growing demand for engineering analysts who can study the information needs of organizations and are qualified to recommend efficient systems for collecting, sorting, classifying, and interpreting data. Information acquisition and control for effective management decision making, particularly as it relates to technically oriented organizations, is emphasized in this program.

Semester Hours

Required courses: ACC 300; IFE 422, 431, 461, 475, 476, ASE 324, 492 (ECE 300 and 340 required in the engineering core) 24

Approved engineering electives from an area of emphasis 13

Materials Science. Historically man's way of life has been influenced greatly by his development and utilization of new materials. Many challenges faced in the past were met successfully only after new materials had been developed to meet the new demands, most recently evidenced by the space program. Today's engineers must find solutions to problems in critical areas such as energy production, transportation, pollution control, and efficient utilization of our natural resources. Challenges to the materials scientist in these areas are numerous. For example, materials capable of withstanding large doses of high energy neutron radiation in future fast breeder nuclear energy stations must be developed. Again, improved materials capable of longer life in the high temperature corrosive environment of pollution control systems on automobiles are needed, as are more efficient solar cells for direct conversion of solar energy to electricity. This program is designed to provide the student with the necessary knowledge in the area of materials science and engineering to work effectively as part of an engineering team facing new, uncharted challenges.

	<i>Semester Hours</i>
Required courses: EEE 333, ESE 351, 454, 455; MFE 411, 487, ASE 492 (ECE 304 and 361 required in the engineering core)	22
Approved engineering electives from an area of emphasis	15

Measurement Systems Engineering. Today's technology in all fields exceeds the capabilities of purely theoretical approaches. Experimental work of increasingly sophisticated nature is necessary to study phenomena in all branches of engineering. The engineering of these measuring systems is a new exciting and challenging

field. Measurements are made in all disciplines, and all disciplines contribute to the design of measuring systems. Thus, measurement engineering is among the broadest and most general of the areas of engineering. For this reason, job opportunities in industry are particularly promising for engineers with this preparation.

	<i>Semester Hours</i>
Required courses: EEE 302, 341, 362; ESE 415, 455, 462; MEE 365; MEE 465 (or EEE 480); ASE 492 (ECE 304, 361 and 446 required in the engineering core)	27
Approved engineering electives from an area of emphasis	10

Nuclear Engineering. Nuclear engineering is concerned with the release, control and utilization of nuclear energy, including an understanding of basic principles in the design and application of nuclear reactors for electrical power generation, marine propulsion, sea water desalting, and power systems for outer space. Advanced research methods are also studied using neutron activation analysis and radioisotope techniques in the fields of medicine, biology, agriculture, and industry. This program is deeply rooted in the thermal and electrical sciences as well as nuclear science.

	<i>Semester Hours</i>
Required courses: ESE 415; MEE 372, 411, 412, 413, 415, 488; ASE 492 (ECE 304, 361 and 446 required in the engineering core)	24
Approved engineering electives from an area of emphasis	13

Operations Research. This program enables the student to formulate operational problems of an engineering and socio-economic variety, with emphasis on the quantitative tools and techniques used by operations researchers. Problems are de-

scribed in a decision theory framework involving objectives and constraints resulting from budgets, corporate policy, and federal regulations.

	<i>Semester Hours</i>
Required courses: IEE 431, 461, 473, 476, MAT 460, ASE 322 (or IEE 475), 441, 442, 492 (ECE 300, 340 and 361 required in the engineering core)	27
Approved engineering electives from an area of emphasis	10

Physical Metallurgy. The field of physical metallurgy includes the selection of metals and alloys for optimum utilization, the control of processing and fabrication variables, failure analysis, and the development of new alloys. Modern technology requires the continued development of metals to meet standards previously considered impossible while at the same time the dwindling resources of some of our most important metals require their optimum utilization. Thus, the metallurgist routinely faces challenges that are both demanding and exciting. Fortunately he has a far better understanding of the underlying structure of metals than his predecessor and can therefore make better use of basic physical science in achieving his objectives. However, this more exact knowledge of the atomic scale behavior of metals has not diminished the requirement for an engineering approach in the solving of metallurgical problems—the basic purpose of this program.

	<i>Semester Hours</i>
Required courses: ESE 450, 451, 455, 456, MEF 489; ASE 492 (ECE 361 required in the engineering core)	20
Approved engineering electives from an area of emphasis	17

Urban Systems Engineering. Frequently civilizations are measured by their cities. For the past 100 years America has been

moving toward urbanization, and forecasts indicate that this trend will likely continue for the next two decades. The problems of urbanization extend over a wide range of physical, social and economic conditions. These problems are also affected by scale, thus an urban area with a concentration of 1,000,000 people is not always functionally the same as another area with a population of 100,000. The problems of urban areas are highly interrelated and interdisciplinary. This program leads into such areas as urban engineering, transportation planning, environmental engineering, city planning, urban management and decision making, or perhaps serving the electorate directly.

	<i>Semester Hours</i>
Required courses: CEE 371, 372, 461; IEE 431, 473, 476; ASE 442, 492 (ECE 300, 340 and 361 required in the engineering core)	24
Approved engineering electives from an area of emphasis	13

Note: PGS 100 and SOC 301 must be selected as a part of the General Studies requirement.

**Bachelor of Science
Interdisciplinary Programs**

Business and Pre-Law. This program accommodates particularly those engineering students whose primary intent is to earn a graduate degree in business administration or law. 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 or legal careers will be enhanced to an even greater degree in the future. Students who

complete this program may complete requirements for the degree Master of Business Administration in one calendar year.

	<i>Semester Hours</i>
Required courses: ACC 300; ADS 305, FIN 300; MGT 301; MKT 300, IEE 473; ASE 322, 442, 492 (ECE 340 and 361 required in the engineering core)	27
Approved engineering electives from a field of specialization (one course must be of engineering sciences type content)	10

Note: ECN 101 must be selected as a part of the General Studies requirement.

Education. This program accommodates those who wish to couple an engineering education with a career in teaching. It is particularly directed to those who desire teaching competence in engineering, mathematics, or the physical sciences. Its content has been organized in cooperation with the College of Education and the Arizona State Department of Public Instruction. Graduates of this program receive a Bachelor of Science degree and a secondary teaching certificate with a teaching major in engineering science. It is also possible to obtain teaching minors in mathematics and physics.

REGULAR PROGRAM

	<i>Semester Hours</i>
Required courses: SED 310, 311, 411, 433, EDP 310, RDG 467, 480, ASE 492 (ECE 361 required in the engineering core)	28
Approved engineering electives from a field of specialization (two courses must be of engineering sciences type content and one of design type content)	9

NOTE: POS 100 or 300 and 311, plus at least one course in American history and

one course in general psychology, must be selected as part of General Studies requirements, and all students in this program must file a petition for variance for their General Studies program. An education elective of 3 semester hours is also required for teacher's certification but not for the B.S. degree.

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, high ways, and sites for waste disposal. Additionally, the geological factors associated with land use planning and with the occurrence of petroleum and mineral deposits are encompassed within the program.

	<i>Semester Hours</i>
Required courses: GLG 101, 310, 321, 324, 418; CEE 351, 452, ASE 492 (ECE 300 and 361 required in the engineering core)	27
Approved engineering electives from an area of emphasis six hours of an approved summer engineering-geology field course is highly recommended)	10

Pre-Medical. In the past decade the inter relation between engineering and medicine has become vigorous and exciting. Our rapidly expanding technology dictates that engineering will continue to become increasingly involved in all branches of medicine. As this develops, so will the need for physicians trained in the engineering sciences

medical men and women with a knowledge of computer technology, operations research, electronics and cybernetics. This program would be of special interest to students desiring entry into a medical college and whose medical interests lie in research, aerospace and undersea medicine, or bio physics. 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.

	<i>Semester Hours</i>
Required courses: BIO 101, 102, 340; CHM 331, 332, 335, 336; ASE 492 (CHM 115, 116 and ECE 304 and 361 required in the engineering core)	22
Approved pre medical elective	3
Approved engineering electives from a field of specialization (two courses must be of engineering sciences type content and one of design type content)	12

Public Administration. The primary purpose of this program is to equip the engineering student for graduate study in political science. It is important that sound engineering judgment not be ignored in making political decisions. For the future, engineers must be more knowledgeable in political science, and servants of the electorate must be more aware of the technological consequences of their decisions. Students selecting this program will be better equipped to implement proposed engineering programs involving the public health and safety, and esthetic considerations

	<i>Semester Hours</i>
Required courses. HIS 303, 304, POS 250 (or 260), POS 428; SOC 301, 341, 352 or (PGS 325, ASE 492 ECE 300, 340, and 361 required in the engineering core)	24

Approved engineering electives from a field of specialization (two courses must be of engineering sciences type content and one of design type content) 13

NOTE: POS 100 and 301 or 302 must be selected as part of the General Studies requirement in social science.

Social Systems. Much of the progress and many of the problems of modern society are derived from a technologically oriented culture. Today such societal problems as environmental pollution and urban decay continue to increase in both quantity and complexity. This program is responsive to achieving a better understanding of their causes and effects. The multi discipline background provided is drawn from the social studies and engineering with strong emphasis being given to management, system optimization, and data acquisition and processing.

	<i>Semester Hours</i>
Required courses: CEE 371, 461; IEE 431, 473 or 476; PAF 523, SOC 341, ASE 492 (ECE 300, 340 and 361 required in the engineering core)	21
Approved Humanities or Social Science elective	4
Approved engineering electives from a field of specialization (one course must be of engineering sciences type content and one of design type content)	12

NOTE: POS 100 and 301 or 302 must be selected as part of the General Studies requirement in social science.

Students taking 300- and 400 level courses as part of their approved graduate program must indicate the graduate credit option in the appropriate location on the Course Request Option form.

Analysis and Systems

ASE 200 Engineering Drawing. Further study of orthographic projection, auxiliary views, section views, dimensioning and standard engineering drawing conventions. Drafting skills and precision dimensioning techniques for production drawings of typical engineering parts. Prerequisite: ECE 104 or IND 111. Six hours lecture-laboratory. Credit, 2 hours

226 Digital Computer Programming. Role of the digital computer in business and society, computer systems and information representation, problem solving and algorithm design. FORTRAN programming fundamentals. Credit: 2 hours

307 Environmental Systems Methodology. Integrated interdisciplinary systems methods for planning environmental programs, consideration of the social, political, natural, economic and technical factors which influence environmental developments; case studies. Open to junior, senior and graduate students who have completed high school algebra. Assigned under PHG 307. Credit: 3 hours

309 Technical Writing. Mechanics of technical writing with some practical report writing. Not for engineering or construction degree credit. Prerequisite: ENG 101. Credit: 3 hours

321 Fundamentals of Computer Programming. A human-oriented systems approach to problem definition, formulation and solution using FORTRAN. Suitable as either an introductory or terminal course. ASE 321 and ECE 122 cannot both be used for credit. Computer solutions required for projects. Prerequisite: high school algebra. Two lectures. Credit: 3 hours

322 Advanced FORTRAN with Systems Applications. Advanced concepts of FORTRAN programming and elementary numerical methods for solving systems engineering problems. Solution of nonlinear equations and systems of linear equations, error studies, numerical methods of integration, differentiation, interpolation, extrapolation and curve fitting. Prerequisites: ECE 122 or ASE 226, MAT 121. Credit: 3 hours

324 Introduction to COBOL. The business oriented language COBOL. Emphasis on applications to management information systems. Credit: 3 hours

360 Measuring Systems. Applications of systems concepts to measurements. Fundamental theory of static and dynamic system behavior. Discussion of carrying, processing, shaping and converting energy and information. Lectures discuss on groups, labora-

tory (Not for engineering degree credit) Prerequisites AET 362 PHY 112 ND 311 or 312 and ELT 200 Credit 3 hours

402 Technology, Society and Human Values. Values which motivate mankind to create technology Areas of conflict and resolution on between basic human values and technological society Reading and discussions on with visiting lecturers Also listed under HUM 402) Prerequisite: junior standing. Credit 3 hours

403 Engineering Technology and Public Policy. Technology assessment environmental protection on resource management and the social consequences of technology related to public policy formulation and the responsibilities of the engineering profession Case studies and group projects Prerequisite: junior or standing Credit 3 hours

407 Environmental Systems Planning. Review of interdisciplinary systems analysis and techniques for planning and managing environmental programs student group investigations of projects formulated in collaboration with university faculty members and or community groups. (Also listed under PHG 407) Credit 3 hours

408 Introduction to System Engineering. Methods for modeling and structuring complex systems with emphasis on multidisciplinary approaches. Case studies of interactions among technological, industrial, governmental and environmental systems. Relationship of management by objectives to the planning process, policy analysis and decision criteria Prerequisite: junior standing Credit 3 hours

422 Programming Languages. Programming language specification and its application to FORTRAN V and ALGOL languages Prerequisites ECE 122 or ASE 226 ECE 345 or MAT 212 Credit 3 hours.

423 Symbolic Programming. Symbolic assembly language programming techniques and applications Prerequisite: ECE 122 or ASE 226 Lectures and laboratory Credit 3 hours

424 Advanced COBOL. In depth treatment of the COBOL language Report Writer file management and structured programming will be covered Prerequisite ASE 324 Credit 3 hours

425 Advanced Programming. Programming as a discipline applicable to many subjects FORTRAN topcs searching sorting magnetic tape merging character handling machine dependency, plotting professional programming practices and use of time sharing terminals A second course in computer applications for nonmajors. Prerequisites ECE 122 or ASE 226 MAT 117 Lecture and laboratory Credit 3 hours

441 Probability for Engineers. Foundations of probability Transformation of variables Markov chains and simple time-dependent stochastic processes applications in engineering. Prerequisite ECE 340 Credit 3 hours.

442 Engineering Statistics. Regression analysis and correlation analysis of variance maximum likelihood, marginal and conditional distributions experimental design and quality control and reliability Prerequisite ECE 340 Credit 3 hours

490 Directed Writing for Graduate Research. Composition and thesis research methods for graduate students transferring to ASU who have not demonstrated a proficiency in English (Not for engineering degree credit) Credit 1 hour

492 Project in Design and Development. Individual project in creative design and synthesis Credit 2-3 hours

544 Linear Algebra in Engineering. Matrix theory and numerical analysis of matrix operations Applications from mechanical structural electrical and control fields of engineering Prerequisite ECE 446 or MAT 460 Credit 3 hours

545 Complex Analysis in Engineering. Complex variables in engineering analytic functions, integral power series conformal mapping application of conformal mapping and transforms to problems in fluid flow heat transfer and electrical potential Prerequisite ECE 446 or MAT 460 Credit 3 hours

546 Partial Differential Equations in Engineering. Ordinary differential equations series solutions boundary value problems Fourier series separation of variables inhomogeneous problems Prerequisites ECE 345 or MAT 212 ECE 446 or MAT 460 Credit, 3 hours

547 Partial Differential Equations in Engineering. Classification of second order partial differential equations; properties of elliptic hyperbolic and parabolic equations generalized Green's identities and functions integral transforms variational methods Prerequisite ASE 546. Credit 3 hours

549 Statistical Applications in Engineering. Descriptive statistics linear and nonlinear regression on analysis, experimental design and experimental optimum seeking techniques Credit 3 hours.

Special Courses: ASE 494 498 499 500 584 590 591 592 594 598 599 792 799 (See pages 48-49.)

Chemical and Bio Engineering

Professors:

REISER (EC G-136B) BERMAN CRAIG,
DORSON SATER

Associate Professor:

KUESTER

Assistant Professor:

EHMSEN

CHE 211 Chemical Process Calculations. Principles of physics and chemistry applied to the formulation of material and energy balances. Prerequisite: CHM 115 corequisite MAT 121 Credit, 2 hours

331 Transport Processes. Development and application of the principles of momentum, energy and mass transfer Corequisite CHE 211 Credit 4 hours.

332 Chemical Engineering Operations. Process operations including distillation extraction, absorption drying crystallization fractionation, material handling and preparation Prerequisite CHE 331 Credit, 4 hours

333 Transport Phenomena Laboratory. Physicochemical measurements and determination of transport properties Prerequisite CHE 331. Three hours laboratory Credit 1 hour

342 Applied Chemical Thermodynamics. Energy relations and equilibrium conversions based on chemical potentials and phase equilibrium Prerequisite CHE 211 Credit 3 hours.

350 Mathematics in Medicine. Use of symbolic notation to represent physiological variables units of measurement graphical techniques; use of biomedical computers biostatistics and differential and integral calculus. Emphasis on practical applications *For non engineering majors* Prerequisite high school algebra or equivalent knowledge Credit, 3 hours.

411 Biomedical Engineering. Transport metabolic and autoregulatory processes in the human body using engineering terminology and analysis current survey of human systems mutation, prosthetic devices diagnostic methods engineering criteria and properties of biological fluids Prerequisite CHE 350 or equivalent Credit 3 hours

413 Physiological Instrumentation. Problems con

cepts and techniques of biomedical instrumentation on static and dynamic environments. Lecture and laboratory. Prerequisite: ZOL 360 or BAS 460 or equivalent. Credit 3 hours.

415 Introduction to Pathophysiology. Dynamics of disruptions to normal physiology. Systematic development of malfunctions by systems including diseases due to heredity, stress, malnutrition, infection, physical and chemical agents. Prerequisite: ZOL 360 or BAS 460 or equivalent. Credit 3 hours.

442 Chemical Reactor Design. Application of kinetics to chemical reactor design. Prerequisite: CHE 342. Credit 3 hours.

451, 452 Chemical Engineering Laboratory. Operation, control and design of experimental and industrial process equipment. Independent research projects. Corequisite: CHE 332. Six hours laboratory. Credit 2 hours each semester.

461 Process Control. Process dynamics, instrumentation and feedback applied to automatic process control. Prerequisites: MAT 212, CHE 331. Two lectures, 3 hours laboratory. Credit 3 hours.

462 Process Design. Application of economic principles to optimize equipment selection and design; development and design of process systems. Prerequisite: CHE 332. Credit 4 hours.

496 Professional Seminar. Professional and ethical aspects with a discussion of employment opportunities and responsibilities. Lectures and field trips. Credit none.

513 Rheology of Fluids. Physical and mathematical foundation of the constitutive fluid equations and their application, including biological fluids. Uses and limitations of experimental viscometry, development of momentum conservation flow equation for a general fluid. Prerequisite: ECE 371. Credit 3 hours.

515 Physiological Transport Processes. Analysis of heat, mass, momentum and electrical energy transfer in mammals. Derivation of both microscopic and macroscopic models based on current research. Credit 3 hours.

517 Prosthetic and Diagnostic Engineering. Criteria for mechanical replacement or assistance of organ functions. Diagnostic methods, equipment and usage. Existing methodology and future requirements. Includes detailed designs. Credit 3 hours.

521 Chemical Processing of Nuclear Materials. Chemical production of nuclear fuels and processing of spent fuels for recycling and recovery of fissionable materials. Credit 3 hours.

523 Materials Processing. Solid state theory, control of morphology, purity, growth and defects, forma-

tion, structure and properties of thin films, microcrystals, whiskers, organic crystals. Credit 3 hours.

527 Polymer Science and Engineering. Synthesis, characterization and processing of commercial high polymers. Credit 3 hours.

533 Transport Processes. Unified treatment of momentum, heat and mass transfer from molecular theory and continuum points of view. Continuum equations for microscopic and macroscopic systems, multi-component and multi-phase systems. Credit 3 hours.

534 Mass Transfer. Applications of the transport equations to multicomponent and multiphase systems. Comparison of methods of solution and computer algorithms for different mass transfer processes with emphasis on multi-stage separations. Credit 3 hours.

535 Interfacial Transport. Physical characteristics of interfaces with application to industrial contact, separation, interfacial motion and stability. Disperse systems; absorption, adsorption, desorption, adhesion, emulsions, drop formation and coalescence, electrostatic phenomena. Credit 3 hours.

543 Thermodynamics of Chemical Systems. Classical and statistical thermodynamics of non-ideal physicochemical systems and processes predicted on of optimum operating conditions. Credit 3 hours.

544 Chemical Process Kinetics. Reaction rates, thermodynamics and transport principles applied to the design and operation of chemical reactors. Prerequisite: CHE 543. Credit 3 hours.

553 Energy-Pollution Strategies. Interaction of energy conservation, residuals management and economic policy in the chemical process industry. Credit 3 hours.

555 Membrane Processes for Environmental Control. Theory and practice of membrane separation techniques are developed, emphasizing environmental control problems. Both gas and liquid stream, industrial case histories are reviewed. Prerequisites: ECE 371, 381. Credit 3 hours.

557 Industrial Water and Waste Treatment. Purification of water for industrial use, purity, corrosion and scale formation, treatment of wastewater for recycling and thermal upgrading for compliance with zero pollutant discharge regulations. Credit 3 hours.

562 Chemical Systems Engineering. Process dynamics, systems analysis, computer applications, process control. Credit 3 hours.

563, 564 Chemical Engineering Design. Computational methods, the design of chemical plants and processes. Credit 3 hours each semester.

571 Electrochemical Engineering. Principles of electrochemical reactions applied to chemical production, electropolymerization, electroanalysis, and fuel cells. Credit 3 hours.

581 Optimization Techniques. Development and application of classical search and dynamic programming methods for optimizing unconstrained, equality constrained and inequality constrained problems. Prerequisite: MAT 212. Credit 3 hours.

Special Courses: CHE 494, 498, 499, 590, 591, 592, 594, 598, 599, 690, 792, 799. (See pages 48-49)

Civil Engineering

Professors:

HILL (ECG 136A), BETZ, BLACKBURN, KLOCK, LUNDGREN, PAN, RUFF, WILSON

Associate Professors:

MATTHIAS, O'BANNON, ROSNER

Assistant Professors:

BORGO, DOWNS, RAZZAQ, SEGALL

CEE 241 Surveying. Theory and field work, construction and land surveys. Prerequisite: MAT 118. Two lectures, 3 hours laboratory. Credit 3 hours.

310 Materials for Construction. Structural and behavioral characteristics, engineering properties, measurements and application of construction materials. Not open to engineering students. Prerequisite: CON 323 or equivalent. One lecture, 3 hours laboratory. Credit 2 hours.

312 Engineering Materials. Structure and behavior of civil engineering materials. Laboratory investigations and test criteria. Prerequisite: ECE 313. One lecture, 3 hours laboratory. Credit 2 hours.

321 Structural Mechanics. Static, indeterminate and indeterminate structures, including trusses, beams and frames. Prerequisite: ECE 313. Three lectures, 2 hours laboratory. Credit 4 hours.

322 Fundamentals of Structures. Theory and design of structural elements. Prerequisites: CEE 312 and 321. Three lectures, 3 hours laboratory. Credit 4 hours.

340 Surveying and Mapping. Large scale mapping of small areas by plane table, transit, stadia and grid squares. Computation of traverses and areas, topographic map reading. Not open to engineering or construction students. Prerequisite: high school

college trigonometry. One lecture 3 hours laboratory Credit, 3 hours.

343 Computations and Adjustments. Surveying adjustments. Least squares adjustment of geodetic survey data by observation and condition equations using matrices. Problems in weighting observational data. Prerequisite: CEE 241. Two lectures 3 hours laboratory. Credit 3 hours

344 Route Surveying. Simple compound and transition curves, reconnaissance preliminary and location surveys. Calculation of earthwork. So far observations for azimuth. Prerequisite: CEE 241. Two lectures 3 hours laboratory. Credit 3 hours

351 Soil Mechanics. Index properties and engineering characteristics of soils. Compaction shear compressibility and permeability. Prerequisite: ECE 313. Two lectures 3 hours laboratory. Credit 3 hours

361 Environmental Engineering. Man's environment water resources hydrologic cycle chemistry of natural waters quality requirements and water treatment water distribution systems. Credit 3 hours

362 Environmental Engineering. Man's environment the carbon cycle and biogeochemistry of wastes principles of waste treatment drainage systems. Credit 2 hours

371 Urban Problems. Problems of the modern urban environment. Concepts of comprehensive planning. History of urban development transportation public service zoning and division urban renewal neighborhood planning. Credit 3 hours.

372 Transportation Engineering. Elementary forms of transportation highway, rail water air. Structures and differences in construction operation, planning and administration. Credit 3 hours

380 Hydrology and Hydraulics. Water supply and distribution precipitation and runoff waves. Flow in pressure conduits and open channels. Hydraulic machinery. Not open to engineering students. Two lectures 2 hours laboratory. Credit 3 hours

381 Hydraulic Engineering. Fluid flow concepts and basic equations. Application of fluid mechanics to pressure conduit and free surface flow unsteady flow and turbomachinery. Prerequisites: ECE 312 and 313. Two lectures 2 hours laboratory. Credit, 3 hours

423 Structural Design. Analysis and design of structural systems. Prerequisite: CEE 322. Two lectures 3 hours laboratory. Credit 3 hours

450 Soil Mechanics in Construction. Soil mechanics as applied to the construction of foundations, highways retaining walls and slope stability. Relationship between soil characteristics and geologic

formations. Prerequisite: senior standing or approval of instructor. Not open to engineering students. Two lectures 3 hours laboratory. Credit, 3 hours

452 Foundations. Applications of soil mechanics to slope stability highways earth dams foundations, and stress distribution in soil media. Prerequisite: CEE 351. Two lectures 3 hours laboratory. Credit 3 hours

461 Environment and Man. Physical, chemical and biological components of the natural environment. Impact of man's organs and types of pollution. Environmental factors affecting man. Open to juniors seniors and graduate students. Credit 3 hours.

466 Sanitary Systems Design. Capacity planning and design of water supply domestic and storm drainage and solid waste systems. Credit 3 hours

475 Highway Geometric Design. Design of the visible elements of the roadway. Fundamental design considerations with application to rural roads at grade intersections freeways and interchanges. Prerequisite: CEE 372. Two lectures 2 hours laboratory. Credit 3 hours

481 Water Resources Engineering. Water resources systems for various types of water utilization, including irrigation hydroelectric power navigation and flood control. Physical hydrology. Economic analysis. Case studies. Credit 3 hours

495 Topics in Civil Engineering. Selection and evaluation of the significant variables in civil engineering problems. Application of concepts acquired in undergraduate curriculum to the development of a rational and feasible problem solution. Prerequisite: senior standing. Credit 1 hour

496 The Civil Engineer. Technical economic political legal and social aspects of civil engineering practice as related to the concept of planning design and management of engineering projects. Credit 3 hours

521 Stress Analysis. Advanced topics in the analytical determination of stress and strain. Prerequisite: ECE 313. Credit 3 hours

524 Steel Structures. Strength properties of steel and the 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. Credit 3 hours

525 Bridge Design. Computer aided design of bridges and bridge components. Superstructure design of continuous girder continuous truss arch and suspension bridges. Complete design of a continuous plate girder bridge. Prerequisite:

CEE 531. Two hours lecture 2 hours laboratory. Credit 3 hours

526 Building Design. Structural design (elastic and plastic) of buildings and frames. Methods of framing wind and earthquake forces. Special systems. Prerequisite: CEE 423. Corequisite: CEE 531. Credit 3 hours

527 Concrete Structures. Elastic ultimate strength and yield line theory. Deflection torsion shrinkage and plastic flow. Prestressed concrete special systems. Prerequisite: CEE 531. Credit 3 hours

528 Stability of Structures. Elastic and inelastic buckling of rod and cold formed columns and beams. Stability of plates rigid frames and trusses. Credit 3 hours

531 Theory of Structures. General theorems relating to elastic systems. Deflection of trusses and beams, statically indeterminate trusses beams rings arches, and frames by constant deformation. Castigliano's work and elastic center. Horizontally curved members in bending and torsion. Prerequisite: CEE 321. Credit 3 hours.

532 Matrix Methods in Structural Analysis. Matrix methods applied to structural engineering and structural mechanics. Stiffness and flexibility methods, finite elements differences. Prerequisites: CEE 531 or equivalent and computer programming background. Credit 3 hours

533 Optimization of Design. Linear and nonlinear mathematical techniques leading to optimum weight and optimum cost design. Application to civil and aerospace structures and civil systems. Credit 3 hours

534,535 Plate and Shell Structures. Development of equations and applications of theory to the analysis of plates and shells emphasizing numerical solutions. Membrane and bending stresses in steel and concrete structures. Prerequisites: CEE 521 531 and partial differential equations. Credit 3 hours each semester

536 Dynamics of Structures. 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. Prerequisite: CEE 531. Credit 3 hours

538 Structural Models. Dimensional analysis and principles of similitude. Direct and indirect models. Corequisite: CEE 531. Credit 3 hours

552 Geological Engineering. Geologic investigation for engineering purposes. Case histories. Major aspects of geologic structure weathering river me-

chanics glacial deposits eolian deposits airphoto interpretation for engineering site locations. Credit, 3 hours

553 Theoretical Soil Mechanics. Engineering properties of soils application of theory of elasticity to soil media failure theories theories of consolidation and shear strength of granular materials Prerequisite CEE 351 Two lectures 3 hours laboratory Credit 3 hours

554 Theoretical Soil Mechanics. Shear strength of cohesive materials clay mineralogy and soil structure theories of bearing capacity slope stability soil dynamics Prerequisite CEE 351 Two lectures, 3 hours laboratory. Credit 3 hours

555 Applied Soil Mechanics. Application of theoretical soil mechanics to engineering problems Subsoil investigations sampling techniques field measurements underpinning dewatering systems chemical and mechanical stabilization techniques. Prerequisite: CEE 553 Two lectures 3 hours laboratory Credit 3 hours

556 Seepage and Earth Dams. Transient and steady state flow of water through soil media confined and unconfined flow pore water pressures and application of theories to the design of earth dams Prerequisite CEE 351 Two lectures 3 hours laboratory Credit 3 hours

557 Advanced Foundation Engineering. Design of shallow and deep foundations retaining walls braced excavations anchored bulkheads and cofferdams Prerequisite. CEE 553. Credit 3 hours.

561 Water and Waste Water Treatment. Theory and design of physical and chemical processes for the treatment of water and waste waters Prerequisite CEE 361 or equivalent Credit 3 hours

562 Waste Water Treatment. Theory and design of biological waste treatment systems Pollution and environmental assimilation of wastes Prerequisite CEE 362 or equivalent Credit 3 hours.

563 Environmental Chemistry Laboratory. Analysis of water domestic and industrial wastes laboratory procedures for control of water and waste treatment processes. Prerequisite CEE 361 or 362 Two lectures 3 hours laboratory Credit, 3 hours

564,565 Industrial Hygiene. 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 Two lectures 3 hours laboratory Credit 3 hours each semester

566 Sanitary Engineering Processes Laboratory.

Laboratory study of unit processes involved in water and waste treatment One lecture, 6 hours laboratory Credit 3 hours

567 Atmospheric Pollution. Atmospheric composition and dynamics origins and chemistry of contamination biological significance analytical measurement engineering control methods and air pollution regulation Credit 3 hours

568 Epidemiology and Public Health Engineering. Biology and transmission of diseases, mathematical theory of epidemics sanitation and public health administration. Credit 3 hours

571 City Planning. Municipal organization and administration, public utilities services zoning regulation critical studies Two lectures 2 hours laboratory. Credit 3 hours

572 Design of Highway and Airport Pavements. Design practices materials and testing of flexible and rigid pavements Prerequisites CEE 351 372 Two lectures 3 hours laboratory Credit, 3 hours

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

574 Traffic Engineering. Operator and vehicle characteristics street capacities signals signs and markings etc. All phases of traffic engineering as applied to urban areas. Credit 3 hours

576 Airport Engineering. Planning and design of airport facilities financing air traffic control aircraft characteristics demand site selection, runway configuration and terminal areas Prerequisite CEE 372 Two lectures 2 hours laboratory Credit 3 hours

577 Urban Transportation Planning. 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 Credit 3 hours

578 Highway Engineering, Planning and Economics. Highway transportation including design operation planning environmental impact economic feasibility and financing Highways as a regional system Credit 3 hours.

581 Hydrology. Advanced hydrologic principles Hydrologic measurements statistical analysis of data design storms flood routing ground water theory Prerequisite CEE 381 Credit 3 hours

582 Free Surface Flow. Steady and unsteady flow in open channels surface curves transitions and control structures hydraulic jump surges and waves Secondary flows Prerequisite CEE 381 Credit 3 hours

584 Hydromechanics. Theoretical considerations of

water waves jets wakes cavities stratified flows, diffusion phenomena unsteady flow profiles and surge problems potential flow concepts and turbulence. Credit 3 hours

585 Applied Hydromechanics. Advanced topics selected in accordance with student interest sedimentation phenomena water waves coastal processes flow in porous media cavitation density currents transport phenomena and fluid mixing Prerequisite CEE 584 Credit 3 hours

586 Projects Planning. Procedures for the planning design and management of large scale civil engineering projects, systems modeling optimum ranges of design evaluation and choice of alternatives problems of implementation case studies Credit 3 hours

587 Water Resources Systems. Socioeconomic impact ecological and technical factors affecting decisions in resource allocation and water resource systems environmental evaluation on methods, case studies Credit 3 hours

588 Physical Oceanography. Current systems circulation and wind driven currents emphasizing the upper ocean Credit 3 hours

Special Courses: CEE 494, 498 499 580 584 590 591 592 594 598 599 792 799 See pages 48 49

Electrical Engineering

Professors:

TICE (EC A 209) DEMASSA DONNELLY,
JELSMA KAUFMAN KELLY PALAIS
PATTERSON P E RUSSELL, SIRK S
T B THOMPSON WELCH WOODFLL

Associate Professors:

BLACKLEDGE CLARK GELOPULOS,
HGGNS, ROBBNS, SNIDER, STEINMANN
ZMMER

Assistant Professor:

WHITE

Lecturer:

SAKIOTIS

EEE 273 Electrical Construct on Fundamentals.

Electrical circuits and machinery Elements of power transmission and distribution Related measurement and instrumentation essential summation. Not for

degree credit for EEE majors) Prerequisites: PHY 112 MAT 120 Three lectures 3 hours laboratory Credit 4 hours.

302 Electrical Networks. Analysis of networks and near systems. Prerequisites: ECE 122 330 Credit 3 hours

320 Digital Computer Fundamentals. Switching theory number systems computer arithmetic, computer system hardware and software Prerequisite: junior standing Credit 3 hours

325 Analog Methods. Introduction to analog computers. Analog techniques applied to simulation of electrical mechanical hydraulic and other dynamic systems. (Not for degree credit for EEE majors) Prerequisites: ECE 345 or MAT 212 ECE 312 330 Two lectures 3 hours laboratory Credit 3 hours

332 Electronic Engineering II. Analysis and applications of digital and analog circuits Prerequisite: ECE 331 Three lectures 3 hours laboratory Credit 4 hours

333 Semiconductors and Devices. Semiconductors drift diffusion generation recombination junctions diodes switching transistors Ebers-Moll equations Prerequisites: ECE 331, 350 Credit 3 hours

341 Engineering Electromagnetics. Static electric and magnetic fields Gradient curl and divergence D electric and magnetic materials Time varying fields Maxwell's equations Poynting vector Uniform plane waves Radiation Prerequisites: ECE 202 MAT 362 Credit 3 hours

362 Electromechanics. Magnetic circuits and electromechanical energy conversion Introduction to analog and digital simulation and to machinery laboratory Prerequisite: EEE 302 Three lectures 3 hours laboratory Credit, 4 hours

401 Distributed Parameter Networks. Analysis and applications Prerequisites: EEE 302 341 Three lectures 3 hours laboratory Credit 4 hours

402 Network Analysis. Prerequisite: EEE 302 Credit, 3 hours

405 Network Design. Modern network synthesis Frequency domain approximation Theory of two port networks Prerequisite: EEE 302 Credit 3 hours

406 Computer Aided Network Design. Computer methods in AC, DC and transient analysis of linear and nonlinear networks Selected general purpose programs such as ECAP C RCUS and SCEPTRE Active device modeling Prerequisite: EEE 302 Credit 3 hours

420 Digital System Design Fundamentals. Computer arithmetic logic design, and circuit technology. Hardware programming, and software of a particular

system Software includes use of on-line assembly and utility systems Prerequisite: EEE 320 2 5 hours lecture 1 5 hours laboratory Credit 3 hours

425 Digital Systems Circuits. Modes and analysis of BJT and FETs in nonlinear electrical circuits for logic timing switching memory and oscillations in digital and analog systems Prerequisites: EEE 320 ECE 331 Corequisite: EEE 426 or equivalent Credit 3 hours

426 Digital Circuits Laboratory. Incorporation of digital components into circuits for digital systems applications Corequisite: EEE 425 Three hours Credit 1 hour

427 Digital Switching Theory. Minimization of Boolean functions for combination logic and multiplex output switching circuits Symmetrical functions threshold functions memory elements and computer logic sequential machines Prerequisite: EEE 320 Credit 3 hours

428 Analog and Hybrid Computers. Design and use of hybrid analog-digital computer systems and components such as op amps multipliers analog switches and comparators A/D and D/A converters Special computing techniques. Prerequisites: EEE 362 332 Two lectures 3 hours laboratory Credit 3 hours

431 Semiconductor Devices. Transient time and charge control concepts; narrow-base diodes bipolar drift transistors junction and MOS field effect transistors. Simple static and dynamic models for computer aided analysis and design system applications Prerequisites: EEE 332 333 Two lectures 3 hours laboratory Credit 3 hours

432 Solid State Circuits. Basic monolithic integrated circuit design and limitations for realizing passive and active network elements advanced bipolar and MOS device models for computer simulation of integrated circuits Prerequisites: EEE 332 333. Two lectures, 3 hours laboratory Credit 3 hours

433 Analog Circuit Design. Design of electronic circuits including amplifiers mixers waveform generators and active filters Prerequisites: EEE 302 332 or equivalent Three lectures 3 hours laboratory Credit 4 hours

434 Quantum Mechanics for Engineers. Probability Schroedinger equation eigenfunctions harmonic oscillator periodic potentials superposition angular momentum scattering tunneling perturbation theory Prerequisites: MAT 362 EEE 341. Credit 3 hours

435 Microelectronics. Practice of solid state device fabrication techniques including thin film and integrated circuit fabrication processes Prerequisite:

EEE 333 or equivalent Two lectures, 3 hours laboratory Credit 3 hours

441 Advanced Engineering Electromagnetics. Static and time varying fields Polarization Magnetization High frequency impedance Propagation and reflection of plane waves Guided waves. Slow waves Anisotropic media Resonators Coupling Radiation Prerequisite: EEE 341 Credit 3 hours

443 Antennas. Engineering principles arrays, measurements numerical computations Prerequisites: EEE 341 401 Credit 3 hours

445 Microwaves. Components systems and measurements. Prerequisites: EEE 341 401 Three lectures, 3 hours laboratory Credit 4 hours.

448 Coherent Optics. Analysis and design of systems using lasers. Prerequisite: EEE 341 Credit 3 hours

451 Error Correcting Codes. Application of modern algebra to the analysis and synthesis of random error-detecting and error correcting block codes Prerequisite: EEE 320 Credit 3 hours

455 Communication Theory. Spectral analysis of signals and noise. Linear and exponential modulation Sampling theory and pulse modulation Comparison analysis of systems. Prerequisites: EEE 302 332 Three lectures 3 hours laboratory Credit 4 hours

456 Communication Systems. Statistical methods in communication systems Representation of random signals Detection and estimation theory. Prerequisite: EEE 455 Credit, 3 hours

461 Synchronous Machines. Classical and modern models of synchronous machines emphasizing power utility applications Prerequisite: EEE 362 Credit 3 hours

462 Power Systems Control. Economic dispatch and area generation control, excitation control governors and power system stabilizers Corequisite: EEE 480 Credit 3 hours

470 Alternating Current Circuits. Steady state solution of networks with alternating current sources Fundamentals of generation transmission and protection of polyphase systems Prerequisite: EEE 302 Credit 3 hours

471, 472 Electric Power Systems. Power system analysis Prerequisite: EEE 362 or 470 or equivalent Credit 3 hours each semester

480 Feedback Systems. Analysis and design of linear feedback systems Frequency response and root locus techniques series compensation and state variable feedback. Prerequisites: EEE 332 362 Three lectures 3 hours laboratory. Credit 4 hours

482 Digital Simulation of Systems. Concepts of sys-

tem analysis, numerical analysis, techniques, operational methods for digital simulation, and digital simulation languages. Corequisite: EEE 480. Credit, 3 hours

485 Clinical Engineering. Applications of electrical engineering to the delivery of medical care and the maintenance of medical facilities. Prerequisite: ECE 331. Credit: 3 hours

486 Bio-Medical Electronics I. How the engineer can design interfaces with human biological systems obtain data from them and modify their function - illustrated with specific medical applications. Prerequisite: ECE 331 or equivalent. Credit: 3 hours

487 Bio-Medical Electronics II. Aspects of the biological system related to the control of body movements in response to sensory inputs such as vision and vestibular signals. Prerequisite: EEE 302. Credit: 3 hours

488 Bio-Medical Electronics III. Speech processing applied to use of electronic techniques to aid in teaching deaf children how to speak. Use of electronic techniques to implement a man-machine verbal interface. Prerequisite: ECE 331. Credit: 3 hours

495 Bio-Engineering Seminar. Applications of the concepts and methods of electrical engineering to the biological and medical sciences. May be repeated for credit. Prerequisite: senior standing. Credit: 3 hours

496 Professional Seminar. Topics of interest to graduating electrical engineers. Prerequisite: senior standing. One lecture. Credit: None

501 Passive Filter Synthesis. Advanced methods for the synthesis of passive filters: frequency and time domain approximation, computer aided design techniques. Prerequisites: EEE 405 and 550 or equivalent. Credit: 3 hours

502 Foundations of Passive Network Theory. Time and frequency domain representation of linear networks. Topological analysis, realizability theory and the foundations of passive network synthesis. Prerequisites: EEE 302 and 550 or equivalent. Credit: 3 hours

503 Active Networks. Theory of networks containing general active elements: Linear amplifier design. Prerequisites: EEE 302 and 550 or equivalent. Credit: 3 hours

504 Active Network Synthesis. Synthesis of active networks for low frequency filtering applications. Use of negative impedance converters, gyrators, and operational amplifiers as active elements. Prerequisite: EEE 405. Credit: 3 hours

505 Digital Processing of Signals. Frequency domain description of digital filtering. Discrete spectrum

analysis by z transform, and discrete Fourier transform with quantization effects. Prerequisites: EEE 302 and 550 or equivalent. Credit: 3 hours

514 Fundamental Computer Algorithms. Subroutines, routines, interpretation, routing, I/O buffering and timing information, structures, stacks, queues, deques, sequential algorithms, binary trees. Prerequisite: ASE 423 or equivalent. Lecture and laboratory. Credit: 3 hours

515 Computer Operating System Algorithms. Theory and practical computer operating systems. Selected topics from dispatching, interrupt processing, dynamic resource allocation, virtual memories, non-numeric, and semiconductor algorithms. Prerequisite: EEE 514 or 517. Lecture and laboratory. Credit: 3 hours.

516 System Programming Methods. Table lookup procedures, hierarchical data structures, macro programming and system implementation languages. Prerequisite: ASE 422. Corequisite: ASE 423. Credit: 3 hours

517 Design of Automatic Programming Systems. Methods and techniques of designing compilers for languages such as FORTRAN and ALGOL. Prerequisite: EEE 516. Credit: 3 hours

518 Compiler Compilers. Theoretical basis of compiler generators with specific examples. Topics include generalized translation, self-compiling and bootstrap compilation of one-dimensional computer languages. Prerequisite: EEE 516. Credit: 3 hours

519 Artificial Intelligence. Progress, problems and prospects of automating cognitive and heuristic reasoning processes. Prerequisite: EEE 516. Credit: 3 hours.

520 Digital System Design. Hardware and logic design of a particular system. Machine and assembly language programming of that system and the use of the on-line assembly and utility systems. CPU technology and implementation. Prerequisite: EEE 420. 2.5 hours lecture, 1.5 hours laboratory. Credit: 3 hours.

521 Digital Systems Hardware. Memory and input-output components of the digital system studied in EEE 520 and survey of other digital systems hardware. Prerequisite: EEE 520. Credit: 3 hours.

522 System Design Using Microprocessors. Microprocessor technology and its application to the design of practical digital systems. Hardware, programming and interface for microprocessor-oriented systems. Prerequisite: EEE 520. Credit: 3 hours

523 Microprogramming. Theory, practice and application

of microprogramming and available microprogrammed computer systems. Prerequisite: EEE 520. Credit: 3 hours

524 Digital Systems Software. Design of digital system software: loading, relocation, loaders, assemblers, online utility systems, and multi-programming operating systems. A continuation of EEE 520. Prerequisite: EEE 520. Credit: 3 hours.

525 Digital Circuit Design. Voltage and current time base generators, multiplexers, negative resistance circuits, active and magnetic memory elements. Prerequisite: EEE 425. Credit: 3 hours

527 Advanced Switching Theory. Application of matrices, partially ordered sets, lattice equivalence and compatibility relations, logical design of completely and incompletely specified sequential machines. Prerequisite: EEE 427. Credit: 3 hours

528 Automata. Theory of finite state machines and their connection with (mathematical) linguistic models. Prerequisite: EEE 527. Credit: 3 hours

529 Digital Systems Seminar. Selected topics in theory, design or application. May be repeated for credit. Credit: 3 hours.

531 Semiconductor Device Theory I. Junction diodes, junction and field-effect transistors, homogeneous impurity profiles, high-field effects, basic fabrication techniques, surface effects, analysis of MOS field-effect transistors. Prerequisites: EEE 333, 341. Credit: 3 hours

532 Semiconductor Device Theory II. Semiconductor device phenomena including light and heat effects, tunneling, meta-insulator-semiconductor devices. Prerequisite: EEE 531. Credit: 3 hours

533 Integrated Circuit Design. Integrated circuit fabrication, device modeling, active and passive parasitics. Comparison of integrated and discrete circuits. Characterization and design of integrated logic and signal circuits. Prerequisites: EEE 302, 332 and 431 or equivalent. Credit: 3 hours.

534 Topics in Solid State Device Theory. Electrical and thermal transport properties, excess carrier dynamics, equilibrium and nonequilibrium processes. Prerequisite: approval of instructor. Credit: 3 hours

541, 542 Advanced Electromagnetic Fields. Analytical techniques applied to electromagnetic field problems. Prerequisite: EEE 341 or equivalent. Credit: 3 hours each semester

543 Antennas. Analysis and synthesis of selected radiation structures and systems. Prerequisite: EEE 443 or equivalent. Credit: 3 hours

545 Microwaves. Components, control devices and circuits. Prerequisite: EEE 445. Credit: 3 hours

547 Microwave Solid State Electronics. Use of fer-rite semiconductor and piezoelectric materials in microwave systems Prerequisites EEE 333 and 445 or equivalent. Credit 3 hours

548 Optical Electronics. Laser communication devices and systems Prerequisite EEE 448. Credit 3 hours

549 Laser Engineering. Theory and design of lasers. Prerequisite EEE 448 Credit 3 hours

550 Transform Theory and Applications. Application of complex variables to Fourier, Laplace, and z transforms Oriented to applications in control, network communication and near system theory Prerequisite EEE 302 Credit 3 hours

551 Error Correcting Codes. Burst error correcting codes, convolution codes, comma-free codes, arithmetic codes and error-control probability Prerequisite EEE 451 Credit 3 hours

554 Random Signal Theory. Application of statistical techniques to the representation and analysis of electrical signals and to communication systems analysis Prerequisite EEE 302 Credit 3 hours

555 Electrical Communications. Processing of signals in the presence of noise Random signals correlation frequency spectra estimation, filtering noise prediction transients Prerequisite EEE 554 Credit, 3 hours.

556 Detection and Estimation Theory. Combination of the classical techniques of statistical inference and the random process characterization of communication radar and other modern data processing systems Prerequisites EEE 455 555. Credit 3 hours

557 Information Theory. Definitions of information sources and channels, fundamental theorems of information theory and their significance, simple error detection and error correcting codes Prerequisite EEE 554 Credit 3 hours

558 Modulation Theory. Linear and nonlinear modulation optimum processors including the development of performance bounds Prerequisites EEE 455 555 Credit 3 hours

559 Quantum Communication Theory. Vectors and operators in Hilbert space. Inner products and the uncertainty principle statistical operator noise in physical systems Prerequisites EEE 434 and 555, or equivalent. Credit 3 hours

570 Symmetrical Components. Application of symmetrical components to the analysis of power systems and machines Prerequisites EEE 362 and 401, or equivalent Credit 3 hours

571 Power System Stability. Transient and steady

state stability limits of power systems Prerequisite EEE 471 or equivalent. Credit 3 hours.

575 Analysis of Power Networks. Tensor and matrix methods applied to problems involving extensive complex networks Prerequisite EEE 471 or equivalent Credit 3 hours.

580 Discrete-Time Control Systems. 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 Credit 3 hours

581 Random Processes in Control Systems. Statistical filtering estimation and control with emphasis on the Kalman filter and its applications and computational problems Prerequisites EEE 550, 554 582 Credit 3 hours

582 Linear System Theory. State variables, dynamic equations and impulse response matrices controllability and observability state feedback and estimators and composite systems Prerequisite EEE 480 Credit 3 hours

586 Nonlinear Control Systems. Stability theory in the complex plane describing function Liapunov's method and frequency domain criteria for continuous and discrete nonlinear and time varying systems Prerequisites EEE 550 582 Credit 3 hours

587 Optimal Control Systems. Application of calculus of variations Pontryagin's principle and dynamic programming to control problems Computational techniques for solving optimal control problems Prerequisites EEE 550 582 Credit 3 hours

Special Courses: EEE 498 499 590 591 592 594 598 599 792 799 (See pages 48-49)

Engineering Core

ECE 102 Introduction to Engineering. Role of the engineer elementary engineering problems current trends in engineering methods of engineering design; and design project Lecture recitation and laboratory Credit 2 hours

104 Engineering Graphics and Design. Graphics as a fundamental means of communication in engineering analysis and design Sketching spatial visualization descriptive geometry and modern engineering drawing practices for design application Six hours lecture laboratory Credit 2 hours

118 Chemical Foundations of Engineering. Atomic and molecular structure states of matter and their energies chemical equilibria and reaction rates organic compounds and industrial processes Prerequisite

superior performance in one year of high school physics and chemistry Lecture demonstrations and recitation Credit 4 hours

122 Computer Programming. Definition formulation and flow charting leading to the solution of complex problems by digital computer using FORTRAN. Computer solution is required for projects Corequisite MAT 120 or prerequisite MAT 142 or 260 Credit, 2 hours.

201 Mechanics and Heat. Basic concepts of mechanics and heat with applications to engineering Lecture demonstrations and laboratory Prerequisite MAT 120 Credit 4 hours

202 Electrical Science. Basic concepts of electricity and magnetism with applications to engineering. Lecture demonstrations and laboratory. Prerequisite ECE 201 corequisite MAT 121. Credit 4 hours

203 Engineering Wave Phenomena. Basic concepts of wave phenomena with applications to engineering. Prerequisite ECE 202 Credit 2 hours

211 Engineering Mechanics, Statics. Force systems resultants, equilibrium distributed forces friction First and second moments of areas Prerequisite ECE 201 corequisite ECE 345 or MAT 212 Credit 2 hours

300 Economic Analysis for Engineers. Economic evaluation of engineering alternatives emphasizing the time value of money Credit 2 hours

304 Atomic and Nuclear Principles. Atomic and nuclear principles with applications to engineering. Prerequisite ECE 202 corequisite ECE 203 Credit, 2 hours

312 Engineering Mechanics, Dynamics. Kinematics and kinetics of particles translation and rotating coordinate systems. Rigid body kinematics Dynamics of systems of particles and rigid bodies. Energy and momentum methods Prerequisites ECE 211 ECE 345 or MAT 212 Credit 3 hours

313 Mechanics of Materials. Stress and strain Hooke's law strength and deflection of axial force members shafts in torsion and beams in flexure combined stress stability of columns Prerequisites ECE 211 ECE 345 or MAT 212 Lecture demonstrations and laboratory Credit 4 hours

330 Electrical Networks. Networks and linear systems Corequisites ECE 202, ECE 345 or MAT 212 Lecture, demonstrations and laboratory. Credit 4 hours

331 Electronic Engineering I. Electronic devices digital and analog applications Prerequisite ECE 330 Lecture demonstrations and laboratory. Credit 4 hours

340 Probability and Statistics for Engineers. Topics include discrete and continuous distributions, random variables, sampling and descriptive statistics as well as tests of hypotheses and estimates. Prerequisite: MAT 121 Credit 3 hours

345 Methods in Engineering Analysis. Topics from vector calculus including vector fields Green's Stokes and divergence theorems Exact and numerical solutions of ordinary differential equations Matrix algebra and systems of equations Applications to engineering Prerequisite: MAT 121 Credit 5 hours

350 Structure and Properties of Materials. Basic concepts of material structure and its relation to properties Application to engineering problems Corequisite: ECE 381 Credit, 3 hours

361 Measurement Systems Engineering. System design concepts applied to static and dynamic measurements Behavior of transducers validation of experimental data. Prerequisites: ECE 313 330 Lecture demonstrations laboratory and recitation. Credit, 4 hours

364 Chemical Process Instrumentation. Theory and applications of analytical and control instrumentation used in the chemical process industries Prerequisites: ECE 118 203 330 Lecture demonstrations and laboratory Credit 3 hours.

371 Fluid Mechanics. Principles of continuum fluid mechanics Prerequisite: ECE 381 Lecture demonstrations and laboratory Credit 4 hours

381 Thermodynamics. Work heat and energy transformations Relation of properties Laws concepts and modes of analysis common to all applications of thermodynamics in engineering Lecture-recitation Corequisite: ECE 312 Credit 3 hours

400 Engineering Communications. Composition for technical papers reports and scientific articles suitable for publication Oral and written presentation Prerequisite: upper division standing Credit 3 hours

444 Numerical Analysis in Engineering. Application of numerical procedures to the solution of complex engineering problems Analysis and organization of practical programs for numerical solution of initial boundary and eigenvalue problems Prerequisite: ECE 345 or MAT 212 Credit 3 hours

446 Methods in Engineering Analysis. Systems of ordinary differential equations Nonlinear systems and stability Partial differential equations and Fourier series Boundary value problems Applications to engineering Prerequisite: ECE 345 or MAT 212 Credit 3 hours

448 Applied Mathematical Analysis. Treatment and

interpretation of engineering data mathematical models of engineering problems linear algebra and introduction to optimization techniques and computational techniques for solving nonlinear equations Prerequisite: ECE 345 or MAT 212 Credit 3 hours

Engineering Science

Professors:

WALLACE (ECG 120B), ALLEN AVERY,
NELSON STEIN L. P. THOMPSON, TURNBOW

Associate Professors:

BICKFORD CHEN, HENDRICKSON, STANLEY

Assistant Professors:

RANKIN S. J. RUSSELL

Engineering Communications

Professor:

WILCOX

Associate Professor:

STADMILLER

Assistant Professor:

LAWLER

ESE 351 Materials Engineering. Material production and conservation with emphasis on solids includes materials resources sources and control of environmental pollution new product processes recycling Prerequisites: ECE 118 or CHM 114 Credit 3 hours

355 Metallurgy. Metallurgy of iron steel and nonferrous alloys Fundamentals of atomic crystal and microstructure studied to explain the attainment of properties through casting hot working cold working and heat treatment For nonengineering majors Prerequisite: CHM 114 or equivalent Two lectures 3 hours laboratory Credit 3 hours

410 Acoustics of the Environment. Principles of acoustics analysis and design emphasizing current environmental problems Prerequisites: MAT 141 or 121 PHY 111 or ECE 203 Lecture and demonstration Credit 2 hours

413 Intermediate Dynamics Rotating reference frames Lagrange's and Euler's equations gyroscope motion, transient response of dynamic systems numerical analysis vehicular impact Prerequisite: ECE 312 Credit 3 hours

414 Space Mechanics. Applications of dynamics to aeronautical and astronautical problems, orbits and trajectories performance and optimization of multistage rockets Prerequisite: ECE 312 Credit 2 hours

415 Vibration Analysis. Undamped and damped vibrations of single degree of freedom systems Forced vibration transient response Many-degrees of freedom systems normal modes vibration of elastic bodies Prerequisite: ECE 313 Credit 3 hours

422 Mechanics of Materials. Theories of failure torsion of noncircular members thick walled pressure vessels curved beams unsymmetrical bending shear flow shear center circular plates Prerequisite: ECE 313 Credit 2 hours

425 Experimental Mechanics. Experimental methods in mechanics mechanical electronics, and optical transducers photoelastic and brittle coating techniques, modeling correlation and error analyses Prerequisite: ESE 422 Lecture and laboratory Credit 3 hours

427 Vehicle Structures. Flight vehicle and ground vehicle structures, design criteria component analysis of rings shear panels multiaxial beams bending shear and torsions; pressure vessel cutouts and sandwich panel design matrix methods for system and subsystem analysis Prerequisite: ESE 422 Credit 2 hours

450 Mechanical Properties of Solids. Effects of environment and microstructure variables on mechanical properties, plastic deformation, fatigue creep brittle fracture internal friction Prerequisite: ECE 350 Credit 3 hours

451 X-Ray Diffraction and Crystallography. Fundamentals of diffraction and crystallography. Basic experimental techniques for X-ray diffraction Fundamentals of X-ray fluorescent spectrometry Prerequisite: ECE 350 Two lectures 2 hours laboratory. Credit 3 hours

454 Materials for Energy Converters. Specifications of materials used for advanced energy conversion devices Prerequisite: ECE 350 Credit 3 hours

455 Physical Metallurgy I. Crystal structure and defects Phase diagrams metallography of deformation and casting deformation and annealing Prerequisite: ECE 350 Three lectures 3 hours laboratory Credit 4 hours

456 Physical Metallurgy II. Nonequilibrium transformations heat treatment of steels pre- and post-treatment hardening solid solution strengthening welding surface reactions Prerequisite: ESE 455 Three lectures 3 hours laboratory Credit 4 hours

462 Measurement Systems. Continuation of ECE 361. Emphasizes on transducer behavior as it affects system characteristics and on system dynamics. Problems of signal enhancement and noise suppression. Prerequisite: ECE 361 or ESE 565. Two lectures, 1 laboratory/lecture. 2 hours laboratory or discussion. Credit: 3 hours.

463 Transducer Physical Principles. Transducers as information and energy processing devices. Characteristics selection criteria and applications. Prerequisite: ECE 361 or ESE 565. Two lectures, 1 laboratory/lecture. 2 hours laboratory or discussion. Credit: 3 hours.

471 Geophysical Fluid Mechanics. Physical oceanography and mantle convection emphasizing fluid mechanics aspects. Prerequisite: ECE 371. Credit: 3 hours.

474 Atmospheric Dynamics. Meteorological processes and the governing equations of meteorology. Numerical techniques used in weather forecasting. Atmospheric pollution dynamics. Prerequisite: ECE 371. Credit: 3 hours.

511 Acoustics. Principles underlying the generation, transmission and reception of acoustic waves. Applications to noise control, electroacoustic transducers and architectural acoustics. Prerequisites: ECE 312, 446 or MAT 362. Lecture and demonstrations. Credit: 3 hours.

513 Advanced Dynamics. Dynamics of particles, systems of particles. Generalized coordinates. D'Alembert's and Hamilton's principles. Lagrange's equations. Kinematics and kinetics of rigid bodies. Prerequisite: ECE 446 or MAT 460. Credit: 3 hours.

514 Space Vehicle Dynamics. Gyrodynamics and gyroscope instruments. Missiles and space vehicle motion: inertial navigation, terminal guidance, flight trajectory optimization. Prerequisite: ESE 513. Credit: 3 hours.

515 Dynamics of Elastic Systems. Free vibration and forced response of discrete elastic systems. Finite elements. Analytical and computer methods of solution. Random vibrations. Prerequisite: ESE 415. Credit: 3 hours.

516 Dynamics of Elastic Systems. Free vibration and forced response of continuous elastic systems. Variational method of formulation. Exact and approximate methods of solution. Wave propagation. Prerequisite: ESE 415. Credit: 3 hours.

517 Nonlinear Vibrations. Qualitative and quantitative methods of analyzing the free and forced response of nonlinear mechanical systems. Credit: 3 hours.

522 Variational Principles of Mechanics. Fundamental variational principles. Virtual work, minimum and complementary potential energy. Resonances and Hamilton's principles. Application to the formulation of governing differential equations and boundary conditions. Direct methods of the calculus of variations treating problems in stability vibrations. Elasticity. Credit: 3 hours.

523 Theory of Plates and Shells. Bending of rectangular and circular plates. Plates on elastic foundation. Large deflections of plates. Membrane theory of shells. Bending theory of shells of revolution. Asymptotic integration. Special and approximate methods. Credit: 3 hours.

524 Theory of Elasticity. Analysis of stress and strain in three dimensions. Generalized Hooke's Law, general theorems. Plane elastostatic problems in rectangular and polar coordinates. Bodies of revolution on general bending and torsion problems and applications. Prerequisite: ECE 446 or MAT 460. Credit: 3 hours.

527 Theory of Plasticity. Elastic behavior of metallic and nonmetallic structural materials. Mechanics of perfect plastic solids and strain hardening solids. Yield conditions and flow laws. Minimum principles. Credit: 3 hours.

528 Fracture Mechanics. Basic concepts of solid mechanics applied to the problem of fracture. Microstructural effects in fracture initiation and propagation. Credit: 3 hours.

529 Theory of Elastic Stability. General stability concepts: stability of discrete systems, bars, frames, arches and rings. Torsion and lateral buckling. Buckling of thin plates and shells. Dynamic stability. Prerequisite: ECE 446 or MAT 460. Credit: 3 hours.

530 Methods of Continuum Mechanics. Topics in mathematics necessary for applications to continuum mechanics: particle mechanics and electromagnetic theory. Topics include: near algebra, tensor analysis on Euclidean spaces and differential geometry as applied to the above. Credit: 3 hours.

532 Methods of Analysis. Asymptotic methods in computing sums. Laplace's method. Stationary phase. Steepest descent. Selected topics in special functions, orthogonal polynomials. Credit: 3 hours.

534 Topics in Nonlinear Analysis. Iterative and direct techniques for nonlinear operator equations and functional equations. Applications to some nonlinear integral equations and differential equations which are of special interest in engineering. Credit: 3 hours.

550 Theory of Crystalline Solids I. Anisotropic properties of crystals. Tensor treatment of elastic, magnetic, electrical and thermal properties; crystallography of Martensitic transformations. Credit: 3 hours.

551 Theory of Crystalline Solids II. Lattice vibrations, point defects, radiation damage, electron structure of alloys. Credit: 3 hours.

552 Dislocation Theory. Fundamental properties of dislocations in crystals. Dislocation multiplication on motion and interactions. Application of dislocation theory to behavior of solids. Prerequisite: ESE 550. Credit: 3 hours.

553 Physical Metallurgy. Advanced research techniques in physical metallurgy: ternary and quaternary phase diagrams, thermal analysis, magnetic analysis, metallography, fracture analysis. Two lectures, 3 hours laboratory. Credit: 3 hours.

554 Metallurgical Thermodynamics and Kinetics. Thermodynamics of alloy systems, diffusion in solids, kinetics of precipitation and phase transformations in solids. Prerequisites: ECE 350, 381. Credit: 3 hours.

563 Measurement Engineering Theory. Discussion on information processing methods, measurement systems. Effects of energy flow, unbalance, reference balance and comparison systems. Effects of information flow. DC, sinusoidal and pulse carriers. Separation of signal from noise. Noise suppression. Prerequisite: ECE 361 or ESE 565. Two lectures, 1 laboratory/lecture. 2 hours laboratory or discussion. Credit: 3 hours.

564 Experimental Stress Analysis. Measurement of static and dynamic stresses in models and prototypes. Brittle analogs and coatings, photoelastic analogs and coatings, membrane and electrical analogs. Iteration method, strain gauges of mechanics and electrical nature. Two lectures, 1 laboratory/lecture, 2 hours laboratory. Credit: 3 hours.

565 Measurement Systems Engineering Theory. Information and energy flow through a system structured of components. Problems in data validation, signal enhancement, noise suppression, for analog measurements. Credit: 3 hours.

572 Geophysical Fluid Mechanics. Mechanics and energetics of the ocean and the earth's atmosphere. Fluid mechanics modeling of the earth's mantle. Credit: 3 hours.

574 Dynamic Meteorology. Applications of meteorological phenomena. Laminar turbulence and boundary layer flows of the atmosphere, atmospheric diffusion processes as applied to pollution control. Credit: 3 hours.

Special Courses: ESE 500, 590, 591, 592, 594, 598, 599, 792, 799. See pages 48-49.

Industrial Engineering

Professors:

YOUNG (EC G-136C), BEDWORTH, DECKER,
HOYT, SMITH

Associate Professors:

DEAN LEWIS LOVELL MOOR ROLLIER

Assistant Professors:

ANDERSON, BAILEY

IEE 301 Words and Human Behavior. Techniques for recognizing and avoiding those habitual responses for familiar words that generate much everyday hostility anxiety confusion and frustration Credit 3 hours

335 Engineering Law. Influence of contract property and tort law on engineering activities contracts agency partnership corporations liens and expert testimony Credit 3 hours

362 Industrial Engineering Analysis. Analysis of man-machine systems using methods of industrial engineering Applications to manufacturing, service, ceramic and technical fields Two lectures, 2 hours laboratory Credit 3 hours

411 Engineering Economy. Cash flow model pricing economic product on charts economic balance analysis profitability models. Prerequisite ECE 300 Credit 3 hours.

422 Information Acquisition. Design of systems to collect information for use in managerial decisions on making human information processing methods of information gathering implementation and evaluation of information systems. Credit 3 hours

425 Environmental Bioengineering. Explanations of bodily responses to industrial aerospace and other man-made habitats A socio-introductory biology of decisions how a human body detects external information and processes it into actions Credit 3 hours

431 Engineering Administration. Engineering organization and administration, introduction to decision making and quantitative approaches to management qualitative approaches to management and engineering administration Credit 3 hours

461 Planning, Scheduling and Control of Resources. Planning analyzing controlling and evaluating operating systems emphasizing the systems approach time series forecasting, network planning scheduling and control Typical operating systems include transportation hospital and production systems Credit 3 hours

463 Control Computer Application. Analog and control digital computers in the industrial process. Automation digital computer logic, assembly language programming real-time computer operation, computer interfaced operation Laboratory assignments Prerequisite ECE 122 or equivalent Credit 3 hours

473 Foundations of Linear Programming. Development of linear programming algorithms with emphasis on relationship to linear algebra Use of computer programs for solving linear programming problems Prerequisite MAT 212 or linear algebra Credit 3 hours

475 Introduction to Discrete Systems Simulation. Concepts of digital simulation and its use in problem solving. Simulation languages with emphasis on GPSS Prerequisites ECE 340 and FORTRAN knowledge Credit 3 hours

476 Operations Research Models. Operations research methodology, development of models and techniques for solving problems such as queueing inventory and replacement Prerequisites ECE 340 and MAT 212 Credit 3 hours

500 Systems Research Methods. Formulation of the systems approach as related to the field of industrial and systems engineering. Credit 3 hours

510 Engineering Economic Analysis. Engineering economic audit break-even point analysis variable budget control of manufacturing costs cost analysis and product pricing Prerequisite ECE 340 Credit 3 hours

511 Analysis of Decision Processes. Methods of making economic decisions statistical decisions on theory effects of risk uncertainty and strategy on managerial economic decisions Prerequisite ECE 340 Credit 3 hours

520 Topics in Human Engineering. Analysis design and control of human performance in man-machine environments considerations of physiological and psychological factors as related to system performance Laboratory assignments Credit 3 hours

521 Applied Synecology. Systematized solution of supervisory and personal problems arising from interpersonal friction Credit 3 hours

522 Biosystems. Analysis and experimentation of muscular cardiac sensory respiratory and neurological systems as they relate to engineering Credit 3 hours

531 Topics in Engineering Administration. Consideration given to philosophical psychological political and social implications of administrative decisions Credit 3 hours

532 Theory in Engineering Administration. Theories

of human and organizational behavior as applied to engineering administration Development of models appropriate to engineering organizational design and control Prerequisite IEE 531 Credit 3 hours.

533 Network Analysis. Network analysis techniques including CPM PERT GERT and maximum flow problems Prerequisites ASE 441 and EE 473 Credit 3 hours.

560 Advanced Computing Concepts for Industrial Systems. Solution of industrial systems problems using digital computers. Topics covered include data structures database management and graphical display systems Prerequisite FORTRAN knowledge Credit 3 hours

562 Discrete System Control. Application of automatic control methodology to discrete processes Sampled data systems Design and synthesis by digital computer statistical analysis and optimization. Prerequisite MAT 212 or equivalent Credit 3 hours

563 Scheduling of Resources. Intensive analysis of scheduling procedures to attain optimum utilization of resources Measures for evaluation in job shop scheduling network scheduling queueing theory concepts applied to scheduling. Prerequisites IEE 461 and 476 Credit 3 hours

564 System Optimization Techniques. Methods for determining the maximum and minimum for functions of many variables Search procedures branch and bound techniques calculus of variations geometric and dynamic programming Credit 3 hours

567 Combined Simulation by Digital Computer. Extension of discrete event simulation concepts Development of concepts of combined discrete and continuous simulation Use of a combined simulation language in large-scale systems problems Prerequisite EE 475 or equivalent Credit 3 hours

569 Nonparametric Statistical Inference. Nonparametric problems associated with categorical and noncategorical data Procedures based on ranks runs signs percentiles ranking methods in the analysis of variance. Kolmogorov-Smirnov test tolerance regions Prerequisite ASE 442 Credit 3 hours.

570 Acceptance Sampling. Statistical design of sampling plans and procedures for attributes and variables data; operating characteristic curves federal specifications and standards of quality Prerequisite ECE 340. Credit 3 hours

571 Probability for Engineers. Continuation of ASE 441 Spectroscopic advanced probability theory application to engineering. Prerequisite ASE 441 or equivalent Credit 3 hours

572 Engineering Statistics. Incomplete blocks, con

founding, fractional replication, response surface methodology, evolutionary operation. Prerequisite: ASE 442. Credit, 3 hours.

573 Reliability Models. Probabilistic failure models; measurement, apportionment, estimation and prediction of reliability; life test procedures; redundancy optimization; maintainability and availability. Prerequisites: ASE 441 and 442. Credit, 3 hours.

574 Mathematical Programming—Linear. Advanced linear programming. Topics include: simplex techniques, revised simplex technique, duality and the primal-dual technique, and decomposition theory. Prerequisite: IEE 473. Credit, 3 hours.

575 Mathematical Programming—Nonlinear. Methods for determining the maximum and minimum for functions of many variables subject to constraints. Classical calculus, Lagrange multipliers, linear approximations, Kuhn-Tucker conditions, quadratic and integer programming. Prerequisite: IEE 473. Credit, 3 hours.

576 Queueing Theory. Analysis of queues using analytical and Monte Carlo methods. Prerequisite: ASE 441. Credit, 3 hours.

577 Information Systems Methodology. Systems approach to the analysis, design and implementation of management information systems. Credit, 3 hours.

578 Inventory Theory. Mathematical and statistical analysis of inventory and warehousing systems. Prerequisites: ASE 441 and IEE 476. Credit, 3 hours.

579 Time Series Analysis and Forecasting. Analysis of advanced forecasting techniques by time series and probability models, smoothing techniques, autocorrelation, and error analysis. Prerequisite: ASE 442. Credit, 3 hours.

580 Current Trends in Industrial Engineering. Evaluation of current trends in the theory and practice of industrial engineering. Credit, 3 hours.

Special Courses: IEE 498, 590, 591, 592, 598, 599, 784, 790, 792, 799. (See pages 48-49.)

MEE 301 is not a prerequisite for MEE 302. Credit, 3 hours each semester.

321 Kinematics and Force Analysis in Machinery. Positions, velocities, and accelerations of machine parts; cams, gears, flexible connectors, rolling contact; synthesis of mechanisms; force analysis in linkages; balancing. Prerequisite: ECE 312. Credit, 3 hours.

332 Production Processes. Production techniques and equipment. Casting and molding, pressure forming, material removal, joining and assembly processes, automation and material handling. Credit, 3 hours.

365 Control System Principles. Analysis and synthesis of feedback control systems. Linear system analysis including root locus, frequency response, and statespace representation of dynamical systems. Controller realization. Laboratory illustration of pneumatic, hydraulic, mechanical, and electromechanical control systems. Prerequisite: ECE 345 or MAT 212. Credit, 2 hours.

372 Fluid Mechanics. Application of basic principles of fluid mechanics to problems in viscous and compressible flow. Prerequisite: ECE 371. Credit, 3 hours.

380, 381 Applied Thermodynamics. Thermodynamics of engines, turbines and compressors, vapor cycles, gas mixtures, and gas and vapor mixtures. Not open to engineering students. Prerequisites: MAT 120; PHY 112. Credit, 3 hours each semester.

382 Thermodynamics. Applied thermodynamics; gas mixtures, power cycles and reactive systems. Prerequisite: ECE 381. Credit, 2 hours.

383 Internal Combustion Engines. Performance characteristics, combustion, carburetion, cooling, and control of internal combustion engines. Prerequisite: MEE 381 or 382 or approval of instructor. Credit, 3 hours.

386 Air Conditioning and Refrigeration. Refrigeration cycles, refrigerant properties, heating, cooling loads; psychrometry; purification; temperature and humidity control. Prerequisite: MEE 381 or 382 or approval of instructor. Credit, 3 hours.

401 Theory, Prediction and Social Effects of Invention. Invention as an instrument of change in civilization; evolutionary nature of inventions, cycle of growth and decline, causation and social effects. Credit, 3 hours.

411 Nuclear Engineering. Principles of neutron chain reacting systems and nuclear power systems. Credit, 3 hours.

412 Health Physics Principles and Radiation Measurements. Source, characteristics, dosimetry and



Mechanical Engineering

Professors:

METZGER (EC G-120D), BEAKLEY, BREGAR, DITSWORTH, FLORSCHUETZ, JANKOWSKI, LOGAN, PRICE, RICE, STAFFORD

Associate Professors:

AUTORE, BACKUS, COOPERRIDER, DAVIDSON, EVANS, FRY, HEDRICK, JACOBSON, WOOD, WOOLDRIDGE

Assistant Professors:

KLINGER, McKLVEEN

Instructor:

HAWLEY

MEE 201 Technology and Social Change. Theories of social change, technology as related to social change, contemporary and possible future impacts of technology on society. Credit, 2 hours.

300 Man and Machine. Mechanical invention and technical progress, and the evolution of social forms and institutions. Credit, 2 hours.

301, 302 Science and Technology in History. History of science and technology. Reciprocal relations with the socio-economic processes and institutions.

measurement techniques for natural and man made radiation. Philosophy of radiation protection. Two lectures 3 hours laboratory Credit 3 hours

413 Reactor Safety Analysis. Power reactor safety and licensing problems. Reactor transient and accident analysis Prerequisite MEE 411 Credit 3 hours.

415 Nuclear System Design. Engineering design of nuclear steam supply systems with emphasis on core heat removal problems Prerequisite MEE 411 corequisite MEE 488 Credit 3 hours

417 Nuclear Engineering Laboratory. Theory and applied concepts in reactor design construction instrumentation and shielding Two lectures 3 hours laboratory Corequisite MEE 411 Credit 3 hours

432 Manufacturing Processes. Physical and economic principles underlying manufacturing processes. Prerequisite MEE 332 Credit 2 hours.

441 Principles of Design I. Design procedures, failure modes stress and deflection analysis, stress concentration fatigue, selected components Prerequisites ESE 422 and ECE 350 Credit 3 hours

442 Principles of Design II. Continuation of MEE 441 with application of the principles and empirical concepts of engineering to the creative design of machine components and subsystems. Prerequisite MEE 441 Credit 3, 3 hours

445 Engineering Design. Projects in design engineering systems requiring problem formulation creativity, application of knowledge from engineering disciplines and consideration of cost, reliability and social and environmental impacts Prerequisite senior standing Credit 3 hours

450 Aerodynamics. Aerodynamic theory; principles of drag reduction modeling and testing Applications in various flow past structures and in the atmosphere Corequisite MEE 372. Credit 3 hours

451 Automatic Control of Aerospace Vehicles. Static and dynamic stability of aircraft, autopilot design active and passive control of satellites Credit 3 hours

453 Propulsion. Performance analysis of propulsion systems including turbojet fanjet and turboprop engines solid and liquid-fueled rockets and on propulsion devices. Prerequisite MEE 382 Credit, 3 hours

455 Turbomachinery. Principles of turbomachines utilized in power plants including steam and gas turbines, hydraulic turbines centrifugal pumps compressors fans and blowers Corequisites MEE 372 and 382. Credit 3 hours

456 Combustion. Thermodynamics aerodynamics and chemical kinetics of combustion. Structure

propagation and stability of flames. Pollutant formation Prerequisite MEE 382 Credit 3 hours

457 Energy Technologies. Supply and demand projections for future energy use. Assessment of new technologies Energy sources and their potential fossil fuels nuclear power, solar and geothermal energy fuel from wastes the hydrogen economy The US resource status and potential for conservation Prerequisite ECE 371. Credit 2 hours

465 Control System Design. Modeling and simulation of dynamic systems. Analog and digital simulation Compensation techniques, performance indices and error criteria Design and implementation of a control system in a laboratory environment Prerequisite MEE 365 Credit 2 hours

471 Numerical Fluid Mechanics. Numerical solutions for selected problems in fluid mechanics Prerequisite MEE 372. Credit 3 hours

487 Direct Energy Conversion. Unconventional methods of energy conversion; fuel cell thermoelectrics, thermionics, photovoltaics and magnetohydrodynamics Prerequisites ECE 350 381 Credit 3 hours.

488 Heat Transfer. Steady and unsteady heat conduction including numerical solutions thermal boundary layer concepts and applications to free and forced convection. Thermal radiation concepts Mass transfer analogies Corequisite MEE 372 Credit, 3 hours

489 Statistical Thermodynamics. Statistical approach to thermodynamic concepts laws and methods of analysis Generalized p v T data Special systems Prerequisite ECE 381 Credit 3 hours

491 Experimental Mechanical Engineering. Experimental and analytical studies of phenomena and performance of fluid flow, heat transfer thermodynamics refrigeration and mechanical power systems Prerequisites MEE 382 ECE 331 or 361 corequisite MEE 488 One lecture 6 hours laboratory Credit 3 hours.

492 Mechanical Engineering Projects. Small group projects in fundamental or applied aspects of mechanical engineering emphasis on experimental solutions to complex problems Prerequisites MEE 441 491 Six hours laboratory Credit 2 hours

493 Experimental System Analysis. Practical approach to a thorough evaluation of an engineering system Parametric mapping data acquisition data analysis and system performance Prerequisites ECE 361 MEE 491 Six hours laboratory Credit 2 hours

512 Reactor Theory. Neutron moderation Fermi Age theory diffusion theory and applications reflected

reactors multigroup diffusion equations Prerequisite MEE 411 Credit, 3 hours

513 Reactor Kinetics and Control. Laplace transform solution of the reactor kinetic equations and reactor transfer functions reactor stability analysis nonlinear reactor dynamics Credit 3 hours

514 Reactor Design. Heterogeneous reactor systems perturbation theory fuel burn-up introduction to neutron transport theory Prerequisite MEE 512 Credit 3 hours

544 Mechanical Design and Failure Analysis. Modes of mechanical failure application of principles of elasticity and plasticity in multiaxial state of stress to design synthesis failure theories fatigue creep impact Prerequisite MEE 445 Credit 3 hours

545 Mechanical Design and Failure Analysis. Principles, concepts phenomenological theories and techniques of analysis associated with failure prevention mechanical design emphasis on fatigue creep, combined fatigue and creep and impact Prerequisite MEE 544 Credit, 3 hours

548 Kinematic Synthesis and Analysis. Synthesis and analysis of displacements velocities and accelerations in mechanical devices Prerequisite MEE 321 Credit, 3 hours

549 Advanced Engineering Design. The application of probability theory decision theory optimization techniques and digital computers to engineering design Prerequisites MEE 445 FORTRAN knowledge Credit 3 hours

551 Aerodynamics. Internal and external gas flows in subsonic through hypersonic regimes perturbation methods method of characteristics similarity three dimensional wings optimization of wings and bodies interference unsteady flow Prerequisite MEE 450 Credit 3 hours

552 Physical Gas Dynamics. Molecular and continuum ideas applied to gases including reacting mixtures chemical kinetics frozen and equilibrium flows, transport properties and flames and detonations Credit 3 hours.

554 Propulsion. Thermodynamics of aircraft engines: aerothermodynamics of jets combustors and nozzles; turbomachinery performance of rocket vehicles chemical rockets nuclear rockets electric rocket propulsion Credit 3 hours

555 Turbomachinery. Performance characteristics energy transfer in rotors cascade mechanics thin airfoil theory axisymmetric potential flow loss mechanism, cavitation surge. Credit 3 hours.

561 Modern Control Theory. Analytical and computational techniques for solving optimal control prob-

blems calculus of variations, dynamic programming, direct methods Deterministic observers Nonlinear control design Prerequisite MEE 465 or equivalent Credit 3 hours.

562 Modern Control Applications. Applications of modern control theory to industrial problems Stochastic control, Kalman filtering Identical on technical questions Digital control Prerequisite MEE 561 Credit 3 hours.

571 Fluid Mechanics. Basic kinematic dynamic and thermodynamic equations of the fluid continuum and their application to some basic modes Credit 3 hours

572 Fluid Mechanics. Continuation of unified treatment of MEE 571 emphasizing compressible and turbulent flows Prerequisite MEE 571 Credit, 3 hours.

573 Turbulence. Prediction methods and experimental results for turbulent shear flows Introduction to research methods and survey of current research activity Prerequisite MEE 571 Credit 3 hours

574 Mechanics of Viscous Fluids. Laminar and turbulent viscous flows Perturbation theory similarity solutions and numerical solutions for the various flow regimes Prerequisite MEE 571 Credit 3 hours

575 Mechanics of Viscous Fluids. Laminar and turbulent boundary layer flows other viscous flows having boundary layer characteristics Prerequisite MEE 574 Credit 3 hours

576 Two-Phase Flow and Boiling Heat Transfer. Heat transfer and pressure drop characteristics of two phase fluid systems boiling and condensation phenomena flow and nonflow systems selected topics Credit 3 hours

577 Hydrodynamic Stability. Linear and nonlinear theories of hydrodynamic stability analytical and numerical solutions on methods comparison of theoretical results with experiments. Corequisite MEE 574. Credit 3 hours

581 Thermodynamics. Basic concepts and laws of classical equilibrium thermodynamics Introduction to statistical thermodynamics Applications to engineering systems. Credit 3 hours

582 Thermodynamics. Continuation of MEE 581, including irreversible thermodynamics Prerequisite MEE 581 Credit 3 hours.

583 Direct Energy Conversion. Basic concepts of direct energy conversion and associated electromagnetic, and thermal phenomena Prerequisite MEE 581. Credit 3 hours

585 Heat Transfer. Basic equations and concepts of

heat transfer applications to conductive, convective and radiative heat transfer. Prerequisite MEE 488 Credit, 3 hours

586 Heat Transfer. Continuation of MEE 585 emphasizing convection heat transfer Prerequisite MEE 585 Credit 3 hours

587 Heat Transfer. Continuation of MEE 585 emphasizing radiation heat transfer Prerequisite MEE 585 Credit 3 hours

591 Seminar. Topics may be offered in the areas of Aerospace Controls Design, Nuclear, or Thermosciences Credit 1-3 hours

594 Graduate Research Conference. Topics in contemporary research Required every semester of a Mechanical Engineering graduate student registered for 9 or more semester hours. Not for degree credit Credit, 1 hour

Special Courses: MEE 498 590 592 598 599, 792 799 See pages 48-49)

Division of Technology

WALTER E. BURDET, Ed.D., *Director*

Purpose

The Division of Technology serves three major functions. One is the preparation of engineering and industrial technologists as members of the total technological team comprised of scientists, engineers, technologists and technicians. A second function is the preparation of other specialists who are not properly categorized as technologists, although their preparation is intensively industrially oriented. This function embraces the preparation of such specialists as industrial designers, graphic and printing management personnel, industrial supervisors, technical managers, and technical communicators. A third function is the preparation of teachers of industrial and technical education in the elementary and secondary schools, technical institutes,

community colleges, universities and in industry.

Each four year Bachelor of Science degree technology curriculum prepares supporting and specialist personnel in the major areas of research and development, design and manufacturing. While comprehensive and foundational understanding of scientific principles is required, the essential nature of the task to be performed is in translation of the scientific ideas or discoveries into useful products and services. Consequently, these curricula combine general foundations of scientific theory and facts with laboratory experiences which are designed to instruct in methods rather than to develop extensive skills. Finally, it is the added purpose of these curricula to make the student keenly aware of the urgent problems of society and to develop deeper appreciation of the cultural achievements of man.

The industrial and technical education curricula prepare graduates for positions as industrial arts and technical teachers, department heads, supervisors or directors, consultants and industrial training directors. It is the purpose of the Division of Technology to meet these needs through offerings leading to the completion of the Bachelor of Arts in Education, the Bachelor of Science, the Master of Arts in Education, the Master of Science in Technology, the Education Specialist, the Doctor of Philosophy, and the Doctor of Education degrees with specialization in industrial education. (See Graduate College catalog.)

A student may select that particular field of specialization which conforms to his interests or plans. For convenience, the fields of specialization are shown in the following list:

Aeronautical Technology
Aeronautical Industrial Technology

Electronic Technology
 Electronic Industrial Technology
 Graphic Communications
 Industrial Design
 Mechanical Design
 Technical Management
 Industrial Technical Education
 Industrial Supervision
 Aeronautical Engineering Technology
 Electronic Engineering Technology
 Manufacturing Engineering Technology
 Mechanical Engineering Technology

Organization

All Division offerings have been organized into four functional programs of study as follows:

- Engineering Technology
- Industrial Technology
- Industrial Design
- Industrial Technical Education

Because each program of study has its own unique educational mission, each is organized around its own structured core of required courses. These respective program cores provide the unifying elements of mathematics, science, graphics, communications, and technical sciences which are appropriate to that particular program of study.

All fields of specialization which are provided through this Division are organized and defined under the four programs of study presented above.

Degrees

Bachelor of Science. Division programs of study require the satisfactory completion of not less than 126 semester hours, or more

where indicated by the specific program or by student entrance deficiencies. Included are the General Studies courses, university English, courses of the selected program of studies core, required courses in the field of specialization, supporting field courses and electives.

Specific details regarding purposes of these programs and their requirements are presented in the appropriate program of studies section.

Bachelor of Arts in Education (Fields of Specialization) Students majoring in Industrial Arts Education may specialize in one of the following areas: transportation and power, drafting, electronics, graphic arts, metals, woods, and general industrial arts.

Graduate Degrees. The Division of Technology offers programs leading to the degree Master of Science in Technology. In addition, the department participates in: (1) the Master of Arts in Education degree program as a subject matter field in Secondary Education, (2) the Education Specialist degree program as a major teaching field, and (3) the Doctor of Education degree program with a major in Industrial Education. Consult the Graduate College catalog for requirements.

Engineering Technology

Baccalaureate engineering technology programs are intimately related to engineering education as engineering technologists are prepared to serve with and in close support of engineers as a part of the total technological enterprise that extends from planning to production and the continuing service.

The essential program content is therefore mathematics, basic science, technical science, and field of specialization related to

a particular area of engineering practice. Provisions for these elements are presented below in the form of the engineering technology core together with the requirements specified in the field of specialization. The latter consists of aeronautical engineering technology, electronic engineering technology, manufacturing engineering technology and mechanical engineering technology. In each case a minimum of 130 semester hours of satisfactory credits are required.

ENGINEERING TECHNOLOGY CORE

			<i>Semester Hours</i>
FLT	200	Applied Electrical Science . . .	3
MET	101	Manufacturing Processes and Materials	3
IND	111	Technical Graphics	2
IND	121	Analysis Techniques	3
COT	420	Technical Writing	3
FCN	201	Principles of Economics	3
MAT	115	College Algebra and Trigonometry	4
MAT	260	Calculus for Technology	3
AET	362	Applied Calculus	3
AET	363	Linear Systems	3
ASE	226	Digital Computer Programming	2
<i>Total</i>			<i>32</i>

Students planning to complete one to two years at a community college or college accredited private technical institute prior to entering this program should consult an Arizona State University Engineering Technology advisor for assistance in planning a transferable program.

Beyond the engineering technology core and the further requirements of General Studies, the requirements for the fields of specialization are as follows:

Aeronautical Engineering Technology
(An ECPD accredited engineering technology program)

The aeronautical engineering technology program, *Emphasis I* is designed to prepare the technologist for technical support of engineering activities throughout the aerospace field. Area of responsibilities includes the application of applied engineering practice related to: aircraft and aerospace vehicle design, internal combustion engines, combustion processes, turbomachinery, systems analysis and environmental control. A minimum of 130 semester hours of satisfactory credits are required to complete this program.

The following courses, along with 4 hours of technical elective courses approved by the student's advisor, are required in addition to the engineering technology core courses and General Studies requirements:

Required courses. ELT 201, IND 310, 311, 360; MFF 380, 381; CHM 114; PHY 111, 113, 112, 114; MET 116; MGT 301; AFT 180, 181, 287, 288, 300, 301, 306, 307, 308, 309, 310, 388, 390, 487, 490

Electronic Engineering Technology
(An ECPD accredited engineering technology program)

Electronic engineering technology is a field of specialization available to students interested in applied electronics with emphasis on state of the art design and application.

The electronic engineering technology core shown below includes the engineering technology core. In addition the student must select an area of emphasis according to career interests within the field of electronics. Four approved areas of emphasis are shown following the core.

Graduates of electronic engineering technology may seek employment in electronic industries or continue their studies at a university. The graduate typically finds employment in most major industries at various levels of responsibility including design support, product support, fabrication, testing and evaluation, and others. Graduate programs are available with an emphasis in business administration, technical education, engineering, and others.

Students planning to complete one to two years at a junior college or college accredited private technical institute prior to entering this program should consult an Arizona State University Electronics advisor for assistance in planning a transferable program. The student is cautioned that special or professional accreditations, such as FCPD, for associate and baccalaureate level programs, do not assure that the institution is accredited for college credit transfer to Arizona State University (See page 9, Accreditation and Affiliation.)

A carefully prepared 64 semester credit transfer program will generally permit a student to complete the electronic engineering technology program in an additional 4 semesters of full time work. A maximum of 64 semester credits may be utilized in transferring from a junior college or private technical institute. A minimum of 24 semester credits of electronics must be completed at Arizona State University. The core courses with an asterisk (*) as well as most 400-level courses may not be waived or substituted by transfer credit without satisfactory completion of a proficiency examination. In addition, the student must have a minimum of 6 semester credits or equivalent of approved upper division laboratory practice and design for graduation. Approved on-the-job experience may be substituted for up to 3 semester credits of this requirement.

ELECTRONIC ENGINEERING TECHNOLOGY CORE

	<i>Semester Hours</i>
Engineering Technology Core (minimum)	32
PHY 111 General Physics	3
PHY 112 General Physics	3
*PHY 460 Elements of Atomic Physics	3
(or CHM 113 General Chemistry (4))	
MAT 107 Basic Computer Programming	3
ELT 201 Applied Electrical Science Laboratory	1
FIT 210 Active Devices	3
FLT 300 Circuits I	3
*ELT 301 Circuits II	3
LLT 310 Electronic Circuits	3
FIT 315 Electro Physical Processes	3
*ELT 322 Switching and Wave shaping Circuits	3
*ELT 323 Electronic Circuits Laboratory	1
ELT 330 Electronic Instrumen tation	3
*ELI 400 Network Analysis I	3
*ELT 430 Measurement Systems or ASE 360)	3
*ELT 450 Digital Electronics	3
	<u>44</u>
Total semester credits minimum	76

*These courses may not be waived or substituted by transfer credit without satisfactory completion of a proficiency examination

Area of Emphasis	
Required (Minimum)	21
Approved Electives	14
Total semester credits minimum	35

Four approved emphasis patterns follow.

Electrical Power Systems Emphasis: Required: ELT 340, 401, 404, 406, 408, 440; ELT 460 or 470. Suggested Electives: ELT 407, 426, 452, 454, 460, 470, 472; FCC License; PHY 464; IND 312, 340, 360; ASE 425; MEE 380, 411, 412, 413; CHM 113, 114.

Electronic Communication Systems Emphasis: Required: ELT 401, 404, 470, 472, 474; ELT 411 or 426; EIT 473 or 476. Suggested Electives: FCC License; ELT 406, 408, 411, 420, 421, 426, 440, 451, 452, 453, 454, 460, 473, 476.

Electronic Computers Emphasis: Required: ELT 408, 411, 420, 452, 454, 456, ELT 406 or 476. Suggested Electives: ELT 401, 404, 406, 440, 451, 453, 457, 470, 472, 476; MET 400, 403; MAT 337, 338, 342, 438; EEE 320, 420; ASE 324, 425; IND 312; ASE 360.

Industrial Control and Measurements Emphasis: Required: ELT 340 or 440; ELT 406, 408, 411, 420; IND 312; ASE 360. Suggested Electives: PHY 463; CHM 113 or 114; ELT 340, 404, 407, 425, 440, 451, 452, 453, 454, 456, 460, 461, 470, 472, 476; IND 303, 340, 360; MET 303, 400, 403.

PROGRAM SUMMARY	<i>Semester Hours</i>
Electronic Engineering Technology	
Core	76
Area of Emphasis (including 14 elective credits) ..	35
University English (ENG 101, 102)	6
Humanities and Fine Arts Suggested Electives: COM 100, 300, 310, 400; HUM 402)	8
Remaining Behavioral and Social Science Electives	5
Total semester credits minimum	130

Manufacturing Engineering Technology

(An ECPD accredited engineering technology program)

Increased technological complexity and sophistication has created great industrial demand for the services of those individuals who possess working knowledge of the technical phases of production. Manufacturing engineering technologists perform a vital function in the follow through and completion of engineering decisions and the solving of manufacturing problems. Accordingly, this field of specialization 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. Areas of emphasis in manufacturing engineering technology are machine tool technology and welding technology.

Required courses: CHM 113, 115; PHY 112; IND 310, 311; AET 309; MEE 380; ELT 201; MET 200, 305, 311, 400, 404. Complete one of two options as follows:

Machine Tool Technology. This area of emphasis is designed to prepare technologists with both conceptual and practical applications of processes, materials, and products related to metalworking industries. Emphasis is focused on the roles of personnel in the automated manufacturing systems.

Required courses: MET 110, 300, 301, 302, 303, 304, 401, 402, 403, 405, plus approved electives.

Welding Technology. An area of emphasis designed to meet the needs of industry for those individuals trained specifically as technologists, supervisors, or consultants in welding and related fields. Opportunities are offered for students to gain both conceptual

and practical knowledge of the techniques and applications of the principal welding processes and materials. Emphasis is focused on applied weldment design, metalurgy, weld analysis and testing as related to current techniques used by manufacturing industries.

Required courses: MET 110, 310, 312, 313, 410, 411, 412, plus approved electives.

Mechanical Engineering Technology

(An ECPD accredited engineering technology program)

The mechanical engineering technologist is concerned with applications within the broad and diversified field of mechanical engineering. Among the responsibilities which may be assigned to such technologists are design, development, and evaluation of machines, power generation, transmission, instrumentation and testing. He may be required to lay out, develop details or supervise the development of a machine or process. In addition, he may test, evaluate performance and make such alterations as to make that machine or process operable and competitive.

The following courses are intended to provide a broad, fundamental base in technical science and skill development in mechanical technology at the baccalaureate level.

Required courses: IND 112, 160, 201, 215, 306, 307, 310, 311, 340, 360, 403, 406, 407; ASE 200, 360; MEE 380, 381, ESF 355; FLT 340; MET 200; PHY 111, 112, 113; CHM 114; COM 100.

The remainder of 9 semester hours (minimum) of required courses will constitute an area of emphasis and shall be selected by the student in consultation with his advisor. Those students planning careers in the

management area shall include ACC 300, MGT 301, and MKT 300 in place of IND 201, 406, 407; and 10 additional semester hours of approved electives. Those students planning careers in the industrial engineering technology area shall include: MET 305, IEE 362, IND 370 in place of IND 201, 406, 407; and 10 additional semester hours of approved electives.

Industrial Technology

The employment objective of the industrial technologist is properly defined as that of production management. Program and employment emphasis is upon applied aspects of industrial processes and upon personnel leadership. To assist in understanding the interfaces, it is appropriate to describe the industrial technologist as occupying the mid ground between engineering, engineering technology and business administration. Programmatically, then, industrial technology requires selected courses in mathematics, basic science, technical science, technical specialties and in business and personnel management.

Variations of the industrial technology programs which permit a high degree of technical emphasis within a field of specialization have been demonstrated by employers to be highly desirable. These areas of emphasis are presented in the fields of specialization requirements where appropriate. All programs in industrial technology are organized around the industrial technology core with the remaining requirements specified in the fields of specialization.

INDUSTRIAL TECHNOLOGY CORE		<i>Semester Hours</i>
ELT 100	Electricity Electronics	3
MET 101	Manufacturing Processes and Materials	3

IND 111	Technical Graphics	2
IND 121	Analysis Techniques	3
COT 420	Technical Writing	3
MAT 115	College Algebra and Trigonometry	4
MAT 260	Calculus for Technology	3
ECN 201	Principles of Economics	3
MGT 301	Principles of Management	3
ASE 226	Digital Computer Programming	2
<i>Total</i>		29

Students planning to complete one to two years at a community college or college accredited private technical institute prior to entering this program should consult an Arizona State University Industrial Technology advisor for assistance in planning a transferable program.

Aeronautical Technology

Instruction combines thorough technical training with a general university education. The curricula are designed to prepare both aeronautical technologists and industrial technologists with theoretical and practical applications in the area of structures, internal combustion, turbomachinery, design, management, general and commercial aviation, systems analysis, and environmental control.

Two areas of emphasis are available in this degree program: *Emphasis II*, Air Transportation Technology (Flight); *Emphasis III*, Air Transportation Management Technology (Non-Flight). These emphases each require a minimum of 127 semester hours of satisfactory credits for completion.

Each of these areas of emphasis requires a common aeronautical technology core and 6 hours of technical elective courses approved by student advisors, in addition to

the required industrial technology core and the General Studies requirements.

AERONAUTICAL TECHNOLOGY CORE

		<i>Semester Hours</i>
CHM 114	General Chemistry for Engineers	4
PHY 111	and 113 General Physics	4
PHY 112	and 114 General Physics	4
AET 180	Aerospace Structures and Materials	3
AET 181	Aerospace Systems	3
AET 287	Aerospace Powerplants	3
AET 288	Gas Turbines and Turbomachinery	3
AET 300	Aircraft Design	3
AET 303	Aviation Law and Regulations	2
AET 305	Vector and Structure Analysis	2
AET 306	Aircraft Electrical and Electronic Systems	3
AFT 384	Airport Planning	2
AET 390	Aerospace Systems Analysis I	3
AET 391	Airport Operation	2
AFI 488	The Air Transportation System	3
AFT 491	Aviation Safety	2
AET 492	Aircraft Accident Investigation	3
AFT 493	Airline Administration	2
<i>Total</i>		51

Air Transportation. (Flight and ground school courses are Federal Aviation Administration certified courses)

The air transportation technology (flight) area of emphasis encompasses academic and technical studies with flight training to qualify a student for positions requiring pro-

fessional piloting ability in general aviation. All phases of training are available to enable the student to complete the private pilot, glider pilot, commercial pilot, and flight instructor certificates, as well as the instrument and multi engine rating requirements of the Federal Aviation Administration.

While enrolled at Arizona State University, students will not receive college credit for flight instruction received at flight schools other than the flight schools with which Arizona State University has contracted for such instruction. Consideration for credit will be given for flight experience and certificates received prior to enrollment at Arizona State University.

Students enrolled in this emphasis must complete a minimum of 5 hours of upper division (300 and 400 series) elective courses.

Flight instruction costs are not included in university tuition.

Required courses. AET 182, 185, 202, 270, 283, 311, 381, 382, 385, 386, 387.

Air Transportation Management. The management area of emphasis is designed to prepare graduates for managerial and supervisory positions with both the air transport industry and general aviation. It encompasses areas leading to jobs with manufacturers, fixed base operations, airports and government service. Included is a depth of technical training as well as a broad exposure to business management curricula.

Required courses. AET 487, 490; ACC 101, 102; ECN 202; FIN 300; MKT 300; MGT 311; ADS 305.

Electronics

A general pattern of specialization in electronics is available in preparation for the many employment opportunities in modern industry

The various fields of specialization and their associated areas of emphasis are all based on a common electronics core, which in turn includes the industrial technology core. Such fields of specialization include: (126 semester credits total minimum)

Electronic Industrial Technology

Electronic Technology Interdisciplinary Patterns in Business Administration, Technical Education, Military Aerospace Science, Technical Distribution, Medical Electronics, etc.

Other electronic instructional patterns are offered under other fields of specialization. These include:

Industrial Supervision—Electronics Emphasis (see Industrial Supervision program section for general program information)

Technical Management Electronics Emphasis (see Technical Management section under Industrial Design for general program information)

Students in other fields of specialization may select from one of several groups of courses in electronics to supplement their particular area of concentration. Suggested course groupings vary from 3 to 24 semester credits for various areas of concentration in electronics.

Students planning to complete one to two years at a junior college or college-accredited private technical institute should consult an Arizona State University Electronics advisor for assistance in planning a transferable program. A minimum of 18 semester credits of electronics must be completed at Arizona State University.

ELECTRONICS CORE

	<i>Semester Hours</i>
Industrial Technology Core	29
PHY 111 General Physics	3

PHY 112	General Physics	3
PHY 460	Elements of Atomic Physics	3
	(or CHM 113 or CHM 114)	
MAT 107	Basic Computer Programming	3
	(or ASE 324)	
ELT 200	Applied Electrical Science	3
ELT 201	Applied Electrical Laboratory	1
ELT 210	Active Devices	3
ELT 300	Circuits I	3
ELT 301	Circuits II	3
*ELT 310	Electronic Circuits	3
ELT 315	Electro Physical Processes	3
ELT 330	Electronic Instrumentation	3
ELT 450	Digital Electronics	3
ELT 451	Digital Electronics Laboratory	1 38
Total semester credits minimum		67

These courses may not be waived or substituted by transfer credit without satisfactory completion of a proficiency examination.

Electronic Industrial Technology

ELECTRONIC INDUSTRIAL TECHNOLOGY CORE		<i>Semester Hours</i>
Electronics Core		67
Technical Specialty: Required Courses		24
FL1 470 (or 400), 426 (or 411), 340 (or 440), 460 (or 322), 430 (or 420), 476 (or 404), 454 (or ASE 425); AET 363 (or QSY 221)		
Industrial Management Technology		15
ITE 443; IEE 301 (or MGT 451), ACC 300 (or ACC 101 and 102, or FIN 203, COM 100 (or 300); ADS 233 (or ASE 309 or COT 220)		

University English (ENG 101, 102)	6
Approved Electives	14
(including those required to complete the 36 credits General Studies requirement)	
Total semester credits minimum	126
<i>Electronic Technology Interdisciplinary Pattern</i>	
	<i>Semester Hours</i>
Electronics Core	67
Approved Technical Specialty Electives	18
Approved Interdisciplinary Pattern	24
University English (ENG 101, 102)	6
Approved General Electives	11
(including those required to complete the 36 credits general studies requirement)	
Total semester credits minimum	126

Interdisciplinary patterns include Business Administration (Pre MBA), Technical Education (Pre MST Tech. Ed.), Military Science Aerospace Studies, Technical Distribution, Technical Construction, Technical Theater, Medical Electronics, Avionics, Technical Fabrication, Electromechanical Systems, Technical Communication, Audio Systems, etc.

EXAMPLES OF APPROVED INTERDISCIPLINARY PATTERNS: (Required Courses)

Business Administration (Pre M.B.A.): ECN 500 499 (or ECN 201, 202); FIN 300 (or 300); QSY 221; ADS 305; MGT 301, MKT 300; ACC 500 499 (or ACC 101, 102).

Technical Education (Pre MST/Tech. Ed.): ITE 402, 442, 445, 480; FDP 310 (or EDP 510 or MGT 451), ITE 445 or equivalent; ITE 485 or equivalent

Military Science Aerospace Studies
MIS AFS: 101, 102, 201, 202, 301, 302, 401, 402.

Technical Distribution:
ECN 202; MKT 300; ADV 301; MKT 310, 302, 304, 412, 434.

INDUSTRIAL SUPERVISION ELECTRONICS EMPHASIS
(See Industrial Supervision section for program information)

An Electronics advisor should be consulted on the electronic field of specialization, transfer credit, etc.

TECHNICAL MANAGEMENT ELECTRONICS EMPHASIS
(See Technical Management program under the Industrial Design section for general program information. Courses required for the Electronics Emphasis are shown below.)

	<i>Semester Hours</i>
Electronics Core	67
Approved Technical Specialization Electives	10
Design Technology (required courses)	14
IND 160, 215, 312, 403; ITE 433.	
Business Administration (additional required courses):	21
ECN 202; ACC 101, 102, QSY 221; ADS 305, MKT 300, FIN 300 Suggested Electives: ADS 223, MGT 463.	
English Humanities, Fine Arts (Required)	14
FNG 101, 102; COM 100 (or 300), COM 411 or 400), Humanities electives 2 credits).	
Total semester credits minimum	126

Graphic Communications

The graphic communications field of specialization provides a diversified approach for individuals interested in communication techniques. The impact of written and printed business and industrial communications, such as newspapers, magazines,

manuals, books, package printing and other visual materials is of great social significance.

The graphic communications core is required of all communications and graphic arts majors.

GRAPHIC COMMUNICATIONS CORE

		<i>Semester Hours</i>
COT 220	Communications Processes	3
GRA 135	General Graphic Arts	3
GRA 236	Layout and Printing Design	3
GRA 339	Estimating and Cost Analysis	3
GRA 438	Graphic Arts Techniques and Processes	3
MGT 311	Personnel Administration	3
	<i>Total</i>	18

Communications. The communications field of specialization offers students preparation for careers in technical writing, graphics, technical journalism, technical editing and publishing. Students may choose supporting interdisciplinary studies offered in other university departments to provide a well rounded background of experiences to prepare for growing employment opportunities in technical communications.

Required courses: COT 320, 421; ITE 346; MGT 311, LIS 471, IEE 301; MCO 110, 312; PHY 101; CHM 101. Six hours relating to a communications field may be elected with the advisor's approval, and 12 hours in a field of technical specialization are required.

Graphic Arts. This field of specialization is designed to provide broad professional education essential for a wide range of careers in the graphic arts industry. Among these are positions in administration and general

management, production and quality control, sales, and sales management, communications, design, estimating, marketing, advertising, photography and research. The needs of each student are reviewed and program flexibility beyond required courses is reflected in the selection of supporting field courses as well as technical electives.

Required courses. GRA 136, 237, 238, 333, 334, 336, 337, 433, 435, 436; IIE 443; CHM 101; PHY 101. A minimum of an additional 12 hours are required in a supporting field of study.

Industrial Design

Three fields of specialization are defined under the industrial design program of study: mechanical design with an optional area of emphasis in agricultural design; industrial design (per se) with areas of emphasis in product design or graphic design, and technical management with areas of emphasis in design, management, or electronics. For electronics emphasis, see electronics section of the catalog. The common unifying elements of the technical basis of these specialties is identified as the mechanical design core.

Students planning to complete one to two years at a junior college or college accredited private technical institute prior to entering this program should consult an Arizona State University Industrial Design advisor for assistance in planning a transferable program.

Mechanical Design. The mechanical designer is primarily concerned with the functional aspects of consumer and industrial products and equipment. His prime objective in design is to combine considerations of function, cost, efficiency, kinematic and

structural dictates. In the execution of this objective, he will prepare layouts, working drawings, and specifications for materials and operation. His emphasis is toward how a machine he designs affects, or is affected by other machines and processes—the machine-machine relationship.

MECHANICAL DESIGN CORE

		<i>Semester Hours</i>
IND 111	Technical Graphics	2
IND 112	Surface Definition	2
IND 121	Analysis Techniques	3
IND 160	Sketching and Drawing	2
IND 215	Materials	3
IND 403	Product Liability	2
ELI 200	Applied Electrical Science	3
MET 101	Manufacturing Processes and Materials	3
COT 420	Technical Writing	3
ASE 200	Engineering Drawing	2
ASE 226	Digital Computer Programming	2
MAT 115	College Algebra and Trigonometry	4
MAT 260	Calculus for Technology	3
PHY 111	General Physics	3
PHY 113	Physics Laboratory	1
ECN 201	Principles of Economics	3
	<i>Total</i>	41

Required courses. IND 161, 201, 305, 306, 307, 310, 311, 340, 360, 406, 407, 450, 451; MET 200, ELI 340; AFT 362; MEE 380; ESE 355; PHY 112; CHM 114; COM 100

The remainder of 8 semester hours (minimum) of required courses shall be selected by the student in consultation with his advisor. Those students planning careers in the design of agricultural production and

processing equipment shall include AGI 300, 325, 440 and ERA 325 in place of IND 305, 340; MEF 380; and 5 additional semester hours of approved electives (AGI 236 may also be required depending upon the student's background and experience.)

Industrial Design. The dynamic profession of industrial design is concerned with the integration of esthetics, materials, manufacturing, human factors, merchandising and creativity, for the primary purpose of developing solutions to three-dimensional problems. Originally associated almost exclusively with product styling, industrial design has matured to include total planning and development. Products such as the telephone, typewriter, and parking meter, including their associated packaging and graphics, and large systems, including modular components for industrialized housing or mass transit systems, are now considered legitimate concerns of the industrial designer. The industrial design program of study is not a specialization of mechanical design but does require the mechanical design core as its technical base while maintaining a strong content in esthetics, art, and studio skills.

Industrial design embraces most human aspects of machine-made consumer and industrial products, and the graphics which attend their esthetics, packaging and merchandising. The product designer is generally involved in the entire development process from initial ideation, sketching and modeling, through production, including product planning, marketing and packaging, to the ultimate use of that product. Esthetics and human factors are of primary concern to the product designer as well as how the product he develops relates to and affects human activities—the man-machine

environment relationship. The graphic designer addresses the visual and esthetic requirements of the two dimensional aspects of products, packages, displays, signage and posters.

Required courses. IND 100, 161, 201, 240, 250, 260, 261, 301, 302, 303, 305, 312, 350, 351, 400; 18 semester hours of art courses, including ART 141, 142, 214, 291, 341; PHY 112; Mechanical Design core.

The remainder of 17 semester hours (minimum) of required courses shall be selected by the student, in consultation with his advisor, in either product design or graphic design. Those students planning careers in product design shall include IND 430, 431, 450, 451. Those students planning careers in graphic design shall select from IND 471, and advisor approved courses in advertising art and graphic arts.

Technical Management. The primary purpose of technical management is to prepare students for positions of responsibility in the areas which interface between the business and the technical communities. The program is designed to provide (1) a basic background in mathematics, science, engineering technology and design, (2) a mastery of basic business tools and skills and an understanding of business procedures, and (3) a specialized knowledge of either design or management. These skills will be applicable to such career objectives as product planning, product cost analysis and reduction, industrial sales, product service administration, budget administration, industrial purchasing, etc. To attain these objectives, the program has been structured with 25% of the student's work in the College of Business Administration, 30% in the College of Engineering and Applied Sciences and 15% selected from either

area as specialization. The remaining 30% is devoted to mathematics, science and General Studies. The student is also thereby prepared to enter the graduate program in business administration, if desired, having completed the basic program for such study. The technical management program of study is not a specialization of mechanical design but does require the mechanical design core as its technical base.

Required courses. IND 306, 307, 312, ACC 101, 102; QSY 221; ADS 233, 305, MKT 300; ECN 202; MGT 301, 463; FIN 300; COM 100, 211 or 300 or 411; CHM 114 or 113; mechanical design core.

The remainder of 24 semester hours (minimum) of required courses shall be selected by the student in consultation with his advisor. Those students planning careers in the product area shall include: IND 303, 402, 450, 451. Those students planning careers in the management area shall include ACC 331; MGT 331, 355, 368, 451. Advisors will remain responsive to the individual needs of the student and other areas of emphasis may be considered with the approval of the department. Those students planning careers in the electronics area should consult the electronics section of the catalog and an electronics advisor.

Industrial Technical Education

Combining courses in technology, General Studies and professional education, students may prepare for educational careers in industrial arts, technical teacher education and industrial supervision. Fields of specialization in a variety of technical areas are provided.

The following common core is required for all majors in industrial arts and technical teacher education.

INDUSTRIAL ARTS AND TECHNICAL TEACHER EDUCATION CORE			<i>Semester Hours</i>
ELT 100	Electricity Electronics		3
IND 111	Technical Graphics		2
ITE 402	Analysis and Course Development		3
ITF 442	Facility Planning and Management		3
ITE 480	Teaching Industrial Technical Subjects		3
MAT 115	College Algebra and Trigonometry		4
	Physical Sciences		6
<i>Total</i>			24

Industrial Arts Education. The specific objective of this program is to prepare students for the requirements of industrial arts teaching. The carefully planned pattern of course work permits students to receive a balance and sequence of study. The curriculum leads to a Bachelor of Arts in Education and certification for teaching. For the specific requirements of general and professional education, consult the College of Education section of this catalog.

There are two plans available for industrial arts education majors: (1) a comprehensive major of 60 hours, and (2) a 42 hour major with a minor.

Required courses: Industrial Arts and Technical Teacher Education core; ITE 250, 251, 346, GRA 135, 3 hours of professional electives, and 30 hours of approved technical courses.

Technical Teacher Education. The purpose of this program is to develop competency in one of the technologies and in professional technical education. This four year Bachelor of Science degree prepares

instructors and training personnel for selected trade and technical programs offered at the various levels.

Required courses. Complete Industrial Arts and Technical Teacher Education core. ITE 401, 443, 444, 446, 485, 491; COT 420, ECN 201; MGT 301, 451; MAT 107, 260; COM 100. A minimum of 40 credits, approved by the advisor, is required in a field of specialization or supporting field, of which ITE 445 and ITE 455 may be a part.

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

Industrial Supervision. The purpose of this program is to prepare first line supervisors for industry. Leading to a Bachelor of Science degree, the program provides for a general education background with a field of specialization in recognized technology and supervisory studies.

Most students will complete the major part of the first two years at a community college. This should include General Studies and lower division specialization courses.

Required courses. FIT 100; IND 111; COT 420, ITE 443, 444, 445, 450, 452; MGT 301, 311, 451; ECN 201; COM 100; PHY 111; CHM 113. A minimum of 20 credits, approved by the advisor, is required in supervision and 40 credits in a technology field of specialization, such as business, safety, fire science, health, and the various options in industrial technology (i.e., aeronautics, drafting design, electronics, graphic arts, manufacturing of which ITE 445 and ITE 455 may be a part).

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

Students taking 300-440 level courses as part of their approved graduate program

must indicate the graduate credit option in the appropriate location on the Course Request Opscan form.

Technology

Professors:

BURDETTE TC 201), BARTEL BROWN, KIGIN, LITRELL PRUST THOMASON

Associate Professors:

BENZINGER, BLANCHARD COX GRAHAM KANNEMAN MINTER PARDIN STAFFORD

Assistant Professors:

ADAMS, ANDERSON, BAILEY BIEKERT, CAVALLIERE, DUNLAP, EDWARDS HAY, HIRATA, HGBEE KETH McCURDY NIELSEN ROOK, ROPER SCHOEN SMITH SPRADLING, QUESADA WILLIAMS

Instructor:

BAGLEY

Lecturers:

REED, SHELLER, SPERSTAD

AERONAUTICAL TECHNOLOGY

(Flight instruction costs are not included in University tuition)

AET 180 Aerospace Structures and Materials. Basic aerodynamics aerospace vehicle structural design and materials. Construction manufacturing processes assembly and repair techniques and hardware selection. Two lectures 4 hours laboratory. Credit 3 hours

181 Aerospace Systems. Modern aircraft and aerospace vehicle systems hydraulic pneumatics auxiliary control and instrument weight and balance ground handling and inspection requirements and methods. Prerequisite AET 180. Two lectures 4 hours laboratory. Credit 3 hours

182 Basic Ground School. Ground school preparation for the FAA Private Pilot Certificate. Satisfactory completion of FAA exams required. Three lectures 3 hours recitation. Credit 4 hours

183 Glider Pilot Rating. Science of soaring. Basic flight principles glider instrumentation and performance

Soaring techniques cross country. Prepares the student for a FAA Glider Pilot rating. Satisfactory completion of FAA tests and Glider Pilot certificate required. Course not required for graduation. Two lectures and flight. Credit 2 hours

185 Private Pilot Certificate. Flight training for the FAA Private Pilot Certificate. Satisfactory completion of FAA tests is required. Prerequisite or corequisite AET 182. Credit 1 hour

202 Meteorology. Evaluation analysis interpretation of atmospheric phenomena. Characteristics of meteorology low and high altitude weather from the point of view of precipitation. Prerequisite PHY 111. Credit 3 hours

270 Intermediate Ground School. Ground school course in preparation for the FAA Instrument Rating. Ten hours of simulator required. Satisfactory completion of FAA exam required. Prerequisites AET 182 185 or equivalent; prerequisite or corequisite AET 202. Three lectures 1 hour recitation. Credit 3 hours

283 Instrument Pilot Rating. Flight training for the FAA Instrument Pilot Rating. Satisfactory completion of FAA tests required. Prerequisite or corequisite AET 270. Credit 1 hour

287 Aircraft and Aerospace Powerplants. Theory of internal combustion engines components, performance analysis engine accessories systems and environmental control. Two lectures 4 hours laboratory. Credit 3 hours

288 Gas Turbines and Turbomachinery. History development and theory of gas turbine engines. Thrust and performance analysis. Engine components systems. Aerodynamic problem applications and environmental control. Prerequisite AET 287. Two lectures 4 hours laboratory. Credit 3 hours

300 Aircraft Design. Considerations theory and concepts airfoil and wing theory performance analysis correction of design requirements with manufacturing practice. Prerequisites AET 181 288 MAT 260-PHY 111. Credit 3 hours

301 Applied Aerodynamics. Properties of a r a rfo theory wind tunnel testing techniques a rflow measurements, wind tunnel mode development. Prerequisite AET 300. Two lectures 2 hours laboratory. Credit 3 hours.

303 Aviat on Law and Regulations. System definition implementation legislative and administrative rule making procedures concept of sovereignty statutory provisions and resulting regulations enforcement methods and definition of terms. Aircraft and airman certification requirement. Credit 2 hours

- 305 Vector and Structure Analysis.** Vector analysis and topological structural analysis Prerequisites MAT 115 or equivalent and PHY 111. Credit 2, 2 hours
- 306 Aerospace Electrical and Electronic Systems.** Theory, design reliability requirements, applications of complex electrical and electronic systems instruments, communications and navigation equipment used in aircraft and aerospace vehicles Prerequisites ELT 100 or 200 MAT 260 PHY 112 Credit 3 hours.
- 307 Aerospace Systems Design.** Analysis and design of aircraft and spacecraft systems performance evaluation for rockets and missiles Prerequisite PHY 112 Credit 3 hours
- 308 Combustion Analysis.** Principles of combustion systems components, chemical and physical performance analysis of fuels and lubricants using standard ASTM Testing Methods Prerequisites AET 288 MAT 260 MEE 380 PHY 112 CHM 114 or equivalent Credit 2 hours
- 309 Nondestructive Testing and Quality Assurance.** Purpose of industrial inspection quality standards and statistical methods Theory and application of nondestructive and destructive testing procedures Six hours lecture and laboratory Credit 3 hours
- 310 Instrumentation.** Concepts and principles of instrumentation, behavior of material sensors and force systems. Pressure, temperature and flow measurements by electrical and mechanical transducers. Theory coordinated with practical applications of instrumentation and measurements to aerospace systems Prerequisites ELT 200, AET 306 MAT 260 PHY 112 Two lectures, 2 hours laboratory Credit 3 hours.
- 311 Air Traffic Control.** History and development of procedures involved in control of airborne traffic during VFR and IFR conditions Governing regulations and safety requirements. Credit 2 hours
- 362 Applied Calculus.** Application of principles of differential and integral calculus ordinary differential equations Laplace transforms and infinite series emphasis on modeling and analysis through numerical methods including computer based methods Prerequisites MAT 260 ASE 226 or knowledge of FORTRAN programming Credit 3 hours.
- 363 Linear Systems.** Applied mathematics directed toward technological systems with emphasis on solution of polynomials by numerical methods Linear algebra linear programming, basic methods in probability and statistics computer algorithms Prerequisites MAT 260 ASE 226 or knowledge of FORTRAN programming Credit 3 hours

- 381 Advanced Ground School.** Ground school preparation for the FAA Commercial Pilot Certificate. Satisfactory completion of FAA exams required Prerequisite AET 270 or equivalent Three lectures Credit 3 hours
- 382 Air Navigation.** Advanced navigation methods and underlying principles Dead reckoning celestial pressure differential techniques grid navigation and integrated navigation systems Credit 2 hours
- 384 Airport Planning.** Community and airport related issues, site selection financing navigation aids, geometric design of airport terminal buildings lighting and planning considerations Credit 2 hours
- 385 Commercial Pilot Certificate.** Flight training for the FAA Commercial Pilot Certificate Satisfactory completion of FAA test required Prerequisite or corequisite AET 270 or equivalent Credit 2 hours
- 386 Flight Instructor Rating.** Prepares the commercial pilot for a FAA Flight Instructor Certificate Satisfactory completion of FAA test required Prerequisite AET 385 or equivalent Credit 2 hours
- 387 Multi-Engine and Flight Engineering Rating.** Classroom work and flight training for the FAA Multi-Engine Rating a course requirement Topics and problems for flight engineers. Student is *not* required to complete the FAA Flight Engineers written examination Prerequisite AET 385 or equivalent Credit 2 hours
- 388 Propulsion.** Principles thrust performance combustion systems metalurgy gas turbines ram jets rockets and combustor design considerations Prerequisite AET 308. Two lectures 2 hours laboratory. Credit 3 hours
- 390 Aerospace Systems Analysis I.** Theory research and development methods, planning analyzing, controlling and evaluating operating systems Emphasis is on probability, break even analysis and networking techniques including CPM and PERT using a total system concept Prerequisites ASE 226 MAT 260. Credit 3 hours
- 391 Airport Operation.** Operational functions commercial airlines general aviation operations terminal buildings utilizations support facilities community relationships and airport financing Prerequisite AET 384 Credit 2 hours
- 487 Aircraft and Aerospace Design.** Analysis of design data for aircraft and aerospace vehicles value analysis product on requirements and manufacturing techniques Prerequisites AET 300 390 Credit 3 hours
- 488 The Air Transportation System.** A commerce related to the transportation system regulatory c

- mate of a regional and fixed base operations career planning. Prerequisites ECN 201 MGT 301 Credit 3 hours
- 490 Aerospace Systems Analysis II.** Systems planning analysis and control Continuation of AET 390 with topological forecasting transportation and assignment algorithms networks, linear programming production scheduling and production management. Prerequisite AET 390 Credit 3 hours
- 491 Aviation Safety.** Critical analysis of aircraft accidents accident prevention development and evaluation of aviation safety programs Credit, 2 hours
- 492 Aircraft Accident Investigation.** Development and analysis of data evaluation and recommendations for preventative practices Prerequisite AET 491 Credit 3 hours
- 493 Airline Administration.** Administrative organization, economics of airline administration operational structure cost analysis relationship with federal government agencies Prerequisite AET 488. Credit 2 hours
- Special Courses:** AET 494 498 499 580 584 590, 591 (See pages 48 49)

COMMUNICATIONS

- COT 220 Communication Processes.** Composition, presentation speech and technical reading Credit 3 hours
- 320 Industrial Documentation.** Integrates use of technical illustration, use of specifications with industrial practices and production processes of handbooks and manuals Credit 3 hours
- 420 Technical Writing.** Writing techniques organization of material research methods for technical writers Credit 3 hours
- 421 Technical Editing.** Editing proposals handbooks manuals and reports Credit 3 hours
- Special Courses:** COT 494 498 499, 580 584 590, 591 (See pages 48 49)

ELECTRONICS

- ELT 100 Electricity Electronics Survey.** Physical and circuit properties of passive and active components for electronics and electrical power DC and AC circuits, vacuum and solid state devices applications Prerequisite MAT 106 or equivalent Three lectures 3 hours laboratory Credit 3 or 4 hours
- 101 Electricity Electronics Lab.** Corequisite ELT 100 Three hours laboratory Credit 1 hour

200 Applied Electrical Science. Physical and mathematical concepts of basic circuit elements, dc and ac circuits. Prerequisite: MAT 115 Credit: 3 hours

201 Applied Electrical Science Laboratory. Basic circuits laboratory techniques and instruments. Corequisite: ELT 200 Three hours laboratory. Credit: 1 hour

210 Active Devices. Physical properties, modes and basic circuit design principles of vacuum and solid state devices including vacuum tubes, bipolar and unipolar semiconductor devices. Prerequisites: ELT 200, ELT 201 or equivalent. Two lectures, 3 hours laboratory. Credit: 2 or 3 hours

300 Circuits I. Theory and application of circuit analysis. Resistive networks, circuit theorems, magnetic and electric circuits, RLC transients. Prerequisites: ELT 200, MAT 115. Two lectures, 2 hours laboratory demonstration recitation. Credit: 3 hours

301 Circuits II. Analysis and applications of RLC circuits under steady-state sinusoidal excitation. Network transfer function, frequency response, Bode plots, RLC transients, transformer operation, single and three-phase power. Nonsinusoidal waveform analysis. Prerequisite: ELT 300, corequisite: MAT 260. Two lectures, 2 hours laboratory demonstration recitation. Credit: 3 hours

310 Electronic Circuits. Design and applications of electronic circuits using the model approach. Amplifier principles, frequency response analysis. Prerequisite: ELT 210, corequisite: ELT 301. Three lectures, 1 hour recitation. Credit: 3 hours

315 Electro-Physical Processes. Circuit layout documentation on breadboarding, packaging, interconnection, construction. Equipment electrophysical design principles and practices, heat transfer considerations. Prerequisites: ELT 210 or equivalent, PHY 112. Two lectures, 3 hours laboratory. Credit: 2 or 3 hours

322 Switching and Waveshaping Circuits. Design and analysis of passive and active circuits operating in a switching mode. Waveshaping, timing and logic. Prerequisites: ELT 301, 310. Credit: 3 hours

323 Electronic Circuits Laboratory. Prerequisite: ELT 310, corequisite: ELT 322. Three hours laboratory recitation. Credit: 1 hour.

330 Electronic Instrumentation. Theory and operation of instruments and measurement circuits including meters, bridges, oscilloscopes, recorders, signal and waveform generators, counters. Calibration, diagnostic principles and procedures. Prerequisite: ELT 210 or equivalent. Two lectures, 3 hours laboratory. Credit: 2 or 3 hours.

340 Electrical Machines. Rotating equipment, trans-

formers, related power control components and equipment. Prerequisites: ELT 200, MAT 115. Two lectures, 2 hours laboratory demonstration recitation. Credit: 3 hours

342 Construction Electrical Systems. Electrical circuits, machinery lighting. Elements of power transmission and distribution. Light and power within buildings. Prerequisite: MAT 115 or equivalent. Three lectures, 3 hours laboratory. Credit: 3 or 4 hours

400 Network Analysis I. Electrical networks and applications of network theorems. Transient and frequency response, operational calculus and transfer function analysis. Laplace transform, pole-zero concepts. Prerequisites: MAT 260, ELT 301. Credit: 3 hours

401 Network Analysis II. Two-port networks and matrix methods, coupled networks. Filter design theory and active networks. Further analysis. Discrete networks. Computer solution of network problems. Prerequisites: ELT 400 or AET 362, ELT 310 or equivalent. Credit: 3 hours

404 Transmission Lines and Waveguides. Propagation, reflection and impedance properties of transmission lines and waveguides. Analysis and matching techniques using the Smith Chart. Microwave measurements, components and devices. Prerequisite: ELT 301. Four hours lecture demonstration recitation. Credit: 3 hours.

406, 407 System Dynamics and Control. Differential equations for physical systems, electrical analogs, analysis, simulation, system parameters and response characteristics, open-loop vs. closed-loop design. Block diagram and operational transfer function analysis. Control components and circuits. Prerequisite: ELT 400 or AET 362. Credit: 3 hours each semester

408 Analog Simulation. Analog simulation of dynamic electrical, mechanical, and other physical systems. Simulation study of feedback systems. Programming methods and scaling techniques for linear and nonlinear simulation on the analog logic computer. Prerequisite: ELT 400 or AET 362. Four hours lecture laboratory. Credit: 3 hours

411 Linear Electronic Circuits Design. Frequency response and feedback design of multistage electronic circuits and systems. Linear integrated circuitry. Prerequisites: ELT 301, 310. Credit: 3 hours

420 Operational Electronics. Differential and operational amplifier circuitry, feedback configurations, operational amplifier errors and compensation, linear and nonlinear circuitry. Applications. Prerequisites: ELT 301, 310. Credit: 3 hours

421 Operational Electronics Lab. Laboratory study of linear integrated circuits and op-amp applications. Corequisite: ELT 420. Three hours laboratory. Credit: 1 hour

426 Audio Circuits and Systems. Principles and applications of audio circuits and amplifiers. Acoustic measurements, noise. Prerequisite: ELT 310. Credit: 3 hours.

430 Measurement Systems. Measurement principles and instrumentation techniques. Linear and digital instrumentation on circuits and systems. Instrumentation amplifiers. Grounding and shielding. Terminations and matching. High speed digital techniques. Prerequisites: ELT 310, ELT 330 or equivalent, ELT 450 or equivalent. Credit: 3 hours

440 Electrical Power Systems. Transmissions, distribution, instrumentation, protection and related system components. Prerequisites: ELT 200, MAT 115. Credit: 3 hours

450 Digital Electronics. Logic devices and characteristcs. Combinational design, Karnaugh map, simplification, flip-flops, sequential circuits, application of registers, counters. Prerequisite: ELT 210 or equivalent. Credit: 3 hours. Fall semester

451 Digital Electronics Laboratory. Three hours laboratory recitation. Corequisite: ELT 450. Credit: 1 hour

452 Logic Design. Design of combinational and sequential logic circuits for control computation and information manipulation. Digital systems design using register transfer modules. Prerequisite: ELT 450. Credit: 3 hours.

453 Digital Systems Design Laboratory. Prerequisite: ELT 450, corequisite: ELT 452. Three hours laboratory recitation. Credit: 1 hour

454 Digital Computer Systems. Organization and representation of information, computer arithmetic. Computer building blocks, memory devices, digital machine characteristics. PDP 11 minicomputer architecture, processor, machine language characteristics and operations. Prerequisite: ELT 450 or equivalent. Four hours lecture demonstration. Credit: 3 hours

456, 457 Minicomputer Systems and Applications. Minicomputer assembly-level programming using the PDP 11 minicomputer and other representative digital hardware. Offline diagnostic programming techniques and applications. Computer peripherals interface design and applications. Prerequisite: ELT 454. Four hours lecture laboratory demonstration. Credit: 3 hours each semester.

460 Special Devices and Applications. Electronic devices, circuits and systems, linear and nonlinear

circuit elements and applications including FETs, op amps, UJT's, thyristors, and optoelectronics. Power supplies, D/A converters. Prerequisite: ELT 310. ELT 450 or equivalent. Credit: 3 hours.

461 Special Devices Laboratory. Corequisite: ELT 460. Three hours laboratory. Credit: 1 hour.

470 Communication Circuits. Coupling networks, filters, impedance matching, Class C tuned amplifiers, oscillators, Modulation and demodulation techniques for AM and FM. Prerequisites: ELT 301, 310. Three lectures, 3 hours laboratory. Credit: 3 or 4 hours.

472, 473 Communication Systems. Analysis and design of AM, FM, and SSB and cable communication systems. Noise and distortion performance. Radar system principles, Digital and space communication. Prerequisites: ELT 470, ELT 404 or equivalent. ELT 450 or equivalent. Credit: 3 hours each semester.

474 Antennas and Propagation. Propagation of energy in transmission lines, waveguides and free space with atmospheric anomalies. Antenna characteristics and measurement techniques. Prerequisites: ELT 301, ELT 404 or equivalent. Credit: 3 hours.

476 Video Circuits and Systems. Radio frequency selectors, video amplifiers, synchronizing circuits, and kinescopes in systems applications. Prerequisite: ELT 310 or equivalent. Two lectures, 2 hours laboratory demonstration. Credit: 3 hours.

480, 481 Electronics Survey. Vacuum and solid state electronics, electron circuits and devices, electron power circuits and components. Applications for power communications switching instrumentation. Prerequisite: ELT 100 or equivalent. ELT 480 is not a prerequisite for 481. Two lectures, 3 hours laboratory demonstration. Credit: 3 hours each semester.

Special Courses: ELT 494, 498, 499, 580, 584, 590, 591. See pages 48-49.

GRAPHIC ARTS

GRA 135 General Graphic Arts. Type composition, stroke composition, presswork, bookbinding, porous printing, flexography application and duplication. One lecture, 5 hours laboratory. Credit: 3 hours.

136 Graphic Arts Processes. Letterpress, presswork, photo offset lithography, photo screen, tagging and production techniques. One lecture, 5 hours laboratory. Credit: 3 hours.

236 Layout and Printing Design. Specification interpretation, principles of typography layout, preparation of rough working layouts and comprehension. Credit: 3 hours.

237 Image Preparation and Carrier Assembly. Preparation of copy for reproduction. Typographic planning for graphic arts processes. Credit: 3 hours.

238 Instruments and Controls. Purposes and various uses of measuring instruments useful for quality control. Credit: 3 hours.

333 Offset Lithography (Presswork). Planography and operation of the offset press. Etches, gums, solvents. One lecture, 5 hours laboratory. Credit: 3 hours.

334 Offset Lithography (Camerawork). Materials, methods and equipment used in the production of photographic negatives and positives for offset lithography, negatives and halftones. One lecture, 5 hours laboratory. Credit: 3 hours.

336 Color Separation. Methods of producing separations on negatives. Prerequisite: GRA 334. One lecture, 5 hours laboratory. Credit: 3 hours.

337 Production Management. Various systems used in the graphic arts industry for planning and controlling workflow. Credit: 3 hours.

339 Estimating and Cost Analysis. Estimating printing operations and materials elements of cost finding using selected systems. Credit: 3 hours.

433 Production Techniques. Systematic production planning experiences. Six hours lecture and laboratory. Credit: 3 hours.

435 Plant Management. Independent documentary research, problems, equipment and personnel selection, plant site selection and layout and recent developments in production management. Credit: 3 hours.

436 Technical and Research Problems. Individual activities involving investigation and experimentation. Credit: 3 hours.

438 Graphic Arts Techniques and Processes. Graphic arts production. Complex technology of paper, ink and related materials with reference to printing processes. Two lectures, 4 hours laboratory. Credit: 3 hours.

Special Courses: GRA 494, 498, 499, 580, 584, 590, 591. See pages 48-49.)

INDUSTRIAL DESIGN

IND 100 Introduction to Design. Presentation of history, philosophy, principles and influence of industry design. The designer's past and present role in society. Credit: 2 hours.

111 Technical Graphics. Elements of orthographic and axonometric projection; charts and graphs, graphing, mathematical basic descriptive geometry.

Six hours lecture and laboratory. Credit: 2 hours.

112 Surface Definition. Descriptive spatial relationships between points, lines and planes. Techniques presented for developing complex double-curved surfaces and intersections. Prerequisite: ND 111. One lecture, 3 hours laboratory. Credit: 2 hours.

121 Analysis Techniques. Methods for defining organizing developing ideas and solutions to problems of a technical nature. Use of graphical communication techniques, the slide rule and time sharing computer application to problem solving are emphasized. Prerequisite: Trigonometry. Two lectures, 3 hours laboratory. Credit: 3 hours.

160 Sketching and Drawing. Free hand sketching and drawing, light and shade, pen and pencil techniques, two-point perspective. Emphasis on quick visual presentations of objects and concepts. Four hours lecture and laboratory. Credit: 2 hours.

161 Advanced Sketching and Drawing. Refinement of quick drawing. Fundamentals of perspective. Color in various media. Emphasis on third dimension. Prerequisite: IND 160. Four hours lecture and laboratory. Credit: 2 hours.

201 Engineering Layout Drawing. Use of orthographic and surface definition skills in the functional arrangement of components to form a complete design concept or system. Prerequisite: ASE 200. Four hours lecture and laboratory. Credit: 2 hours.

215 Materials. Materials application in design. Characteristics and properties of ferrous and nonferrous metals, plastics and elastomers. Credit: 3 hours.

240 Color. Theory and practice of basic color concepts, color history and systems, color relationships, psychology of color use of color in industry. Six hours lecture and laboratory. Credit: 3 hours.

250 Rendering. Use of current media to communicate design concepts and represent common visual used materials. Rapid proposal sketches and final presentation quality renderings. Prerequisite: ND 161. Four hours lecture and laboratory. Credit: 2 hours.

260 Design and Modeling I. Model construction using fiberglass, plastics, metals and wood. Experimentation with volume and shape in plaster and clay. Prerequisites: ND 112, 160. Four hours lecture and laboratory. Credit: 2 hours.

261 Design and Modeling II. Model design and construction from concept to final presentation. Idea sketching, mockups, model drawing, construction and presentation techniques. Prerequisite: ND 260. Four hours lecture and laboratory. Credit: 2 hours.

301 Product Design I. Design of mass produced consumer products. Preliminary design sketches through

final solutions including renderings and models. Prerequisites: IND 250 261 Eight hours lecture and laboratory. Credit, 4 hours

302 Product Design II. Increased complexity of problems. Marketing considerations, human factors emphasized. Prerequisite: IND 301. Eight hours lecture and laboratory. Credit, 4 hours

303 Human Factors in Design. Man-machine environment systems; human characteristics and behavior applied to design of products and systems and the operating environment and the methods of their use. Credit, 3 hours

305 Plastics Design. Mold design for part requirements: molded holes and undercuts, threads, inserts, fastening and joining, decorating, extrusion design; reinforced plastics. Prerequisite: IND 215. One lecture, 3 hours laboratory. Credit, 2 hours

306 Mechanical Design I. Linkages; cams; dimensions determination; stress concentration; fasteners, springs, screws. Prerequisite: ND 201 corequisite: ND 310 or 312. Three lectures, 3 hours laboratory. Credit, 4 hours.

307 Mechanical Design II. Couplings; clutches; brakes; gears; bearings; lubrication. Prerequisite: IND 306 corequisite: ND 311. Three lectures, 3 hours laboratory. Credit, 4 hours

310 Applied Mechanics—Statics. Vectors, force systems, friction, equilibrium, centroids and moment of inertia. Prerequisites: PHY 111 MAT 260. Credit, 3 hours

311 Applied Mechanics—Materials. Deformation of members and bodies under stress. Prerequisite: ND 310. Four hours lecture and laboratory. Credit, 3 hours

312 Applied Mechanics. Combined statics and materials. Not open to Aero Eng Tech, Mfg Eng Tech, Mech Eng Tech. Mech Design Prerequisites: PHY 111 MAT 260. Credit, 4 hours.

340 Fluid Mechanics. Static and dynamic properties of fluids. Flow measurement and fluid control design. Prerequisites: MAT 260 PHY 111. Four hours lecture and laboratory. Credit, 3 hours.

350 Graphic Design. Visual design as it relates to products: packages, displays, signage and posters. Mixed media. Prerequisite: ND 250. Six hours lecture and laboratory. May be repeated once for credit. Credit, 3 hours

351 Package Design I. Esthetic and structural considerations of containing, protecting and promoting a product through packaging. Prerequisite: IND 350. Six hours lecture and laboratory. May be repeated once for credit. Credit, 3 hours

360 Applied Mechanics—Dynamics. Masses, motion, kinematics, dynamics of machinery. Prerequisite: ND 310 or 312. Credit, 3 hours

370 Tool Design. Jig and fixture design. Prerequisite: ND 201. Two lectures, 3 hours laboratory. Credit, 3 hours.

400 Professional Practice. Business procedures, management techniques, accounting systems, ethical and legal responsibilities of the design professions. Prerequisite: junior or senior standing. Credit, 2 hours.

402 Value Analysis. Critical investment of functions, cost and design-manufacturing interface in component development. Case histories. Credit, 2 hours

403 Product Liability. Manufacturer's liability. Statutes, regulations and common law rules, role of expert witnesses, insurance and product safety programs. Credit, 2 hours

406 Mechanical Design III. Integration of kinematics, human factors, materials and layout of components into total design concept. Prerequisite: IND 307. Three lectures, 3 hours laboratory. Credit, 4 hours.

407 Mechanical Design IV. Continuation of IND 406. Innovative design in broad area of product development. Problems selected from power transmission, transportation, biomedical, etc. Prerequisite: ND 406. Three lectures, 3 hours laboratory. Credit, 4 hours

430 Product Design III. Design ideas and form coupled with analysis and comprehensive engineering layout design drawing leading towards the presentation of a new product in drawing and model form. Prerequisite: IND 302. Eight hours lecture and laboratory. Credit, 4 hours

431 Product Design IV. Product design project with accent on individual approach and student interest. Objective: To use a lone's experience in an individual manner to produce a new product. Prerequisite: ND 430. Eight hours lecture and laboratory. Credit, 4 hours

450 Design Project. Large-scale interdisciplinary class project involving significant efforts of project planning and control design, prototype development, feasibility study and reporting. Prerequisite: senior standing. Six hours lecture and laboratory. Credit, 3 hours

451 Design Project. Design finalization, modification, technical and summary reports, graphics, oral presentation of results. Prerequisite: ND 450. Six hours lecture and laboratory. Credit, 3 hours

471 Package Design II. Structural package design

testing, cushioning, industrial standards, materials, packaging. Credit, 2 hours.

Special Courses: IND 494 498 499, 580 584 590 591 (See pages 48-49)

MANUFACTURING ENGINEERING TECHNOLOGY

MET 101 Manufacturing Processes and Materials. Manufacturing operations, procedures, processes and materials emphasizing the industrial applications. Two lectures, 3 hours laboratory. Credit, 3 hours

110 Welding Survey. Oxy-acetylene arc brazing, resistance and tungsten inert gas (TIG) welding procedures for ferrous and nonferrous metals. Six hours lecture and laboratory. Credit, 3 hours.

116 Aeronautical Welding. Oxy acetylene and tungsten inert gas (TIG) welding procedures and brazing techniques used for aircraft structures. Six hours lecture and laboratory. Credit, 3 hours

200 Manufacturing Processes. Metal removal processes and procedures emphasizing the calculation of speeds and feeds as related to lathe, milling and drilling operations. Metal grinding. Six hours lecture and laboratory. Credit, 3 hours

300 Production Tooling. Fabrication and design of jigs, fixtures and special industrial tooling related to manufacturing methods. Prerequisite: MET 200. Six hours lecture and laboratory. Credit, 3 hours

301 Production Control. Contemporary methods used to plan, schedule and control the flow of material in manufacturing operations. Credit, 3 hours

302 Abrasive Machining Processes. Theory and application of abrasive cutting, including surface grinding, cylindrical grinding and tool and cutter grinding. Prerequisite: MET 200. Six hours lecture and laboratory. Credit, 3 hours

303 Manufacturing Systems. Functions and applications of semi-automatic, automatic, and computer control systems emphasizing current industrial trends. Credit, 3 hours.

304 Casting and Forming Processes. Analysis of various casting, molding and forming processes in terms of equipment requirements, product characteristics and manufacturing costs. Four hours lecture and laboratory. Credit, 3 hours

305 Manufacturing Processes. Metal removal processes and procedures emphasizing the calculation of speeds and feeds related to metal grinding and shaping operations, tool geometry of forming processes. Six hours lecture and laboratory. Prerequisite: MET 200. Credit, 3 hours

310 Advanced Welding Procedures. Theory and application of arc, MIG and submerged arc welding fabrications Electron beam thermal laser beam inert gas and ultrasonic equipment and weld design Prerequisite MET 110. Six hours lecture and laboratory Credit, 3 hours

311 Precision Measuring Systems. Analysis of English and metric linear measuring systems emphasize using standard gauging and measuring inspection systems Credit 3 hours

312 Welding Power Supply Analysis. Electron welding equipment power systems for arc TIG MIG and automatic welding equipment Prerequisite MET 110 Credit, 3 hours.

313 Inert Gas Welding Procedures. Metal inert gas (MIG) and tungsten inert gas (TIG) welding procedures for joining common commercial metals and alloys Prerequisite MET 110 Six hours lecture and laboratory Credit 3 hours.

400 N C Manual Programming Numerical controls related to point to point and continuous path systems Methods of programming set up and operation of two and three-axis machines Six hours lecture and laboratory. Credit 3 hours

401 Quality Control. Statistical methods as applied to enhance process control sampling and reliability Corequisite MET 311 Credit 3 hours

402 New Production Processes. Industrial processes used in the metalworking industry chipless machining processes of electrical discharge machining (EDM) electrical chemical machining (ECM) chemical and electrochemical grinding (ECG) Credit 3 hours

403 N C Computer Programming. Applications of computer-aided programming for point to point and continuous path methods of numerical control APT and AD-APT computer languages Six hours lecture and laboratory Credit 3 hours

404 Manufacturing Materials Engineering materials, emphasis on factors affecting properties and methods of testing and evaluation. Six hours lecture and laboratory Credit 3 hours

405 N C Continuous Path Programming. Linear and circular interpolation programming related to three four and five axis machining centers and two axis NC machines Six hours lecture and laboratory Prerequisite MET 400 Credit 3 hours

410 Metallurgy of Welded Metals. Study of welding and brazing conditions on the metalurgical structure and the resulting effects on properties for representative metals and alloys Six hours lecture and laboratory Prerequisite MET 404 Credit 3 hours.

411 Welding High Temperature Alloys. Equipment and methods for welding various high temperature nonferrous based alloys such as nickel cobalt titanium columbium and molybdenum Effect of welding conditions on properties Prerequisites MET 110 404 Credit 3 hours.

412 Design of Weldments. Static and dynamic loading, strength considerations of ferrous and nonferrous weldments Prerequisites MET 110 and IND 311 Credit, 3 hours

Special Courses: MET 494 498 499 58 , 584, 590 591 See pages 48 49)

INDUSTRIAL TECHNICAL EDUCATION

ITE 121 Industrial Wood Processes. Wood fabrication processes, materials of construction construction technology product development Four hours lecture and laboratory Credit 2 hours

174 Basic Automotives. Historical development design and function of automotive systems preventive maintenance use of hand tools and safety principles Six hours lecture and laboratory Credit 3 hours

222 Wood Technology. Wood physical properties and products job opportunities home workshops safe use of tools machines and processes for wood products Six hours lecture and laboratory. Credit 3 hours

250 Integrated Industrial Studies. Prepares industrial arts teachers in career education and interdisciplinary programs individual and group activities problem applications design principles fabrication processes free enterprise Combines essential design in metal wood synthetic materials and related technical subjects Three hours lecture 4 hours recitation 9 hours laboratory. Credit 8 hours

251 Integrated Power Studies. Prepares teachers in the concepts of energy conversion, power transmission, control and utilization. Engine electrical fluid mechanical and circuit devices. Experiences with pumps motors valves actuators heating and arc welding Six hours lecture and laboratory Credit 3 hours

273 Automotive Electrical and Power Training. Principles specification service of clutches transmissions differential steering systems brakes power operated accessories. Six hours lecture and laboratory Credit 3 hours

326 Experimentation with Wood Forming laminating adhesives bending ovals, strength of materials structural design and testing other forestry products Six hours lecture and laboratory Credit 3 hours

346 Modern Technology and Civilization. Forces leading to growth of American industries production systems unions, occupations, problems of technological change interrelationships of men materials and processes Credit, 2 hours.

361 Industrial Crafts. Design and activities in plastic leather apertured wax process wood and metal. Four hours lecture and laboratory Credit 2 hours

377 Internal Combustion Engines. Industrial, marine, and automotive engine principles engine design rebuilding engine output analysis tune-up fuel systems Six hours lecture and laboratory. Credit, 3 hours

401 Vocational Education in American Schools. Principles and philosophies of vocational education Relationship between vocational career and general education Trends and legislation Credit 3 hours

402 Analysis and Course Development. Selecting instructional units through task analysis techniques, industrial technical course and training program development Credit, 3 hours

405 Improving Instruction in Drafting. Methods evaluation, industrial practices drafting problem sequences and equipment Credit 3 hours

421 Production Wood Technology. Product and process design material handling fixtures work environment personnel quality control assembly finishing wood technology Six hours lecture and laboratory Credit 3 hours

423 Industrial Arts for Elementary Teachers. Tools and material centered activities related to teaching children about technology; classroom problems, integrated instruction instructional aids Six hours lecture and laboratory Credit 3 hours

424 Techniques of Construction. Buildings nonbuilding planning site preparation structure construction materials personnel Six hours lecture and laboratory Credit 3 hours

427 Industrial Plastics. Fabrication techniques physical qualities, manufacturing processes injection molding, vacuum forming welding, laminating casting Six hours lecture and laboratory Credit 3 hours

442 Facility Planning and Management. Planning organizing and managing industrial technical education laboratories equipment and supply selection facility arrangement Credit 3 hours

443 Industrial Safety. Accident prevention accident factors methods of recording and reporting analysis psychological aspects attitudes recent legislation on safety consciousness and ability Credit 3 hours

444 Modern Industries. Aspects of management, labor, plant and product; for interpretation of industry in secondary school industrial education program. Credit, 3 hours.

445 Industrial Internship. Assignment commensurate with student's instructional program. Manufacturing processes, technical information, instructional techniques, management experiences, specialized instruction by industry. For Division majors by application only. Prerequisite: approval of advisor and ITE Department. Credit, 1-10 hours.

446 Instructional Aids and Materials. Selection, preparation, construction and methods of use in industrial technical education. Credit, 3 hours.

450 Industrial Training. Training techniques and learning processes. Planning, developing, and evaluating training programs in industry and governmental agencies. Credit, 3 hours.

452 Industrial Supervision. Supervisory principles as applied to industrial and governmental agencies. Supervisor-employee relations, group morale, leadership techniques, policy interpretation and training. Credit, 3 hours.

455 Industrial Technical Programs. Industrial, governmental, factory, and special school programs. Prerequisites: advisor and ITE departmental approval, and senior status. Credit, 1-12 hours.

461 Hot Metals Techniques. Properties of metals; sand and investment casting; pattern making. Six hours lecture and laboratory. Credit, 3 hours.

465 General Metals. Mass production, numerical control, chipless machining; study in areas of special interest. Six hours lecture and laboratory. Credit, 3 hours.

470 Contemporary Power Education. Model programs, theory and practice, environmental problems, equipment and service, methods and media. Credit, 3 hours.

471 Automotive Fabrication Materials. Coating, repairing, finishing, forming and shaping; plastic and metal design; effects of heat, wear, and corrosion; safety, teaching aids and materials. Six hours lecture and laboratory. Credit, 3 hours.

478 Engine Analysis. Measuring of power and factors affecting engine performance, instrumentation, fuels and lubricants, diagnosis, tune-up procedures. Prerequisites: ITE 174, 273 or equivalent. Six hours lecture and laboratory. Credit, 3 hours.

480 Teaching Industrial Technical Subjects. Teaching techniques, philosophy, organization, planning, evaluation of teaching efficiency. Credit, 3 hours.

485 Teaching Internship. Application of theory to in-

struction and/or training in post-secondary institutions, industry and governmental agencies. Classroom, laboratory, and training session management procedures. Prerequisites: ITE 402, 480 (or 450), senior status, and departmental approval. Credit, 1-6 hours.

491 Organization and Management of Cooperative Programs. Workstudy programs for industrial technical occupations in high schools and junior colleges. Developing and coordinating programs. Instructional materials. Credit, 3 hours.

513 Experimental Activities. Investigation and solution of technical problems in the student's area of specialization involving material design and analysis. Credit, 3 hours.

540 Evaluation in Industrial Technical Education. Evaluative factors such as attitudes, behavioral factors, skills, technical information; instrument construction; evaluation of program effectiveness. Credit, 3 hours.

541 Adult Vocational Programs. Organizing and administering evening and adult industrial technical programs. Formal and informal school and industry offerings. Credit, 3 hours.

542 Philosophy of Industrial Technical Education. Current concepts, anticipated policies, practices and objectives in practical arts and vocational-technical education. Credit, 3 hours.

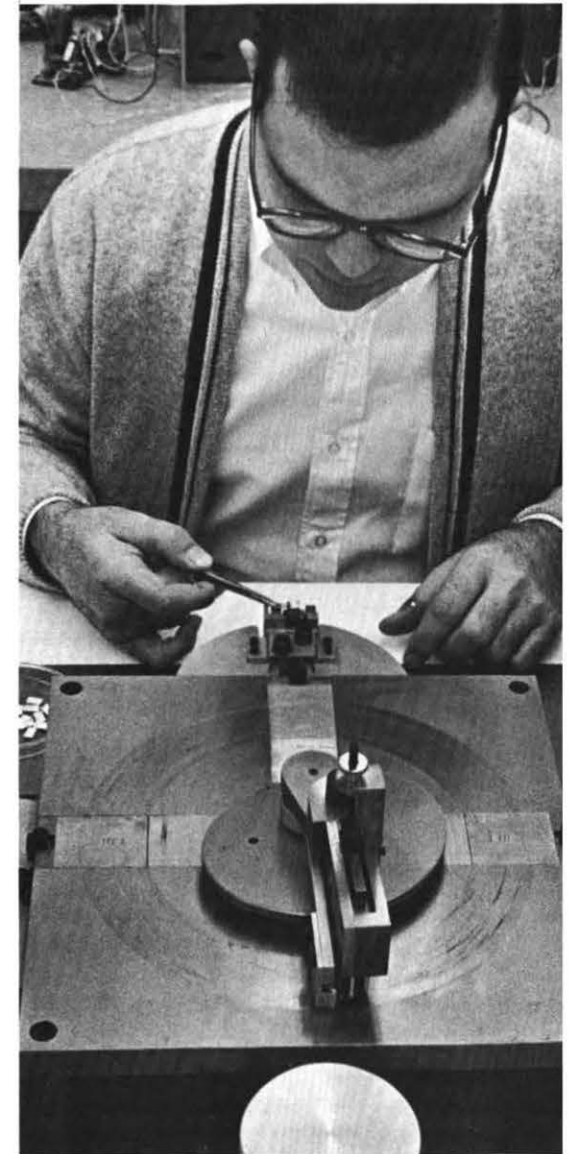
544 History of Industrial Technical Education. Factors motivating evolution of modern programs; implication of future trends. Credit, 3 hours.

546 Post-Secondary Occupational Education. Trends, community surveys, needs, curricula, instruction, evaluation of occupational programs, financing, emphasis on industrial occupational education at the post-secondary level. Credit, 3 hours.

548 Administration of Industrial Technical Education. Improving instruction, fund and material control, student personnel problems, curricular patterns. Credit, 3 hours.

549 Current Literature and Research. Selection of research problems, analysis of literature, individual investigations, preparing reports; local, state, and federal programs. Credit, 3 hours.

Special Courses: ITE 494, 498, 499, 580, 584, 590, 591, 592, 594, 598, 599, 780, 783, 784, 790, 791, 792, 799. (See pages 48-49.)



College of Architecture

HUGH BURGESS, M.S. ARCH.,
Dean

Purpose

The central function of the College of Architecture is to educate professional students for the practice of architecture, including preparation and training for architectural and planning specializations at the graduate level. The College also contributes to continuing efforts to conserve or improve the quality of our natural and built environments toward the end of bettering the human condition in our society.

Affiliations

The College of Architecture maintains active affiliations with the Arizona Society of Architects, the Central Arizona Chapter of the American Institute of Architects, the Associated Student Chapters of the American Institute of Architects, the American Institute of Planners, the Collegiate Schools of Planning, the American Society of Landscape Architects and the National Instructors of Landscape Architecture.

The College also maintains and supports its contacts with the Frank Lloyd Wright School of Architecture at Taliesin West and the Arcosanti Project of the Cosanti Foundation by Paolo Soleri. The College has employed seminars, instructional exchange, and joint student faculty gatherings with these groups.

Accreditation

The Bachelor of Architecture degree offered by the College is accredited by the National Architectural Accrediting Board and the Arizona State Board of Technical Registration. The College also maintains active memberships in the Associations of Collegiate Schools of Architecture, Collegiate Schools of Planning, National Council for Instructors in Landscape Architecture, and

American Institute of Landscape Architects.

Information

Further detailed information concerning the course of study, advice on pre architecture courses, admission practices, expense and financial assistance will be found in the *Bulletin* of the College of Architecture. Requests for the *Bulletin* and for application forms should be addressed to the Office of the Dean, College of Architecture, Arizona State University, Tempe, Arizona 85281.

Pre-Professional Preparation

GENERAL STUDIES COURSES PRE PROFESSIONAL PREPARATION FOR THE STUDY OF ARCHITECTURE. This preparatory work may be accomplished at ASU in any of the undergraduate colleges by completion of the ASU courses as listed. The work may also be accomplished at other accredited institutions, including community colleges, by the completion of courses with equivalent content. The described work includes all of the ASU General Studies requirements. Four semesters or equivalent is the minimum required preparation.

COURSES	Semester Hours
<i>Architecture</i> APH 100 Introduction to Architecture 2 (or elective, if not in attendance at ASU)	
<i>University English Proficiency</i> 6 (English composition ENG 101, 102 or 104 and elective)	
<i>Humanities</i> Electives 8 (Art history, music history, literature, philosophy, speech, humanities)	
<i>Social and Behavioral Sciences</i> Electives 8 (Anthropology, economics, cultural geography, history, psychology, sociology, political science)	

Sciences and Mathematics

Required Courses plus		
Option A* or B**	15*	or 18**
Mathematics: MAT 118 Plane Trigonometry	2	
Engineering Sciences ASE 226 Digital Computer Programming	2	
(Suggested elective prior to ASE 226: MAT 107 Basic Computer Programming 3)		
Physics: PHY 101 Introduction to Physics	4	8* 8**
<i>Option A* Math.</i>		
MAT 141 Math for Social, Life and Management Sciences	4	
MAT 226 Elements of Statistics	3	7*
<i>Option B** Math</i>		
MAT 120 Analytical Geometry and Calculus I	5	
MAT 121 Analytical Geometry and Calculus II	5	10
<i>General Studies Electives</i>		
Additional courses in humanities, sociology and behavioral sciences, sciences, or science and math	2	5*
Electives (Suggested electives to aid in establishing and developing graphic and problem solving skills and in preparing a required portfolio for admission application.)	16	
Art: ART 111 Beginning Drawing	3	
Art: ART 141 Introduction to Studio Art (Basic Design)	3	
Engineering Science: ECE 102 Introduction to Engineering	2	
Industrial Design: IND 111 Technical Graphics	2	
Industrial Design: IND 160 Sketching and Drawing	2	
Industrial Design: IND 161 Advanced Sketching and Drawing	2	
Other drawing advertising design interior and space design, and photography electives as selected)		
Minimum Total Semester Hours		60
(for admission to the College of Architecture three year professional program for Fall 1975 or 1976)		

Bachelor of Architecture Degree

The College of Architecture offers a three year program of studies leading to the professional degree, Bachelor of Architecture, and entry into the architecture profession and related career areas in practice, government, business, construction, and education. The professional degree serves as preparation for graduate programs leading to specialized careers in urban planning, landscape architecture, regional planning, architectural administration, production management, solar energy technology and environmental analysis and programming.

To fulfill the requirements for a B. Arch. degree, a student must satisfy all of the following:

- 1) Admittance to the College of Architecture as a candidate for the degree and satisfaction of any conditions imposed at the time of admission or prior to graduation during the course of his study.
- 2) Satisfaction of full time residency course and attendance requirements for the College of Architecture.
- 3) Successful completion of a minimum of 110 hours of academic professional studies credit with a cumulative weighted average of 70 or better
- 4) Completion of all College of Architecture required courses
- 5) Maintain a personal code of conduct in keeping with the highest standards of a professional student and as defined in the *Code of Student Responsibilities* and the *College of Architecture Handbook of Policies Procedures Organization and Curriculum*.

A student must be in residence on full time attendance for a minimum of six semesters or their equivalent, with the exception of those students who transfer with ad-

vanced standing from another accredited professional college or school of architecture. A semester in residence is earned when a student has been enrolled and maintained, without dropping course work, a minimum of 16 to 18 credit hours as specified by the curriculum. A transfer student must complete the work of at least two semesters in the College of Architecture immediately preceding the granting of a degree.

Admissions

First year students are admitted only for the Fall semester. The requirements for admission to the College of Architecture are:

- 1) Qualified for admission/in good standing Arizona State University
- 2) Completion of two years of academic studies at an accredited institution, including community colleges. This pre professional course work consists of a minimum of 60 credit hours of specified and elective General Studies courses, as specified in this section.
- 3) Submission of application documents to the Admissions Committee, College of Architecture, showing evidence that the applicant's interests and aptitude in architecture, personal character, academic achievement and potential, graphic and creative skills, ACT SAT and other scores and documents are at a level to show a high potential for success in the profession of architecture. A limited number of spaces are available in each entering class.

Complete application documents must be submitted *prior to the deadline of April 1*. Documents may be submitted on the basis of the completion of three semesters of preparatory work in order to meet the

stated deadline if the student is registered for all remaining requirements. Tentative admission may be granted on this basis. However, it is important to understand that the fourth and final semester's transcript must show completion of all preparatory course work and that the student's cumulative grade index was not reduced. A tentative admission may be revoked if on receipt of final transcripts a lower grade average than indicated at the time of initial application is recorded.

All items of the documents must be submitted by the applicant at one time, bound together in 8 1/2 x 11" portfolio form, using a notebook or suitable binding. Incomplete documents, or those received later than the April 1 deadline, will not be considered by the Admissions Committee.

THE APPLICATION DOCUMENTS ARE:

- 1) College of Architecture Application form, completely filled out. (Available upon request at Dean's Office, College of Architecture.)
- 2) High school transcripts, including personal and character records.
- 3) ACT or SAT, or other equivalent test score certificates.
- 4) Official college transcripts, from all schools attended, showing completion of all course work as described herein.
- 5) A portfolio showing examples of graphic skills and other creative work. The portfolio may be a product from the following or similar courses of study: Beginning Drawing and Sketching, Basic Art Design, Photography, or other self directed skills and creative work that the applicant believes may best represent his/her aptitude, skills and motivation for professional architecture course work.

Original examples may not be submitted: All examples should be photostated, photographed, or otherwise reproduced.

In general it is the policy of the College of Architecture to discourage transfers from other architecture schools in mid professional work. In exceptional cases, however, a student who has successfully completed his first or second year with an outstanding record at an accredited school of architecture may be permitted to transfer into the College with advanced standing.

The pre professional preparation for the study of architecture may be completed in community colleges, but only by completing course work equal in content to the required pre professional courses listed by title and number in this *General Catalog*. The completion of an associate or bachelor's degree, in itself, will not necessarily complete the pre-professional requirements.

Credit is not given in the professional program in architecture for any pre professional architecture or drafting course work completed at other institutions, including technically oriented architectural options at community colleges. Students are required to complete all of the courses in the professional curriculum. Only in the case of a student granted advanced standing, from an other accredited college of architecture, will an exception to this requirement be considered.

The College of Architecture Admissions Committee will evaluate all aspects of the individual application documents, including: high school and college academic and personal records, ACT SAT and other scores, and portfolio material. The limited number of spaces available each year will be awarded to those applicants evidencing the highest promise for professional success in an architecture career.

These are not the only factors considered. The admission requirements are flexible and other evidences of ability and an applicant's prospect for significant public service in the practice of architecture will be carefully considered by the Admissions Committee with the object of selecting those who are likely to succeed in the study of architecture. As a state institution, the College weighs residency as a factor in admission.

Successful applicants will be notified by letter when evaluations are completed. Those receiving tentative admission will receive notice of final admission upon receipt of final transcripts by the College around June 15. A signed receipt of admission conditions is required of successful applicants prior to final admission. *All applicants* can expect to be informed of admission or non admission on or about July 1.

Course of Study

The program of study in the College of Architecture is designed for full time students over a three year period, paralleling other professional curriculums such as law and medicine. It concentrates and combines fully integrated lecture and laboratory course work involving both individual and team learning experiences. It is aimed at giving students skill and facility as they prepare for the practice of architecture. The curriculum provides for applications of a liberal arts preparatory education, but its thrust is toward acquiring competency in professional skills in a rapidly changing and increasingly competitive technological society. The professional curriculum is designed to aid students in their quest for a successful career in architecture. One or two summers of clinical internship in an architect's office under the direction of an approved preceptor and licensed practitioner provides

a distinct educational experience when openings are available.

Professional Curriculum Bachelor of Architecture

A student seeking the Bachelor of Architecture degree must satisfactorily complete a curriculum of 170 semester hours, including a minimum of 60 semester credits of pre-professional preparatory course work consisting of University and liberal arts subject matter and, if elected, basic military science or aerospace studies. The major categories of course work are classified as follows.

Architectural Philosophy and History

(APH) develops an understanding of architecture as both a determinant and a consequence of man's behavior in the past and present. These studies are concerned with the *reasons* for design and construction.

Environmental Analysis and Programming

(ANP) develops capabilities to analyze and program natural environmental and human factors as pre-conditions for architectural design. These studies are concerned with the *analytical methods* used by architects.

Architectural Technology (ATE)

develops knowledge of the technical determinants, resources and processes of architecture. These studies are concerned with the *technical science* of design and construction.

Architectural Design and Technology

Laboratories (ADF) demand and encourage synthesis of the knowledge and understanding the student has gained from course work and all other sources in the comprehensive design of architectural

projects. These laboratories integrate the *reasons, analytical methods, and technical sciences* of architecture.

Architectural Administration (AAD) develops the organizational and managerial aspects of architectural practice

Landscape Architecture and Regional Planning

(ALP) explores the reasons for, and techniques involved in, the analysis, planning and design of the exterior environment, both natural and man made.

Urban Planning (AUP) exposes the student to the theories, methods, and interdisciplinary concerns of the urban planning profession and the related field of urban design

A limited program of *electives* enables the student to fortify weaknesses, exploit strengths and pursue special interests. Recommended electives and options developed by the faculty together with the members of the College Council are available to each student at his or her request

Option 1: Professional Architecture Career

Goal Suggested electives to complement professional architectural studies. Select 12 semester hours from the following:

	Semester Hours
ADS 305 Business Law	3
ADS 306 Business Law	3
ADS 431 Business Report Writing	3
REA 411 Real Estate Law	3
REA 441 Real Estate Land Development	3

Option 2: Allied Professional Studies

Career Goal (Landscape Architecture, Urban Design, Urban Planning)

	Semester Hours
Architecture or University Electives	22

See Coordinator, Faculty of Environmental

Design for recommended electives appropriate to the various options.

Professional Studies Required Courses:

FIRST YEAR

	Fall	Semester Hours
ATE 351 Building Systems I	3	3
ATF 353 Arch. Const. I	3	3
ANP 331 Environ. Analysis I	3	3
APH 313 Hist. Western Arch. I	3	3
ADF 321 Elements of Arch.	5	5
Total		17

Spring

	Semester Hours
ATE 352 Building Systems II	3
ATE 354 Arch. Const. II	3
ANP 332 Environ. Analysis II	3
APH 314 Hist. Western Arch. I	3
ADE 322 Dwelling Units	5
Total	17

SECOND YEAR

	Fall	Semester Hours
ATE 461 Building Struct. I	3	3
ATE 451 Adv. Arch. Const. I	3	3
ATE 453 Adv. Bldg. Systems I	3	3
Arch. or Univ. Elect.	3	3
ADE 421 Community Facilities	6	6
Total		18

Spring

	Semester Hours
ATE 462 Building Struct. II	3
ATE 452 Adv. Arch. Const. II	3
ATE 454 Adv. Bldg. Systems II	3
Arch. or Univ. Elect.	3
ADE 422 Building Complexes	6
Total	18

	Semester Hours
AES 381 Clinical Internship	3-6
1st and or 2nd summer as available	

THIRD YEAR

Fall	Semester Hours
ATE 563 Building Struct III	3
**AAD 555 Arch Admin I	2
**ANP 531 Computer Applications	3
*Arch. or Univ. Elect	3
ADE 521 Urban Develop Plan	7
<i>Total</i>	18
Spring	Semester Hours
ATE 564 Building Struct IV	3
*AAD 556 Arch Admin II	2
*CON 387 Bldg Estimating	3
*Arch. or Univ. Elect	3
ADE 522 Multi Story Bldgs	7
<i>Total</i>	18

*May be taken during summer terms if offered.
 **Other professional emphasis electives may be substituted with approval of the College Council.

Study Environments. As a designer of environments and as a future architect, the professional student should consider his or her study environment as reflective of the pride in his or her own work. Our students are expected to reflect orderly work habits within their work spaces. A special effort is being made to make our facilities and laboratories especially thoughtful examples of good design. They are to be perceived as simulated architects' offices and as such offer unique study environments for professional students.

Clinical Internships. All students at the College of Architecture are required to participate in the internship program during the summers between the first and second and the second and third years if positions in approved firms are available.

Credit for a full time internship is six elective credits, and for a half time internship, three elective credits. Although a stu-

dent may enroll in more than one internship (subject to the availability of positions) the maximum credit permitted toward graduation is six hours unless the College Council specifically waives the limitation.

Master of Architecture Degree

Graduate Professional Specializations.

A graduate program has been approved with the following important characteristics: The Master of Architecture is a professional specialization degree acting as an umbrella for present and future graduate specializations. It has several options with a coordinate focus on *building design* and *human settlement in arid regions*.

Consult the appropriate section in the Graduate College catalog for a complete description of course offerings, admission requirements, financial aid, and other related information.

Evening and Special Studies

Evening Program. This is a work and study opportunity for those who have secured employment in architectural or related professional offices approved by the Coordinator for Evening and Special Studies.

Admission. The requirements and procedures for admission are equal and similar to those for the day professional program. See: "Pre Professional Preparation for the Study of Architecture." Consult the Dean's office for course requirements for a Full Evening and Special Studies.

Grading

First, Second, and Third Year Courses. Performance in first, second, and third year

courses and comparable evening study levels is graded under the following numerical scale:

99-90	A, Excellent
89-80	B, Good
79-70	C, Average
69-60	D, Minimum Passing
59-50	E, Failure

Incomplete Grades. A grade of "Incomplete" is given only when a student is unable to complete a course because of illness or other serious personal reason. Each student receiving an "Incomplete" must contact the instructor and complete the course within one calendar year or within such shorter period as may be required by the instructor. If an "Incomplete" is not thus removed, the instructor is expected to change the "Incomplete" to an appropriate grade. If the student chooses not to change the "Incomplete" the "I" becomes a part of the student's record. If the instructor is not available, the Dean will act in his place.

No credit is recorded for a course until an incomplete grade has been removed. A student contemplating graduation should remove an incomplete grade no later than two months prior to the graduation date in order to qualify for certification of candidacy.

Examinations. A student may be excused from taking an examination only for health reasons or other serious personal difficulties. Any excuse shall be reviewed by the Dean in consultation with the appropriate faculty member. A student excused must normally take the next regular examination offered in the course. In unusual cases and with the instructor's permission, he may take the examination late or be given a special examination.

Retention Standards. To be eligible to

continue in the College of Architecture professional program, a student must maintain a cumulative weighted average of 70 or better at the end of the first full academic year and at the end of each semester. Any student whose average for the first semester falls below the 70 level is automatically placed on probation. Continuation of enrollment shall be upon such terms and conditions as the College may impose. A student whose cumulative average thereafter falls below the 70 level will be dismissed but may petition the faculty through the Office of the Dean for 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 the College thereafter may be conditioned on achieving a level of performance higher than the overall 70 average. Failure in any single course places a student on probation, regardless of his cumulative average. This course must be successfully completed in addition to his next full course schedule or during the summer if offered. Records of individual student rankings for each semester of course work completed are maintained in the Dean's Office and are available upon request.

Professional Curriculum Courses. All courses in the three years of the architecture curriculum are required, unless an optional course is specified by the College. If any course is not completed during the year of study, the course must be completed during the summer if offered or the following year in addition to the normal course load. Upon petition, in rare and unusual cases

and for compelling reasons, a core curriculum course may be waived by the College Council.

Attendance. Required attendance at classes and seminars is a vital part of architectural studies and is an essential element in determining whether a student is in residence for purposes satisfying requirements for graduation. As a general matter, if absences are noted in a particular course, the student will be invited to confer with the Dean's Office; continued absence after such an invitation may result in a student being administratively withdrawn from the course. All faculty maintain accurate attendance records.

Transfer Students. In general, it is the policy of the College of Architecture to discourage transfer from another school of architecture in mid-architecture course work. In exceptional cases, however, a student who has completed his first or second year with a substantially better than average grade level at an accredited school of architecture may be permitted to transfer into the College of Architecture with advanced standing. A transfer applicant is considered, however, only to the extent that vacancies exist in the relevant class. All conditions shall be set forth by the College at the time of admittance. The amount of credit to be allowed for previous professional work shall also be set forth at the time of admittance.

No transfer credit is granted for courses with less than "C" grades or for work completed in an unaccredited architecture school. Ordinarily a student receives credit for courses in which he receives a "C" or better. However, the College reserves the right to deny or reduce credit for particular courses.

Grades received at another school of ar

chitecture are not counted in determining a student's cumulative grade point average.

Non-Architecture Students. Graduate or other professional students enrolled in colleges other than architecture may be permitted to enroll in certain architecture lecture or interdisciplinary courses with the approval of the Dean and the instructor. Enrollment is prohibited in design and technology laboratory courses.

Special Honors at Graduation. At the time of graduation, students with academic distinction in the study of architecture may be awarded the respective designations *cum laude*, *magna cum laude*, and *summa cum laude*. Recipients of these awards are selected by the Architecture faculty on the basis of graded performance in courses for the three years.

Employment. It is difficult for an architecture student to carry part time employment while in school. Acceptance of Admission to the College carries a commitment on the part of the applicant that the necessary time will be available for professional architectural studies. However, if there is no other solution to the financial problem, then it is strongly recommended that employment *not exceed 10 or at the most 15 hours per week*, and that the Coordinator of the Faculty of Architecture be informed. Students carrying part time employment in excess of 15 hours per week will be advised to arrange their professional studies with the evening program.

Facilities. The College has excellent design laboratories, classrooms and library facilities. A lounge, exhibition gallery, workshop, photographic laboratory and a cooperative supply and printing shop comprise

the major features. Environmental and solar testing laboratories are scheduled for completion in the near future

Resources

HOWE ARCHITECTURE LIBRARY: The Howe Architecture Library is administratively a part of the University Library, but it exists to serve the academic needs within the College of Architecture. It also serves as a regional resource library for the general University community and for the practicing architectural profession.

ARCHITECTURE FOUNDATION: The Architecture Foundation was established in June 1958, to provide for enrichment of the programs of the College of Architecture. Operating under by-laws adopted October 29, 1963, as revised, it seeks to supplement rather than replace funds regularly available from appropriations and fees.

ASU ALUMNI ARCHITECTURE ASSOCIATION. The Arizona State University Architecture Alumni Association was formed on September 4, 1974, with the recognition that graduates can and should bring to the College a special contribution by acting as liaison among the College, community, students, and the practicing professional architects.

STUDENT CHAPTER AIA. The Association of Student Chapters of the AIA was established at the College of Architecture in 1957. Its purpose was to assist the student with the transition into professional life, and to acquaint them with the profession of architecture.

ALPHA RHO CHI. Satyios Chapter of Alpha Rho Chi was reorganized in 1974. Alpha Rho Chi is a national professional fraternity limiting its membership to students of architecture and the allied arts.

Financial Aid. A wide variety of financial aid and loan programs are available to students with demonstrated need without regard to race, creed, color, national origin or sex. For further details consult the Dean's Office.

Students taking 300 and 400 level courses as part of their approved graduate program must indicate the graduate credit option in the appropriate location on the Course Request Opscan form.

Architecture

Professors:

BURGESS (ARCH 134), COOK ELLNER
ELMORE WHIFFEN

Associate Professors:

BOYLE, FLYNN, HERSHBERGER
HNSHAW JAKOB, LA
OLIVER, PETERSON RAPP

Assistant Professors:

BERTELSEN, LARSON, SHEYDAYI, YOST

Lecturers:

BALLEW CHRISTENSEN CLARK
ENRIQUEZ FELLOWS,
OLEARY, PERRELL SCALISE
SIEFER

ARCHITECTURAL PHILOSOPHY AND HISTORY

Unless otherwise indicated these courses are open to any student meeting the stated pre requisites and are recognized in the University's program of General Studies

APH 100 Introduction to Architecture I. Understanding of our physical environment through the

forms, functions and determinants of today's architecture its continuity with the past and its relation to the developing present. Brief examination of architecture as a profession. Credit 2 hours

101 Introduction to Architecture II. Contemporary architecture urban planning, landscape architecture and interior design with emphasis on career preparation for these professions. Credit, 2 hours.

304 American Architecture. Architecture in the U.S. from earliest colonial times to the present. Credit 3 hours

305 Asian Architecture. Middle East, India, Southeast Asia, China and Japan from ancient times to the present. Credit 3 hours.

313 History of Western Architecture I. Representative works of western architecture, ancient through medieval. Credit, 3 hours

314 History of Western Architecture II. Architecture of the Renaissance through the present day. Credit 3 hours.

315 Topics in Architectural Philosophies. Developments, theories or achievements of current or special interest. Prerequisite: junior standing and approval of instructor. Credit, 1 3 hours

405 Seminar. Discussion and reports on aspects of contemporary architecture theory practice, criticism. Prerequisites: ADE 421 and 422. Credit 2 hours

411 Ancient Architecture. The ancient Mediterranean world with selective emphasis on major historical complexes and monumental styles. Prerequisite APH 313. Credit 3 hours

412 Medieval Architecture. Europe and the Near East from the reign of Constantine to the end of the Middle Ages. Prerequisite APH 313. Credit 3 hours

413 Renaissance Architecture. Europe and America in the 15th and 16th centuries. Prerequisite APH 313 or 314. Credit 3 hours.

414 Baroque Architecture. Europe and America from the late 16th to the middle 18th century. Prerequisite APH 314. Credit 3 hours

415 19th Century Architecture. Europe and America from neoclassicism to art nouveau. Prerequisite APH 314. Credit 3 hours

416 20th Century Architecture I. Europe and America from the foundations of the modern movement to the culmination of the international style. Prerequisite APH 314. Credit 3 hours

417 20th Century Architecture II. Developments in architecture since the international style. Prerequisite APH 314. Credit 3 hours

ARCHITECTURE TECHNOLOGIES

Unless otherwise indicated these courses are open only to students admitted to the professional program of the College of Architecture (see page 226)

ATE 351 Building Systems I. Introduction to building structural, mechanical and electrical systems. Credit, 3 hours.

352 Building Systems II. Continuation of introductory structural, mechanical and electrical systems. Prerequisite: ATE 351. Credit 3 hours.

353 Architectural Construction I. Basic materials and methods of architectural construction. Credit, 3 hours.

354 Architectural Construction II. Continuation of previous work with building materials and their use in construction. Prerequisite: ATE 353. Credit 3 hours.

451 Advanced Architectural Construction I. Selection and employment of materials and systems according to their nature and the techniques of their use. Prerequisite: ATE 354. Credit 3 hours.

452 Advanced Architectural Construction II. Developing systems used in the preparation of contract drawings, specifications and documents. Use of building codes and zoning ordinances. Prerequisite: ATE 451. Credit 3 hours.

453 Advanced Building Systems I. Technical problems of composite acoustics, lighting, communication and other mechanical and electrical systems. Prerequisite: ATE 352. Credit 3 hours.

454 Advanced Building Systems II. Continuation of previous work with technical problems of composite control, acoustics, lighting, communications and other mechanical and electrical systems. Prerequisite: ATE 453. Credit 3 hours.

461 Building Structures I. Elasticity of structural materials, properties of sections, elastic stress analysis of determinate structures, flow diagramming for computer programming (BAS C). Credit, 3 hours.

462 Building Structures II. Indeterminate structures; use of existing structural (computer) programs, structural engineering properties of wood, steel and concrete. Prerequisite: ATE 461. Credit 3 hours.

563 Building Structures III. Structural design and analysis of wood, steel masonry and concrete buildings, introduction to aera (wind and seismic) analysis. Prerequisites: ATE 354, 462. Credit 3 hours.

564 Building Structures IV. Structural design of multi-story steel and concrete frame buildings including continuity connections and aera analysis.

Preliminary design of multi-story buildings. Prerequisite: ATE 563. Credit 3 hours.

565 Experimental Building Systems and Structures. Design calculations and testing of experimental or advanced building systems and structures. Prerequisite: ATE 564. Credit 3 hours.

566 Soil Mechanics and Foundations. Soils characteristics, elementary soil mechanics, development of flow diagrams and computer programs for preliminary foundation design. Prerequisite: ATE 565. Credit 3 hours.

651 Desert Habitation Technology. Analysis of habitation approaches in non-technological and technological societies arising from the nature of desert areas, includes aridity, availability of solar radiation, and extremes of temperature fluctuation, both diurnal and annual. Credit, 3 hours.

652 Solar Energy Technology. Utilization of solar radiation and nocturnal cooling for heating and cooling buildings in arid and other regions. Credit 3 hours.

653 Construction Documents I. Production of architectural working drawings, legal status, organization, plans, sections, elevations, details, schedules and coordination. Credit 6 hours.

654 Construction Documents II. Continuation of ATE 653. Credit 6 hours.

655 Construction Specifications. Preparation of architectural construction specifications, legal status, relationship to working drawings, organization, methods of specifying, language, writing techniques, building a ternate contracts, general conditions, bonds, guarantees, technical sections, interpretation. Credit 3 hours.

656 Building Codes and Ordinances. Analysis of national, state and local building codes, ordinances and restrictions relative to their impact on architectural programming, design and construction documentation. Credit 3 hours.

657 Building Materials and Systems Research. Empirical analysis of architectural and structural materials and systems, individual or team research. 9 hours of laboratory work per week. Credit 6 hours.

ARCHITECTURAL DESIGN AND TECHNOLOGY LABORATORIES

Unless otherwise indicated these courses are open only to students admitted to the professional program of the College of Architecture. Each semester a 1 academic course work is integrated with the de-

sign and technology laboratories. The common format of all major projects includes environmental analysis and programming, site planning, schematics, design development, construction detailing and specifications, structural, mechanical and electrical systems design, professional administration documents and cost estimates. Periodic examinations and sketch projects complement major projects and are in addition to the normal scheduled with each course.

ADE 321 Elements of Architecture. Architectural design, basic graphic skills and the principles of order applied to architectural form, space and time within the context of natural and man-made sensory environments. Sketch projects and examinations, five afternoons in lab per week. Credit 5 hours.

322 Dwelling Units. Applications of the comprehensive process of architectural practice to dwelling unit design and site planning. Sketch projects and examinations, five afternoons in lab per week. Prerequisite: ADE 321. Credit, 5 hours.

421 Community Facilities. Design of specific community facilities within an urban or natural environment. Sketch projects and examinations, five afternoons in lab per week. Prerequisite: ADE 322. Credit, 6 hours.

422 Building Complexes. Programmatic and comprehensive development of building complexes relating to community development and urban services. Sketch projects and examinations, five afternoons in lab per week. Prerequisite: ADE 421. Credit, 6 hours.

521 Urban Development Planning. Location and economic of community facility distribution on and within the public and private sectors of the development process with a major facility as a generator of urban growth. Sketch projects and examinations, five afternoons per week in lab. Prerequisite: ADE 422. Credit 7 hours.

522 Multi-Story Buildings. Comprehensive architectural design and technology of a multi-story building as a continuation of the student's previous semester's work. Sketch projects and examinations, five afternoons per week in lab. Prerequisite: ADE 521. Credit, 7 hours.

621 Architectural Research and Design I. Specialized architectural research with emphasis on individual theses. Credit 6 hours.

622 Architectural Research and Design II. Application of previous research toward an individual thesis. Credit 6 hours.

623 Building Design for Arid Regions. Laboratory course directed toward the design of residences and

other structures which would be especially adapted to use in desert areas. Low energy use is a primary consideration. Credit 6 hours

624 Urban Design for Arid Regions. Laboratory course directed toward the planning and design of cities in arid regions; conservation of water and energy resources are primary considerations. Credit 6 hours

625 Community Design I. Design problems focus on large scale community design or housing projects in arid regions. Credit 6 hours (2 sections)

626 Community Design II. Continuation of previous course. Credit 6 hours (2 sections)

ARCHITECTURAL ADMINISTRATION

AAD 555 Professional Practice I. Economic and construction aspects of professional practice including finance sources, project funding, partnerships, corporate practice, insurance and administration of building contracts. Prerequisite: third year standing. Credit 2 hours.

556 Professional Practice II. Legal and management aspects relating to professional practice, including legal responsibilities and liabilities, management of time and people, and accounting and marketing services. Prerequisite: third year standing. Credit 2 hours

651 Construction Administration I. Responsibilities of the architect during the construction phases of architectural services including negotiations, shop drawings, field observation, meetings, records, reports, tests, field orders, arbitration applications for payment and project closeout. Credit 3 hours

652 Construction Administration II. Office organization, personnel policies, organizing the production team, scheduling production, cost control, fast track design development, working drawings specifications, selection and coordination of structures electrical, mechanical and other consultants, construction cost estimation, bidding and negotiation. Credit 3 hours

653 Architectural Administration I. Advanced office management methodology and techniques including legal, economic and organizational aspects of professional practice. Credit 6 hours

654 Architectural Administration II. Project feasibility analysis, developmental programming and environmental impact requirements. Credit 6 hours

ENVIRONMENTAL ANALYSIS AND PROGRAMMING

ANP 331 Environmental Analysis I. Analysis of the natural and human environments of architecture as a basis for the programming and design of built environments. Credit 3 hours

332 Environmental Analysis II. Programming and design methodologies, including problem seeking, goal definition, site and climate analysis, code search, observation, questioning, descriptive statistics, relational diagrams, brainstorming, spatial organization and simulation as techniques for process information for building design. Credit 3 hours

531 Computer Applications. Use and potential in such areas as programming specifications, accounting calculations, control, design and graphics as applied to architecture, urban and regional planning. Credit 3 hours

631 Building Evaluation. Case studies of existing buildings to determine their success or failure in meeting program objectives and client user requirements including site considerations, form, function, human factors, expression, safety, durability, economy, time and change. Credit 3 hours

632 Building Programming. Preparation of architectural program for specific buildings including goal formulation, site and climate analysis, code interpretation, functional requirements, human factors, space priorities, relationship diagrams, space planning, phasing and cost control. Credit 3 hours

633 Research Methods. Theory of science, problem definition, research design, techniques of observation and questioning, sampling procedures, experimental design, methods of analysis and interpretation of data. Credit 3 hours

LANDSCAPE ARCHITECTURE AND REGIONAL PLANNING

ALP 441 History of Landscape Architecture. Physical record of man's attitude toward the land. Ancient through contemporary land planning and design. Credit 3 hours

541 Landscape Theory and Methods. Ecology as the basis for land planning and landscape design theory, methods and material vocabulary. Credit 3 hours

542 Landscape Construction and Materials. Design construction materials and site engineering aspects of landscape architecture. Credit 3 hours

543 Environmental Amenities. Analysis of the perceptual characteristics and aesthetic qualities of physical environment from wilderness to metropolitan area. Credit 3 hours

641 Landscape Design for Arid Regions. Design of small scale landscape projects in arid regions. Preparation of planning plans and construction documents as integral parts of the design process. Credit 6 hours

642 Landscape Analysis for Arid Regions. Field work and laboratory and use analysis and planning problems in arid regions emphasizing systems analysis and modeling; includes the physical, social, economic and political determinants of environmental design. Credit 6 hours

643 Resource Analysis. Principles and procedures for basic land and water resource inventory and analysis. Credit 3 hours

644 Remote Sensing and Aerial Analysis. Techniques and applications of remote sensing and aerial analysis. Credit 3 hours

URBAN PLANNING

AUP 471 Theory of Urban Planning. The city as a completely integrated system, including ecological, psychological, behavioral, social, physical and economic aspects of city development. Case studies used as appropriate. Credit 3 hours

472 Evolution of Human Settlements. Ancient and contemporary land use patterns evolved through the progressive acculturation of man over historical time. Credit 3 hours

473 The Man-Made Environment. Esthetic, social, economic, political and other factors creating 20th century land use patterns and their design as part of the overplanning process. Credit 3 hours

474 History of the City. The city from its ancient origins to the present day, emphasizing the cities of Europe and America during the last five centuries. Credit 3 hours

571 Interdisciplinary Urban Planning. Basic theories and methods of urban planning with introduction into substantive issues of concern to planners. Interdisciplinary with visiting lecturers. Credit 3 hours

572 Community Housing. History, practices, trends, and forms of housing including growth of public programs, national and local programs, zoning law, housing distribution, planning principles and policies, design review standards, and private development practice. Credit 3 hours

573 Housing Environments. Contemporary housing

environments, housing types and life styles as determined by user preference, density, development and property standards, cost, community and privacy, security, identity, movement, and the need for open space. Credit, 3 hours.

574 Law and the Built Environment. Law as a determinant of urban development, both in history and in the context of present laws on police power, eminent domain, tax policy, and governmental programs. Credit, 3 hours.

575 Land Development Control Law. Case studies of the law affecting land development and public planning. Police power and eminent domain; zoning, subdivision controls, official mapping, urban renewal, housing, design controls, historic preservation, and exclusionary practices. Credit, 3 hours.

576 System Theory for Urban Planning. General system theory and hierarchy systems in principle with examples as to the usefulness of these concepts as an integrating force in comprehending the complexity of the planning process in all fields of human endeavor. Credit, 3 hours.

673 Urban Statistical Analysis. Quantitative analysis in the urban context, demographic analysis, data processing, planning application and urban systems. Credit, 3 hours.

674 Land Economics. Economic determinants for urban and regional planning; analytical techniques, elementary market analysis and feasibility studies; economic incentives in urban planning. Credit, 3 hours.

EVENING AND SPECIAL STUDIES

ARP 380 Architectural Rendering Techniques. Delineation techniques and the use of various media for design studies and presentations. Four hours in studio. Credit, 2 hours.

381 Clinical Internship. Full-time internship under the supervision of practitioners in the Phoenix area or other locales. Credit, 1-6 hours. May be repeated.

382 Water Color. Painting in transparent water color. Emphasis on techniques, composition and color as they relate to architectural subjects and their environment. 4 hours studio. Credit, 2 hours.

383 Design and Communications I. Introduction to architecture; basic graphic skills and the principles of order applied to architectural form, space, and time within the context of natural and man-made sensory environments. Laboratory. Credit, 1-6 hours. May be repeated.

384 Design and Communications II. Applications of the comprehensive process of architectural practice

to dwelling unit design and site planning. Sketch projects and examinations. Laboratory. Credit, 1-6 hours. May be repeated.

483 Architectural Design and Delineation I. Urban environmental contexts as well as the design of specific community facilities as single buildings. Laboratory. Credit, 1-6 hours. May be repeated.

484 Architectural Design and Delineation II. Programmatic and comprehensive development of a building complex in the context of community development and urban service. Laboratory. Credit, 1-6 hours. May be repeated.

583 Advanced Architectural Design I. Location and economics of community facility distribution includ-

ing public and private sectors in the development process with a major facility as a generator of urban growth. Laboratory. Credit, 1-6 hours. May be repeated.

584 Advanced Architectural Design II. Comprehensive architectural design and technology of a multi-story building as a major component of the student's previous design of an urban development. Laboratory. Credit, 1-6 hours. May be repeated.

585 Architecture Field Study. Organized field study of architecture in specified national and international locations. Credit, 1-6 hours. May be repeated.

Special Courses: AES 298, 492, 493, 494, 497, 498, 499. (See pages 48-49.)



College of Nursing

JUANITA F. MURPHY, PH.D.,
Dean

Purpose

The faculty of the College of Nursing acknowledges its responsibility to health service consumers for the preparation of individuals who will provide nursing care of professional quality through teaching, research and service. The purpose of the College is to provide an educational program which prepares nursing practitioners and specialists who consider the emotional, biophysical, socio cultural and ecological needs in the prevention and treatment of human ills. This nursing care is based upon the belief that all human life has dignity and worth, that there is potential for growth in every individual, and that every individual should have the opportunity to achieve and maintain health.

It is the belief of the College of Nursing that professional preparation in nursing is most appropriately composed of a combination of liberal and specialized educational content, and that the professional nurse is committed to the utilization of knowledge and skills to help other human beings achieve and maintain well being. We also believe that the professional nurse must be prepared as a change agent for the betterment of patient care.

Organization

The College of Nursing is organized as follows:

BACCALAUREATE PROGRAM

GRADUATE PROGRAM

Community Mental Health Psychiatric Nursing

Family-Child Nursing

Medical Surgical Nursing

Community Health Nursing

Administration and Management of Nursing and Health Care

CONTINUING EDUCATION PROGRAM

Presents a variety of course offerings both on and off campus, some of which are for academic credit, and all of which are designed to assist Registered Nurses to increase the knowledges and skills needed in their professional roles.

Degrees

Bachelor of Science in Nursing. The completion of a four year curriculum in nursing leads to the degree of Bachelor of Science in Nursing. The purpose of the baccalaureate program in nursing at Arizona State University is to graduate a nurse who possesses general clinical competence to perform as a beginning professional nurse practitioner in the areas of primary care, acute care, and long term care. The graduate is prepared: 1) to give enlightened patient care to individuals and families using the skills of observation, assessment, decision making, and evaluation; 2) to promote health and prevent illness in working with individuals and groups; 3) to function as a contributing member of the health team and to assume leadership as appropriate; 4) to collaborate with other health professionals in planning and implementing patient care; and 5) to continue his/her own professional and personal growth in a self-directed manner.

The candidate for a degree of Bachelor of Science in Nursing must complete 126 semester hours, including 40 hours in General Studies, 38 hours in related nonnursing courses and electives, and 48 upper division credits in the nursing major. Required courses for the nursing major are: NUR 301, 302, 310, 311, 320, 321, 401, 402, 410, 420, 421. Lower division nursing

course credit will not be accepted towards the Bachelor of Science in Nursing degree.

*Up to and including six semester hours of elective credit in upper division elective nursing courses may be substituted for six of the 38 hours. Each student must seek approval by the Baccalaureate Standards Committee prior to enrollment in the elective nursing course for this substitution.

Curriculum Strategies. The required nursing courses incorporate several innovative curriculum strategies. These strategies include the concept of continuous progress, which provides the student the opportunity to progress according to individual ability, provides materials and facilities for guided independent study, and provides freedom to utilize individual initiative in learning. To implement the concept of continuous progress, alternative ways of acquiring knowledge and skills about nursing are available to the student. These alternatives include multimedia resources in the College of Nursing independent study laboratory, transmission of a body of knowledge via lecture and small group discussions, diagnostic sessions, guided independent study, and clinical practice in health related institutions. Student progression within a course is planned in an organized manner to allow the learner and faculty member to interact on a continuing basis for feedback and validation.

The curriculum strategy of mastery learning facilitates a high level of achievement in as many students as possible. Some of the learning tools to facilitate a high level of achievement by the students are the use of behaviorally stated course objectives, content modules, an independent study laboratory, and formative and summative evaluation examinations.

Other strategies include utilizing a sys-

tematic approach in the planning of nursing care, and organizing and integrating the knowledge about human beings in relationship to health and illness.

Master of Science. The College of Nursing offers a four semester program leading to a Master of Science degree with specialization in Community Mental Health-Psychiatric Nursing, Family-Child Nursing, Medical Surgical Nursing, Community Health Nursing, and Administration and Management of Nursing and Health Care. Requirements for these programs are given in the Graduate College catalog. Persons interested in applying for admission to the program should write to the Arizona State University Graduate College for a catalog and application form.

General Information

The Bachelor of Science in Nursing degree program at Arizona State University is divided into the pre-nursing major and the nursing major. The pre-nursing major consists of prescribed prerequisite courses and elective courses and takes approximately two years to complete. The nursing major consists of the upper division nursing program and elective courses which are completed during the final two years of study.

Entrance into the nursing major from the pre-nursing major is *not* automatic. A second selection process is conducted each Fall and Spring semester by the College of Nursing to admit students to the nursing major. There are program limitations in terms of College of Nursing facilities, available faculty, and clinical resources which require the limitation of applicants accepted into the nursing major. The number of qualified applicants may exceed the number of applicants accepted in each entering nursing

class. Entrance into the nursing major is limited; therefore admission is competitive and selective.

There are separate and distinct admission procedures in the College of Nursing for admission of students to the pre-nursing major and for the nursing major.

Pre-Nursing Major

Admission Requirements. Entering freshmen who meet the University admission requirements listed on pages 13-16 of this catalog are admitted to the College of Nursing Pre-Nursing Major Provisional Status. Transfer applicants (all applicants with 9 hours or more of transfer work) must have attained a 2.50 cumulative grade point average in completed course work for admission to the pre-nursing major.

Transfer applicants who are qualified for admission to Arizona State University but who do not have the required 2.50 cumulative grade point average at the time of admission will be informed that they have not met the criteria for admission to the College of Nursing. They will have an opportunity to change their request for a major and college within the University prior to or after receiving the Certificate of Admission. Another option would be remaining at their present institution or enrolling in another college at Arizona State University to raise their cumulative grade point average to 2.50, the required level for admission to the College of Nursing.

Pre-Nursing Curriculum. The following prescribed courses are required of all applicants who are interested in applying to the nursing major (upper division nursing program). Comparable courses may be taken at other approved universities or colleges. Courses transferred from other universities or colleges are evaluated by the Admissions

Office of Arizona State University for credit acceptability. In addition, the College of Nursing Baccalaureate Standards Committee evaluates the transcripts of each transfer student to determine which of these courses are equivalent in terms of content and credit to meet the prescribed prerequisite courses.

COURSES	San Jose State University
* English	3 6
English Composition FNG 101 and 102 or 04	
Humanities Electives	8
Architecture, Philosophy, Art History, Music History, English Literature, Philosophy, Foreign Languages (History, Literature, Culture and Philosophy only), Humanities, Speech, Theatre History	
Human Communications	3
One of the following is required: COM 100 Introduction to Human Communications or COM 200 Human Communication Systems or COM 300 Group Communication†	
Social and Behavioral Sciences	18
Psychology	3
PGS 100 Introduction to the Science of Psychology	
Sociology	3
SOC 131 Introductory Sociology or SOC 301 Principles of Sociology*	
Anthropology	3
ASM 101 Origin and Development of Man and Culture or ASB 02 Introduction to Cultural and Social Anthropology	
Human Development or Child Development	3
CDL 232 Child Development or FID 313 Child Development or PGS 341 Developmental Psychology	

Family Studies	3
FAS 331 Family Relationships+ or FAS 330 Personal Adjustment for Family Living† or FAS 357 Management in the Family or SOC 415 The Family†	
Nutrition	3
FON 141 Human Nutrition	
Life Sciences	23 24
Chemistry	8
CHM 113 General Chemistry and CHM 231 Elementary Organic Chemistry†	
Anatomy and Physiology	8
ZOL 201 Human Anatomy Physiology and ZOL 202 Human Anatomy Physiology	
Microbiology	4
MIC 201 Microbiology and MIC 202 Microbiology Laboratory	
Genetics	3 or 4
ZOL 241 Human Genetics or BIO 340 General Genetics†	
Statistics	
One statistics course (MAT 226, or PSY 230†, or SOC 390, or EDP 434) is required prior to enrolling in NUR 401 Nursing Research. It is not a prerequisite course requirement to the nursing major.	
*Students who have taken prerequisite courses more than ten years ago may be required to have the course content evaluated by the College of Nursing Baccalaureate Standards Committee to determine whether the courses are acceptable for meeting the particular prerequisite course requirements.	
†Courses which are listed as having prerequisites	
Nursing Major—Upper Division Nursing Program	
Admission to the nursing major involves a	

process separate from admission to Arizona State University and from admission to the pre nursing major. Applicants are responsible for initiating the application procedure and for submitting the required application documents by the prescribed deadlines. The minimum qualification requirements and the application documents and procedures are described in the following sections.

Admission Requirements. Admission requirements to the upper division nursing program are:

1. Admission in good standing to Arizona State University;
2. Completion of all prescribed prerequisite courses with a grade of "C" or better in each course;
3. Attainment of a cumulative grade point average of 2.50 in the prescribed prerequisite courses for in-state applicants and a cumulative grade point average of 2.75 in the prescribed prerequisite courses for out of state applicants. The domicile status which will be considered will be that which has been designated by the Classification Officer on Tuition Status at the time of filing of application to the nursing major.
4. Submission of application documents to the Baccalaureate Program Departmental Office, College of Nursing.

Application Procedures

1. Deadlines
 - a. Applications to the nursing major for the Fall semester must be submitted by January 30 of the same calendar year.
 - b. Applications to the nursing major for the Spring semester must be submitted by May 30 of the preceding year.

Applications may be submitted on the basis of the completion of three semesters preparatory work in order to meet the stated deadline and to receive provisional admission to the nursing major.

2. Documents

The following documents must be on file in the Baccalaureate Program Office, College of Nursing, in order for a student to be considered for provisional admission to the nursing major:

- a. Certificate of Admission to Arizona State University *or* status as a continuing student.
- b. Application to the upper division nursing program (F 86A). Obtain form in the Baccalaureate Program Office, College of Nursing.
- c. *Official* transcripts of completed work.
- d. College of Nursing Health History Inventory (F 86B) and Record of Physical Examination (F 86C) completed prior to and within three months of the date of filing of application. (Both forms available in the Baccalaureate Program Office, College of Nursing.)
- e. Letter of interest and intent. The applicant should respond to the following questions:
 - (1) What are your reasons for pursuing nursing at this university?
 - (2) What attributes do you possess which you feel would contribute to your success as a nurse?
 - (3) What are your long range goals or objectives for a career in nursing?

Selection and Notification of Admission. The Baccalaureate Standards Committee of

the College of Nursing will evaluate the application documents. The limited number of spaces available for each entering class will be awarded to those qualified applicants who have met the minimum criteria for admission to the nursing major *and* give evidence of the most reasonable prospect for success in the nursing major. Provisional admission to the nursing major will be *automatically* revoked if all prescribed prerequisite courses are not completed with the attainment of the required cumulative grade point average.

Applicants will be informed by June 1 (for Fall semester entrance) and December 15 (for Spring semester entrance) of their admission or non admission status to the nursing major.

Grading Policy for Required Nursing Courses in the Baccalaureate Program.

Grades of "A", "B", and "C" are assigned to reflect levels of achievement in terms of meeting the course objectives. The grades of "I", "E", and "W" are assigned in accordance with the Arizona State University grading system (see page 27 of this catalog). Students must re apply to the College of Nursing Baccalaureate Standards Committee for re admission to the nursing courses if a grade of "E" or "W" has been received in a required nursing course.

General Information

Accreditation. The baccalaureate and master's programs of the College of Nursing are accredited by the Arizona State Board of Nursing and the National League for Nursing. The College is a member of the Council of Member Agencies for the Baccalaureate and Higher Degree Programs of the National League for Nursing, and the Western Council on Higher Education for

Nursing. The College is also approved by the military services so that qualified students may apply for their student nurse programs.

Scholarships and Financial Aid. For information regarding scholarships and loans, see page 32 of this catalog. Information about loan funds for nursing students may be obtained from the Director of Financial Aids.

Academic Advisement. Students admitted to the pre nursing major are advised by the College of Nursing academic advisors. Students in the nursing major are advised by College of Nursing baccalaureate faculty. Students are encouraged to seek advisement in order to plan an appropriate program of study.

Student Activities. The nursing student is a member of the general student body of the University, and selects and participates in those campus activities which are of interest to him/her. Students are represented on University and College of Nursing committees.

Students enrolled in the College of Nursing, in the pre-nursing major as well as the nursing major, are eligible for membership in the Arizona Association of Student Nurses, the National Student Nurses Association, and ASASU. Students are represented in the Student Senate of ASASU.

Student Health. In addition to the health policies of the University, the applicant to the nursing major is responsible for submitting a College of Nursing Health History Inventory (Form F 86B) and a record of Physical Examination (Form F 86C) completed prior to and within three months of submission of application to the nursing major



(Form F-86A). The student enrolled in the nursing major (upper division nursing program) is responsible for fulfilling the requirements outlined in the current health policies of the College of Nursing, which is available from the College of Nursing Baccalaureate Program Office. All students enrolled in the nursing major must carry health and accident insurance as outlined in the current health policies of the College of Nursing.

Learning Resources. The College of Nursing offers learning resources which include the University's Hayden Library and the College of Nursing's multi-media indepen-

dent study laboratory. Additional learning experiences with patients and families are provided through federal, state, county and private health agencies under the supervision of qualified nursing faculty.

Student Transportation. Students will provide their own transportation to the health agencies and other selected experiences, such as home visits to patients and families.

Students taking 300- and 400-level courses as part of their approved graduate program must indicate the graduate credit option in the appropriate location on the Course Request Opscan form.

Nursing

Professors:

MURPHY (NURS 459), BRANSTETTER, JOHNSON, McLEOD, ROSE, TAYLOR

Associate Professors:

BRUNER, KASSELMAN, SEGALL, STEFFL, STUMPF, THEOBALD

Assistant Professors:

ABBOTT, BLEWETT, CHAFEY, ELLIS, FELLER, FINCH, LENDLE, LINDEMANN, LYON, MUHLENKAMP, PORTER, RICCI, RIEKE, SANTORA, SEHESTED, SHERIDAN, SPICER, STELLHORN, STENGEL, THIELE, TOBIASON, WURZELL, ZORNOW

Instructors:

BURKE, DAVIS, DEMPSTER, EDMUNDSON, FARGOTSTEIN, FOOTE, HENSON, HINDMAN, KURTH, LOCKHART, OSBORN, PERRY, RIPPKE, SANDLING, SHEA, STERNE, TETTING, VANDER LINDENS

Prerequisite course numbers marked with a dagger (†) have further prerequisites. Each student is required to take the indicated prerequisite courses.

NURSING

NUR 301 Professional Development I. Principles of management, change and learning provide a framework for the student to examine the process of professional development and factors influencing the nursing profession. Enrollment restricted to students admitted to the upper division nursing program. Credit, 2 hours.

302 Professional Development II. Role socialization, individual development, relations with other health professionals, and legal responsibilities as they relate to professional development. Prerequisites: NUR 301†, 310†, 320†. Credit, 2 hours.

310 Human Development and Adaptation I. Adaptation theories provide a framework to examine human behavior and the holistic nature of man. Focus on primary prevention for promotion of optimum health.

Enrollment restricted to students admitted to the upper division nursing program. Credit, 3 hours

311 Human Development and Adaptation II. Persons experiencing an acute disruption of health. Selected altered psychosocial and environmental factors are discussed. Prerequisite: NUR 301†, 310† 320†. Credit: 3 hours

320 Nursing I. Systematic approach to decisions on making provider framework to plan for own learning and nursing intervention. Clinical experience development skills in decision making instrumental and expressive functions of nursing. Prerequisite or concurrent: NUR 301†, 310†. Two lectures, 2 hours conference 9 hours laboratory. Credit 7 hours.

321 Nursing II. Systems approach to planning nursing care. Expressive and instrumental functions directed toward assisting patient to achieve health-related goals. Prerequisite or concurrent: NUR 302† 311†. One lecture 2 hours conference 12 hours laboratory. Credit 9 hours.

401 Nursing Research. Concepts underlying the research process. Significance of research within a profession. Prerequisite: NUR 302†, 311† 321†; and MAT 226† or PSY 230† or SOC 390†, or EDP 454. Credit, 2 hours

402 Leadership in Nursing. Contemporary issues that influence theoretical frameworks of organization management and change. Prerequisites: NUR 401† 410†, 420†. Credit, 4 hours

410 Human Development and Adaptation III. Adaptive responses of individuals and families to actual or potential stressors in life threatening and chronic disruptive states. Interaction of biopsychosocial and environmental stressors and adaptations. Prerequisite: NUR 302†, 311† 321†. Credit 3 hours.

420 Nursing III. Application of leadership decision making expressive and instrumental modes of intervention and human adaptation development in clinical situations involving life threatening and ongoing disruptive health. Prerequisite or concurrent: NUR 401†, 410†. Two lectures 15 hours laboratory. Credit 7 hours

421 Nursing IV. Applies theories of leadership in selected clinical settings. Prerequisite or concurrent: NUR 402†. Two hours conference, 18 hours laboratory. Credit 8 hours

494 Special Topics. Advanced study and/or supervised practice in an area of nursing: e.g. physical health assessment or issues in gerontology. Credit may be accumulated to 6 hours. Prerequisites: 12 hours in the nursing major and approval of instructor. Credit, 1 to 4 hours

498 Pro-Seminar. Small group study for advanced students within the major area. Prerequisite: 12 hours in the nursing major. Credit 1-7 hours.

499 Independent Study (Honors). Formulate and execute an independent study on a nursing care problem. Prerequisite: NUR 401† 410† 420† 3.40 GPA, application form #FL 38 completed eight weeks before beginning course. Credit 3 hours

500 Research Methods I. Investigative methods. Purposes, aims of research. Review of research in nursing. Credit 2 hours

500 Research Methods II. Research design and the scientific proposal development. Role of theory methods of data collection. Credit, 2 hours

580 Advanced Nursing Practicum I. Required concurrently with NUR 581. 2-4 hours laboratory. Credit 1 hour

580 Advanced Nursing Practicum II. Required concurrently with NUR 582. 2-4 hours laboratory. Credit 1 hour

581 Advanced Theory I. Ecological approach to health and illness. Emphasis on family competencies dynamics and available health care in the community. Concurrent practicum required (NUR 580). Prerequisite: approval of instructor. Credit 2 hours

582 Advanced Theory II. Theory related to individual and family coping and adaptive behavior in crisis. Long-term illness and disability principles of health assessment. Concurrent practicum required (NUR 580). Prerequisite: approval of instructor. Credit, 2 hours

599 Thesis. Credit, 1-6 hours (4 hours required)

680 Advanced Nursing Practicum III. To be taken concurrently with NUR 681. Credit 1-6 hours (2 hours required) See sections and subjects below

Section

- 1 Family-Child Nursing
- 2 Community Mental Health-Psychiatric Nursing
- 3 Medical Surgical Nursing
- 4 Community Health Nursing
- 5 Administration and Management of Nursing and Health Care

680 Advanced Nursing Practicum IV. To be taken concurrently with NUR 682. Credit, 1-6 hours (2 hours required) See sections, subjects listed under NUR 680 III

681 Advanced Theory III. Advanced specialized theory. See sections subjects listed under NUR 680-III. Prerequisite: NUR 581, 582. Genetics and approval of instructor. Credit 1-3 hours (1 hour required) Concurrent practicum (NUR 680)

682 Advanced Theory IV. Advanced specialized the-

ory. Includes area of special interest option. See subjects listed under NUR 680-III. Prerequisite: NUR 681 and approval of instructor. Credit 1-3 hours (1 hour required) Concurrent practicum (NUR 680)

691 Seminar. (A) Professional Role Development. Credit 2 hours. Prerequisite: NUR 581 and 582† and approval of instructor

Special Courses: NUR 590 591 592 598 680 684 691 (See pages 48-49)

HUMAN DEVELOPMENT

HDE 510 Origins of Human Behavior. Critical examination of theories, issues and research in the developmental period of infancy through adolescence. Biological, social, psychological and cognitive factors. Prerequisite: CDE 232† or equivalent. Credit 3 hours.

511 Development in Adulthood and Aging. Developmental changes in adulthood and aging. Biological, social, psychological influences related to adult roles, lifestyle, health status and problems of aging. Credit 3 hours

College of Fine Arts

HENRY A. BRUINSMA, PH.D.,
Dean

Purpose and Program

The College of Fine Arts functions within the general framework and philosophy of the University. In addition to providing services and courses in the General Studies program of the University, the College provides thorough professional training for properly qualified students, supported by a broad background of courses designed to prepare the student for responsible citizenship.

The College, through its programs in art, dance, music, communication, communication disorders, theatre, and the interdisciplinary humanities, reflects the wide range of challenges facing the communicative artist and scholar in the 20th century. As an integral part of a University with strong supporting departments, the College provides each student the philosophical foundation for his art, strengthened by the other scientific, behavioral, and humanistic disciplines fundamental to the forming of the contemporary creative artist and scholar.

In addition to the curricula offered by each department of the College, close ties are maintained with other colleges of the University through courses and curricula designed to meet the educational goals of those colleges. The College of Fine Arts also enriches the life of the University community through its extension and laboratory offerings with a broad variety of art exhibitions, the operation of the University Art Collections, the Boulton Collection of World Music and Musical Instruments, and several series of concerts and recitals, dramatic productions, musical theatre, lectures, and various diagnostic and clinical services.

Special Programs

Pass-Fail Courses. The College of Fine Arts does not accept Pass-Fail grades in fulfillment of requirements for any degree. In the case of transfer of Pass-Fail credits, the student may petition the College Standards Committee for exception. In such cases, appropriate official evaluative information must be attached in support of the petition. No course given in any department of the College of Fine Arts may be elected for Pass-Fail credit by any student of the University.

Transfer of Junior College Credits. Credits transferred from accredited junior or community colleges will be accepted up to a maximum of 64 semester hours. Additional credit may be accepted only upon authorization of the standards committee of the college in which the student is enrolled at Arizona State University. Junior college students planning to transfer to Arizona State University at the end of their first or second year should plan their junior college courses to meet the requirements of the curriculum selected. Students will be permitted to follow the degree requirements specified in the Arizona State University catalog in effect at the time they began their junior college work, providing their college attendance has been continuous.

Courses transferred from junior colleges will not be accepted as upper division credit at Arizona State University. Students are urged to choose their junior college courses carefully, in view of the fact that a minimum of 50 semester hours of work taken at the University must be upper division credits. It is therefore suggested that they elect General Studies courses and lower division courses in their major field while attending a junior college.

Religious Studies Program. Although religion oriented courses are offered in several departments of the University, the program of religious studies is offered through the Center for the Humanities.

A major in religious studies is not offered, but it is possible for a student to develop a related field program of religious studies, including 15 hours of credit in his major area, if religious studies are considered appropriately related to the major field of specialization. Courses in religious studies may also be elected to meet General Studies requirements in the Humanities and Fine Arts, or as free electives in those curricula where the hours are available. Students in the interdisciplinary Humanities degree program may select the field of religious studies as one of their primary fields of interest in the Humanities, up to a total of 21 credit hours.

Undergraduate Credit for Graduate Courses. To enable interested students to benefit as much as possible from their undergraduate studies, the Graduate College and the College of Fine Arts extend to seniors, with a grade point index of at least 2.50, the privilege of taking 500 level graduate courses for undergraduate credit. Application for admission to a graduate course for undergraduate credit must be completed in advance of the regular registration period. The application must be approved by the instructor of the class, the student's advisor, and by the chairman of the department in which the course is offered.

Honors Program. The Honors Program in the College of Fine Arts is intended for the outstandingly competent student whose interests and specific curriculum indicate that definite advantages may accrue from a pro-

gram emphasizing individual study. For details of the program in the College of Fine Arts, consult with the Coordinator of Advisement. For a general description of Honors work, see page 29 of this catalog.

Pre-Professional Programs. The College of Fine Arts offers, through its regular major degree programs, the opportunity to prepare for admission to graduate professional programs in law, medicine, dentistry and theology. Students seeking to follow a pre professional program should enroll in either a Bachelor of Arts or Bachelor of Science degree program. For special advisement and assistance in developing the appropriate program of study, students should consult with the Coordinator of Advisement in the College of Fine Arts office.

In addition, students preparing for admission to professional graduate schools should obtain information regarding admission requirements by writing directly to the schools in which they may be interested.

Secondary Education Programs. In cooperation with the College of Education, a student majoring in the College of Fine Arts may obtain a baccalaureate degree from the College of Fine Arts and meet the requirements for a secondary education certificate. The student must meet all the requirements established by the College of Education, including professional education courses and directed teaching, and all the College and departmental requirements for the major degree program in the College of Fine Arts.

Students intending to prepare for a teaching certificate within the College of Fine Arts curricula should indicate this to the office of teacher certification in the College of Education by the end of the sophomore year.

Degrees

Bachelor's Degrees. The College of Fine Arts offers work leading to four baccalaureate degrees: Bachelor of Arts, Bachelor of Science, Bachelor of Fine Arts, and Bachelor of Music. In general, the distinctions among these curricula lie in the degree of specialization permitted in the major field, with the Bachelor of Arts degree providing a broader humanistic program, and the other three placing greater emphasis upon the major field while maintaining the principle of General Studies required of all University students. In cooperation with the College of Education, each department of the College of Fine Arts also offers major and minor programs designed to provide teachers of art, music, speech, theatre, and humanities for the public schools.

Bachelor's degrees are offered in the following fields:

Bachelor of Arts:

- Art
- Art History
- Communication
- Humanities (Interdisciplinary)
- Music
- Theatre

Bachelor of Science:

- Art (Ceramics, Crafts, Graphic Design)
- Communication Disorders
- Communication

Bachelor of Music:

- Choral Music
- General Music
- Instrumental Music
- Jazz Performance
- Music Theatre

Music Therapy
 Performance (Accompanying, Key
 board, Orchestral Instrument, Voice)
 Theory and Composition

Bachelor of Fine Arts:

Ceramics
 Crafts
 Dance
 Drawing
 Graphic Design
 Interior Design
 Painting
 Photography
 Printmaking
 Sculpture
 Theatre (Child Drama, Directing)

Bachelor of Arts in Education.
 (in cooperation with the College of Educa-
 tion) offered in the fields of art, commu-
 nication arts, dance, humanities, music,
 speech communication, theatre.

Master's Degrees. A graduate program
 consisting of a minimum of 30 semester
 hours of approved work leads to a master's
 degree in the following fields:

Master of Arts:

Art Education
 Art History
 Communication
 Humanities (Interdisciplinary)
 Music History and Literature
 Theatre

Master of Fine Arts:

Ceramics
 Crafts
 Drawing
 Interior Design

Painting
 Photography
 Printmaking
 Sculpture

Master of Music:

Choral Music
 Composition
 Conducting
 General Music
 Instrumental Music
 Music Theatre
 Performance
 Performance Pedagogy
 Theory

Master of Science:

Communication Disorders

Master of Arts in Education.

(in cooperation with the College of
 Education)

Art Education
 Communication
 Music Education
 Theatre

Doctoral Degrees: In cooperation with the
 College of Education, the doctoral programs
 in Education are offered with majors in Art
 Education, Music Education, and Human-
 ities Education.

Bachelor Degree Requirement

General Degree Requirements. There
 are requirements that pertain to each bac-
 calaureate degree program in the College of
 Fine Arts.

GENERAL STUDIES REQUIREMENTS: To meet
 the General Studies requirement, students
 in the Bachelor of Arts and the Bachelor of

Science degree programs must take a min-
 imum of 54 semester hours of credit in Gen-
 eral Studies. Students in the Bachelor of
 Fine Arts and Bachelor of Music degree
 programs must meet the University min-
 imum requirement of 36 hours of credit in
 General Studies. In addition, students must
 meet the University requirement of the
 equivalent of two semesters of English com-
 position. At least 8 hours of course work
 must be taken in each of the areas of hu-
 manities and fine arts, social and behavioral
 sciences, and science and mathematics. For
 modification of above requirements for pro-
 grams in communication and theatre, see
 pages 258-259. Courses in the field of spe-
 cialization may not be used to meet the
 General Studies requirement, but courses
 included in related fields normally consid-
 ered as part of the major may be included.
 See page 30 for complete description of the
 University General Studies program

GRADUATION REQUIREMENTS: At least 126
 semester hours and a cumulative scholar-
 ship index of 2.00 are required for gradua-
 tion. (See exception to this grade point
 requirement in the Humanities, Communi-
 cation Disorders, and the BFA Theatre
 curriculum).

UPPER DIVISION COURSES. Of the total of
 126 hours required for graduation, at least
 50 credit hours must consist of upper di-
 vision courses. No credit will be granted
 toward fulfilling major requirements in
 any upper division course in the student's
 major unless the grade in that course is at
 least a "C".

Specific Degree Requirements. In addi-
 tion to the above general degree require-
 ments, each of the degree programs offered
 in the College of Fine Arts has specific
 requirements.

BACHELOR OF ARTS DEGREE: The curriculum for the degree Bachelor of Arts is designed to give the student a broad, general background in the principal fields of human knowledge and a reasonable amount of specialized training in a selected area. This degree is offered in the fields of Art, Communication, Humanities, Music and Theatre. At least 18 semester hours of credit in the major field must be in upper division courses.

Major Requirements The major consists of at least 45 semester hours of credit. Normally, not more than 30 semester hours will be taken in the field of specialization and approximately 15 semester hours in one or more related fields. The exact content of the major is selected by the student in consultation with his/her advisor under the rules and regulations of the department concerned.

General Studies Requirement In the field of science and mathematics, the student must elect at least one course in a laboratory science.

Foreign Language Requirement Knowledge in one foreign language equivalent to the level obtained through 16 hours of instruction is required. This requirement may be fulfilled in whole or in part through language instruction in secondary schools or by other means. If acquired in secondary school, two years of instruction in one foreign language will be considered the equivalent of one year of instruction on the college level. Students who transfer from other colleges with less than two years of credit in a foreign language will be placed in a course at the next level above the work completed. Majors in Communication and Theatre should consult their advisor on modification of the foreign language requirement.

BACHELOR OF SCIENCE DEGREE: The curriculum for the degree Bachelor of Science is designed to give the student a broad, general background in the principal fields of human knowledge and an opportunity to specialize in one specific selected area. This degree is offered with majors in Art, Communication Disorders, and Communication.

Major Requirements The major consists of from 45 to 55 semester hours of credit. The content of the major is selected by the student in consultation with his/her advisor under the rules and regulations of the department concerned.

General Studies Requirements In the field of sciences and mathematics the student must elect at least one course in the physical sciences, one course in the life sciences, and one course in mathematics. One of these courses must be a laboratory science.

BACHELOR OF FINE ARTS DEGREE: The curriculum for the degree Bachelor of Fine Arts is designed to meet the needs of the student with specific professional interest in creative performance in a specialized field of the arts, while providing a broad, general background in the principal fields of human knowledge. This degree is offered in the fields of Art, Theatre, and is also available with a major in Dance through the Department of Health, Physical Education and Recreation. Students enrolled in the Dance major will register in the College of Fine Arts.

Major Requirements A major in one of the areas of Art consists of 75 semester hours of credit, divided between the core curriculum and the area of specialization. A major in Theatre requires 84 hours. The major in Dance consists of a minimum of 70 semes-

ter hours of course work in Dance and related fields. See pages 89-90 of the catalog for detailed requirements in the Dance program.

General Studies Requirement In the field of sciences and mathematics the student must take at least one course in a laboratory science.

BACHELOR OF MUSIC DEGREE: The curriculum for the degree Bachelor of Music is designed to give the student a broad general background in the principal fields of human knowledge and training of a professional caliber in music performance, music theory, music theatre, jazz, composition, music therapy, and the teaching of choral music, general music, and instrumental music.

Placement tests in theory, piano and a major performing medium are required of all freshmen and transfer students.

Major Requirements The major consists of 84 semester hours of credit in music. The content of the major is selected by the student in consultation with his/her advisor under the rules and regulations of the Department of Music.

Foreign Language Requirement Students specializing in Voice Performance must earn 16 semester hours of credit in more than one foreign language, chosen from French, German, or Italian. A student may elect one year of one language and either one or two semesters of the other(s), chosen in conference with the advisor. For other means by which the student can meet this requirement see the statement above pertaining to foreign languages in the Bachelor of Arts degree program.

There is no foreign language requirement in any other major leading to the Bachelor of Music degree.

Art

Professors:

BRECKENRIDGE, BROADLEY F NK GOO,
GR GSBY, HALE JACOBSON L NDERMAN,
SCHAUMBURG TAYLOR TURK, WAGNER
WOOD

Associate Professors:

WATSON (ART 102), HAHN REZN KOFF
STULER WOODS

Assistant Professors:

COHODAS, DEMATTIES FARNES
GASOWSK GULLY JAY KRONENGOLD
KUNZ, SCHM DT, SHIPP SM TH-BRUNET
VARNBUHLER, WESTIN ZIMMERMAN

Instructors:

ANTON E ECKERT, G LL NGWATER P LE
PIMENTEL ROD

Departmental Major Requirements

For advisement purposes, all students registering in an art major program will enroll through the College of Fine Arts. Special advisement check sheets are available for each degree program in the Department of Art office.

Bachelor of Arts Degree Curriculum

ART Consists of 45 semester hours of credit, with a concentration of at least 9 hours in one area of specialization, and at least 15 hours in a closely related field(s) to be approved by the advisor in consultation with the student. Courses ART 111, 141, 142, 223, ARH 101 and 102 are required. At least 18 semester hours must be in upper division courses.

ART HISTORY Consists of 45 semester hours of credit, no less than 27 of which shall be in art history. A minimum of 18 hours shall be in an approved related field(s). At least 18 hours in art history must be in upper division courses, including at least one ARH 498 Pro Seminar. The areas Ancient, Medieval, Renaissance and Modern must each be represented with at least one course. Satisfactory completion of ARA 459, Methodology and Bibliography, is required of art history majors before the senior year. Required courses are ARH 101 and 102; ARA 456; ART 111 and 141 with at least one additional course chosen from ART 214, 223, 231, 291 or 351.

Bachelor of Science Degree Curriculum

ART Consists of 50 semester hours of credit, with a concentration of at least 15 hours in one area of specialization to be approved by the advisor in consultation with the student. Areas for specialization are: ceramics, crafts, and graphic design. Courses ART 111, 141, 214, 223; ARH 101 and 102 are required. At least 20 semester hours must be in upper division courses.

Bachelor of Fine Arts Degree Curriculum

ART Consists of 75 semester hours of credit, with a concentration in one area of specialization selected on the basis of the student's interests and professional intentions. The following areas of specialization are available to the student: ceramics, crafts, drawing, graphic design, interior design, painting, photography, printmaking and sculpture.

A core curriculum for the degree shall

include courses in the following areas of study: design fundamentals (6 credit hours), drawing (6 hours), painting (3 hours), sculpture (3 hours), ceramics or crafts (3 hours), and art history (12 hours). These requirements are normally met by courses ART 111, 141, 142, 214, 223, 231, 261 or 271, ARH 101, 102, and six hours of upper division art history electives.

In addition to the core curriculum, the student will select a minimum of 42 credit hours in consultation with his advisor. At least 30 upper division credit hours must be earned within the major, including at least 12 upper division hours in the area of specialization. Courses from other departments may apply to the major, as in graphic design or interior design, when it is determined they make a special contribution to the student's program of study.

**Departmental Major Teaching Field Requirements
Bachelor of Arts in Education
Degree Curriculum**

ART Consists of 60 semester hours of credit in art. Courses ART 111, 141, 142, 214, 223, 231, 261, 271; ARH 101, 102; ARE 301 or 302, 412, 425 and 480 are required. Additional hours to complete the major are to be approved by the advisor in consultation with the student. At least 24 semester hours must be in upper division courses, one of which must be in art history.

Departmental Minor Teaching Field Requirements

ELEMENTARY EDUCATION MAJOR, MINOR IN ART Consists of 24 semester hours including ART 141; ARE 301 and 420 which are

required. The remaining 15 semester hours are to be selected in consultation with an art education advisor.

SECONDARY EDUCATION MAJOR; MINOR IN ART—Consists of 24 semester hours including ART 141, ARE 412, 425 and 480 which are required. The remaining 12 semester hours are to be selected in consultation with an art education advisor.

SECONDARY EDUCATION MAJOR; MINOR IN PHOTOGRAPHY—Consists of 24 semester hours including ART 141, 291, 391, 392, 492; ARH 460; ARE 480; and one additional course chosen from ART 393, 394, 491 or 493.

Departmental Graduate Programs

The Department of Art offers programs leading to the degree of Master of Arts with a major in art education or art history, and the Master of Fine Arts degree with a major in ceramics, crafts, drawing, interior design, painting, photography, printmaking, or sculpture. In cooperation with the College of Education, the degrees of Master of Arts in Education and Doctor of Education are offered with a major in art education. Consult the Graduate College catalog for requirements for all graduate degrees.

Students taking 300- and 400-level courses as part of their approved graduate program must indicate the graduate credit option in the appropriate location on the Course Request Opscan form.

ART FOUNDATIONS

ART 111 Beginning Drawing 1. Fundamental technical and perceptual skills using common drawing media and their application to pictorial organization. Directed toward the student with no previous college art experience. Six hours a week. Credit, 3 hours.

141 Introduction to Studio Art I. Two-dimensional media, visual organization, and contemporary art concepts. Development of perceptual, imaginative, and expressive responses through problem solving, discussion, and critical evaluation. Emphasis on individual creative solutions. Six hours a week. Credit, 3 hours.

142 Introduction to Studio Art II. Continued development of intellectual and intuitive responses to form in time and space. Constructions, assemblage, kinetics, serial imagery, events or theater pieces, as approaches to three- and four-dimensional concepts. Prerequisite: ART 141. Six hours a week. Credit, 3 hours.

CERAMICS

ART 261 Beginning Ceramics I. Nature of clay and glazes, hand-forming methods, throwing on the wheel, decorative processes, glaze application. Prerequisite: ART 141. Six hours a week. Credit, 3 hours.

262 Beginning Ceramics II. Design analysis and production of functional pottery. Emphasis on throwing techniques, surface enrichment and glaze application. Prerequisites: ART 142 and 261. Six hours a week. Credit, 3 hours.

361 Intermediate Ceramics I. Search for form and personal expression through clay. Emphasis on hand building techniques. Kiln firing and related problems. Prerequisite: ART 262. Six hours a week. Credit, 3 hours.

362 Intermediate Ceramics II. Continued exploration for form and personal expression through clay. Glaze formulation with experimentation in the use of glaze materials and colorants. Prerequisites: ART 361 and approval of instructor. Six hours a week. Credit, 3 hours.

461 Advanced Ceramics I. Studio problems and instruction adapted to meet individual needs. Emphasis on search for personal direction. Professional methods of presentation and documentation of work. Prerequisites: ART 362 and approval of instructor. Six hours a week. Credit, 3 hours.

462 Advanced Ceramics II. Continued studio problems with emphasis on individual research and expression through clay. May be repeated for credit. Prerequisites: ART 461 and approval of instructor. Six hours a week. Credit, 3 hours.

CRAFTS

ART 271 Introduction to Crafts. Studio survey of contemporary crafts. Assigned problems in a variety of media, including fabric, fiber, metal, wood and plas-

tics. Stress on the development of professional disciplines and attitudes. Prerequisite: ART 141. Six hours a week. Credit, 3 hours.

272 Beginning Jewelry. Design and execution of soldered, cast, and forged jewelry. Emphasis on original, contemporary statements. Prerequisite: ART 271. Six hours a week. Credit, 3 hours.

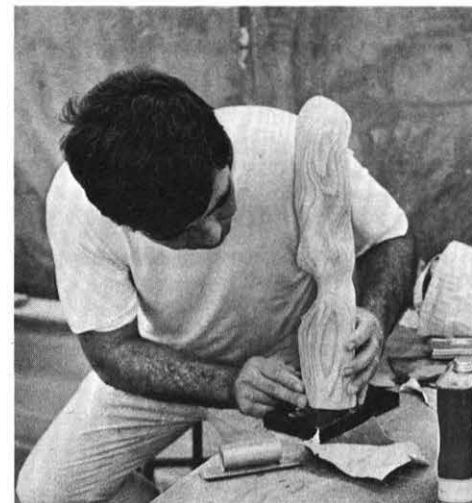
273 Beginning Textiles. Textile arts with extensive studio experience in a variety of applied and structural processes using fabrics and fibers. Prerequisite: ART 271. Six hours a week. Credit, 3 hours.

372 Jewelry and Metalworking. Individual projects in metalworking. Development of professional skills and diversity of expression. Raising, casting, forging, and enameling techniques are used singly and in combination. Prerequisite: ART 272. Six hours a week. Credit, 3 hours.

373 Intermediate Textiles. Continuing investigation of textile processes, centered on professional development. Prerequisite: ART 273. Six hours a week. Credit, 3 hours.

374 Wood. Basic woodworking techniques as applied to creative expression. Prerequisite: ART 271. Six hours a week. Credit, 3 hours.

375 Plastics. Exploratory studio in fabricating and forming processes. Contemporary use of plastics as an art form. Prerequisite: approval of instructor. Six hours a week. Credit, 3 hours.



472 Advanced Jewelry. Development and execution of advanced problems emphasizing experimental elements in jewelry making. May be repeated for credit. Prerequisites: ART 372 and approval of instructor. Six hours a week. Credit: 3 hours.

473 Advanced Textiles. Problems in textile design allowing the student to combine and explore at his own initiative. Stress on clarity of expression and execution. May be repeated for credit. Prerequisites: ART 373 and approval of instructor. Six hours a week. Credit: 3 hours.

474 Advanced Wood. Exposition of advanced techniques including design and construction of furniture and musical instruments. May be repeated for credit. Prerequisites: ART 374 and approval of instructor. Six hours a week. Credit: 3 hours.

475 Advanced Plastics. Advanced techniques in plastics emphasizing investigative and experimental approaches. May be repeated for credit. Prerequisites: ART 375 and approval of instructor. Six hours a week. Credit: 3 hours.

DRAWING

ART 211 Beginning Drawing II. Continued development of technical and perceptual skills beyond foundations course ART 111. Prerequisite: ART 111. Six hours a week. Credit: 3 hours.

214 Beginning Life Drawing. Development of skill and expressiveness in drawing the basic form, construction and gesture from the human figure. Prerequisite: ART 111. Six hours a week. Credit: 3 hours.

311 Intermediate Drawing. Emphasis on composition, exploration of drawing media. Prerequisite: ART 211. Six hours a week. Credit: 3 hours.

314 Intermediate Life Drawing I. Drawing from the model with greater reference to anatomical, graphic and compositional concerns. Prerequisite: ART 214. Six hours a week. Credit: 3 hours.

315 Intermediate Life Drawing II. The human figure as the subject for drawing. Emphasis on conceptual alternatives and management of materials. Prerequisite: ART 314. Six hours a week. Credit: 3 hours.

411 Advanced Drawing. Visual and intellectual concepts through problem solving and independent study. Emphasis on the individual creative statement. May be repeated for credit. Prerequisite: ART 311 and approval of the instructor. Six hours a week. Credit: 3 hours.

412 Drawing Techniques of the Old Masters. Historical techniques of drawing from early Renaissance to the present. The making and use of materials and

tools including silverpoint, bistre, ink, quill pen, pastes and chiaroscuro drawings, as used by Michelangelo, Rembrandt, Tintoretto and other masters. May be repeated for credit. Prerequisite: approval of instructor. Six hours a week. Credit: 3 hours.

414 Advanced Life Drawing. Various media and techniques on an advanced level. The human figure as an expressive vehicle in various contexts. Encouragement of innovative approaches. May be repeated for credit. Prerequisite: ART 315. Six hours a week. Credit: 3 hours.

GRAPHIC DESIGN

ART 180 Lettering and Typography I. The basics of letter forms and type indicated on using a variety of tools. Historical development of the Roman alphabet, technical aspects of typography and creative use of type in graphic design. Recommended prerequisites: ART 111 and 141. May be taken concurrently with 181. Six hours a week. Credit: 3 hours.

181 Introduction to Graphic Design I. Emphasis on layout and creative solutions to problems of visual communication. Basic skills and facility with professional tools. Problems of advertising and other areas of graphic design. Production methods. Prerequisites: ART 111, 141, and 180 which may be taken concurrently. Credit: 3 hours.

280 Lettering and Typography II. Advanced use of type and letter forms in graphic design. The creative use of existing letters in typographic form and design of letters for specific uses such as logos and trademarks. Prerequisites: ART 180 and 181. Six hours a week. Credit: 3 hours.

281 Introduction to Graphic Design II. Continuation of problems and development of skills introduced in ART 180 and 181. Prerequisites: ART 180 and 181. May be taken concurrently with 280. Six hours a week. Credit: 3 hours.

282 Illustration I. Media and methods of contemporary graphic illustration. Problems requiring creative graphic solutions. Prerequisites: ART 180 and 181. ART 223 recommended. May be taken concurrently with 281. Six hours a week. Credit: 3 hours.

381 Advanced Graphic Design. Continuation of ART 281. Prerequisites: ART 280 and 281. Six hours a week. Credit: 3 hours.

382 Illustration II. Continuation of problems and development of skills introduced in ART 282. Prerequisites: ART 281 and 282. Six hours a week. Credit: 3 hours.

383 Advertising Production Processes. Preparation

of art for printing, pasteups and mechanical color separation overalls, methods of specification, and printing processes. Prerequisites: ART 280 and 281. Six hours a week. Credit: 3 hours.

481 Portfolio Preparation. Emphasis on a professional orientation to graphic design. Prerequisites: ART 381, and 382. May be repeated for credit. Six hours a week. Credit: 3 hours.

INTERIOR DESIGN

ART 241 Space Design. Development of functional and esthetic structures. Emphasis on analysis and articulation of space relationships. Six hours a week. Credit: 3 hours.

243 Interior Design. Principles and techniques of environmental design, with regard to historical and the current concepts. Space defining elements as they relate to consumer needs. Design process including documentation of research as well as complete presentations. Six hours a week. Credit: 3 hours.

244 Design Communication. Visualization of design ideas through mechanical drawing. Mutual-view, parallel and perspective drawing techniques studied as prelude to complete contract documents and basic principles of rendering. Prerequisite: ART 111 recommended. Six hours a week. Credit: 3 hours.

245 Environmental Simulation. Development of skills in perspective rendering techniques. Small and large scale three-dimensional constructions explored in conjunction with photographic media as simulators of environmental spaces. Prerequisite: ART 111. Six hours a week. Credit: 3 hours.

341 Exhibition Design I. Design and construction of exhibition and display units. Prerequisite: ART 241 and 244, or approval of instructor. Six hours a week. Credit: 3 hours.

345 Design Workshop. Principles in design and construction of furniture. Prerequisite: ART 244. Six hours a week. Credit: 3 hours.

346 Building Technology. Concepts of structures, construction methods, mechanical systems, lighting and plumbing with respect to the economic feasibility and climatic responsiveness. Current and experimental structures are built and analyzed. Prerequisite: ART 244. Six hours a week. Credit: 3 hours.

347 Color Lighting Workshop. Color sensitivity through research into the interaction of color as light and surface. Visual phenomena, color space relationships and psychological awareness. Prerequisite: ART 243. Six hours a week. Credit: 3 hours.

441 Exhibition Design II. Design and construction of

temporary reusable enclosures; exhibitions planned for existing locations. Environmental factors in relation to exhibition spaces. May be repeated for credit. Prerequisites: ART 341 and 347 or approval of instructor. Six hours a week. Credit: 3 hours.

443 Advanced Interior Design I. Further development and refinement of skills for solving environmental design problems. Prerequisites: ART 243, 244, 245, 346 and PGS 306. Six hours a week. Credit: 3 hours.

444 Advanced Interior Design II. Further study of interior spaces as they enhance human behavior. Refinement of design concepts and skills through study of building types. Prerequisite: ART 443 or approval of instructor. Six hours a week. Credit: 3 hours.

445 Contemporary Furniture. Further development of furniture design concepts, material exploration, and construction. May be repeated for credit. Prerequisite: ART 345 or approval of instructor. Six hours a week. Credit: 3 hours.

447 Design Special Studies. Allows the student to pursue personal interests in the field of interior design; highlighting furniture design, community service projects or general research. Prerequisites: ART 444 or approval of instructor. Six hours a week. Credit: 3 hours.

448 Professional Workshop. General business procedures including types of business and trade contracts, major design trade sources and resource finding systems. Field trips to regional trade markets, senior portfolio and interviews with potential employers in the design field are required. Prerequisite: approval of instructor. Six hours a week. Credit: 3 hours.

449 Professional Practice. Experience in working with clients under the supervision of professional designers and advisors. Applications must be made the preceding semester. Prerequisites: ART 444, 448 and approval of instructor. Six hours a week. Credit: 3 hours.

PAINTING

ART 223 Beginning Painting. Composition, color and technical mastery of painting media. Prerequisites: ART 111, 141 and 214. Six hours a week. Credit: 3 hours.

227 Beginning Watercolor. Painting in a water soluble media. Emphasis on techniques, composition and color. Prerequisites: ART 111, 141 and 214. Six hours a week. Credit: 3 hours.

323 Intermediate Painting I. Advanced problems in painting. Prerequisite: ART 223. Six hours a week. Credit: 3 hours.

324 Intermediate Painting II. Continuation of ART 323. Advanced problems directed toward development of a personal style. Prerequisite: ART 323. Six hours a week. Credit: 3 hours.

325 Figure Painting. The human figure clothed and nude as the subject for painting in selected media. Prerequisites: ART 314, 323. Six hours a week. Credit: 3 hours.

327 Intermediate Watercolor. Experiments using a variety of surfaces, a combination of media and material in a continued search for creative form. Prerequisite: ART 227. Six hours a week. Credit: 3 hours.

421 Painting Mediums and Techniques. Acquaints student with materials and a variety of painting. Experimental problems in traditional and modern synthetic media. Prerequisite: approval of instructor. Six hours a week. Credit: 3 hours.

423 Advanced Painting. Problems for those with a serious interest in painting. May be repeated for credit. Prerequisite: ART 324. Six hours a week. Credit: 3 hours.

425 Advanced Figure Painting. Continued use of the human figure in various environmental and conceptual situations. May be repeated for credit. Prerequisites: ART 315, 324 or 325. Six hours a week. Credit: 3 hours.

427 Advanced Watercolor. Experimentation toward a more personal expression. May be repeated for credit. Prerequisite: ART 327. Six hours a week. Credit: 3 hours.

PHOTOGRAPHY

ART 291 Beginning Photographic Art. Photography as an art medium. Prerequisite: ART 141. Two lectures, 3 hours laboratory. Credit: 3 hours.

391 Intermediate Photographic Art. Development of the disciplines and attitudes of the creative artist photographer. Prerequisites: ART 291; and approval of instructor. Six hours a week. Credit: 3 hours.

392 Advanced Photography. Interpretation and manipulation of light as a tool in the performance of expressive photography. Prerequisites: ART 391 and approval of instructor. Six hours a week. Credit: 3 hours.

393 Photographics. Innovative photographic techniques. Experimentation outside the bounds of traditional photography. Prerequisites: ART 392 and approval of instructor. Six hours a week. Credit: 3 hours.

394 Photography Workshop. Development of perceptual awareness. Construction of visual imagery, expressed

in a photograph with possible uses of relating personal ideas to photographic form. Prerequisites: ART 392 and approval of instructor. Six hours a week. Credit: 3 hours.

491 Black and White Photography. Advanced exploration of experimental, interpretive and straight photography. May be repeated for credit. Prerequisites: ART 392 and approval of instructor. Six hours a week. Credit: 3 hours.

492 Introduction to Color Photography. Application of color transparencies and prints to photographic art. Prerequisites: ART 392 and approval of instructor. Six hours a week. Credit: 3 hours.

493 Advanced Color Photography. Intensive use of subtractive color process in photographic printing. Prerequisites: ART 492 and approval of instructor. May be repeated for credit. Six hours a week. Credit: 3 hours.

496 Cinematography. Exploratory laboratory course, basic aspects of filmmaking as an art form. Cinematic techniques in relation to basic art foundation. May be repeated for credit. Prerequisite: ART 392. Six hours a week. Credit: 3 hours.

497 Photographic Presentation and Exhibition. Care of photographic prints, emphasizing archival processing, print presentation, and exhibition of the print in a gallery situation. Prerequisite: ART 392 and approval of instructor. May be repeated once for credit. Six hours a week. Credit: 3 hours.

595 Directed Experiences in Photographic Education. Maintaining a photographic laboratory and teaching photographic student courses. May be repeated once for credit. Prerequisites: ART 491 and admittance to the MFA program. Credit: 3 hours.

PRINTMAKING

ART 351 Beginning Intaglio. Traditional concepts and techniques for black and white prints including drypoint, mezzotint, etching, engraving, aquatint, sugar lift, soft ground, and contemporary approaches. Use and care of intaglio press, acids, hand tools, solvents, inks, paper and prints for studio safety and etiquette. Prerequisite: approval of instructor. Six hours a week. Credit: 3 hours.

352 Lithography. Process using tone plates and incorporated drawings, transfer, photo transfer and color techniques. Prerequisite: approval of instructor. Six hours a week. Credit: 3 hours.

353 Relief Printmaking. Process using wood, metal, linocut, and other relief techniques. Prerequisite:

approval of instructor. Six hours a week. Credit 3 hours.

354 Serigraphy. Process using silk screen. Various methods and applications are used including the photograph, stencil, and transfer techniques. Prerequisite: approval of instructor. Six hours a week. Credit 3 hours.

355 Photo Process for Printmaking. Introduction to photograph principles and skills to conceive and develop transparencies for photo-mechanical printmaking processes including photo silkscreen, photo litho and photo etching. Prerequisite: approval of instructor. Six hours a week. Credit 3 hours.

451 Advanced Intaglio. Development of single and multiple color prints including stencil, alla poupe and viscosity methods of color application. Implications of color palette and roller relationships. Photo mechanical etching process for zinc, copper, brass, aluminum, and magnesium. Prerequisite: approval of instructor. Six hours a week. Credit 3 hours.

452 Advanced Lithography. Continuation of ART 352. May be repeated for credit. Prerequisite: approval of instructor. Six hours a week. Credit, 3 hours.

453 Advanced Relief Printmaking. Continuation of ART 353. May be repeated for credit. Prerequisite: approval of instructor. Six hours a week. Credit 3 hours.

454 Advanced Serigraphy. Continuation of ART 354. May be repeated for credit. Prerequisite: approval of instructor. Six hours a week. Credit 3 hours.

SCULPTURE

ART 231 Beginning Sculpture. Exploration and expression of sculptural form through ideas and concepts related to basic materials. Emphasis on form relationships, volume, movement and space. Introduction to the means of sculpture: studio safety. Prerequisites: ART 111 and 141. Six hours a week. Credit 3 hours.

331 Intermediate Sculpture. Continued search for form and personal expression through a media with emphasis on design and individual instruction. Prerequisite: ART 231. Six hours a week. Credit 3 hours.

332 Advanced Sculpture. Sculptural problems related to architecture and man's environment. Exploration in media. Color relationships as applied to sculpture. Prerequisite: ART 331. Six hours a week. Credit 3 hours.

431 Special Problems in Sculpture. Development of a personal approach to sculpture. Emphasis on form

individual problems and related color technology. Professional practices and presentation. May be repeated for credit. Prerequisite: ART 332. Six hours a week. Credit 3 hours.

432 Experimental Sculpture. Extending the awareness of man's total environment as resource for images and ideas for any art form. Experimentation in nontraditional methods. Use of natural and synthetic materials interrelating disciplines (e.g., photography, painting). May be repeated for credit. Prerequisite: ART 332 or approval of instructor. Six hours a week. Credit 3 hours.

433 Materials and Techniques in Sculpture. Broad approach to form material relationship in sculpture. Use of natural and synthetic materials and atmospheric, kinetic, audio and electronic art forms. May be repeated for credit. Prerequisite: ART 332. Six hours a week. Credit, 3 hours.

434 Figure Sculpture. The human form as a means of contemporary expression in sculpture. Freedom toward an innovative anatomical reconstruction of the figure leading to a personal statement. May be repeated for credit. Prerequisite: ART 332. Six hours a week. Credit 3 hours.

435 Color in Sculpture. Creative conceptual and esthetic development in color-form context relationships. A merging of inherent colors of materials to the application of colors through synthetic and industrial technology. Understanding psychological visual impact of color to achieve personal expression. May be repeated for credit. Prerequisite: ART 332. Six hours a week. Credit 3 hours.

436 Architectural Sculpture. Sculptural concepts as related to architecture and other man-made environments. Sculpture problems and solutions to defined architectural spaces; individual creative approach. Scale drawing and models and full-scale free standing and relief sculpture for walls and facade. May be repeated for credit. Prerequisite: ART 332 or approval of instructor. Six hours a week. Credit, 3 hours.

SPECIAL STUDIO COURSES

ART 521 Studio Problems. Advanced study in the fields of ceramics, crafts, drawing, interior design, painting, photography, printmaking and sculpture. May be repeated for credit. Six or 12 hours a week. Credit 3 or 6 hours.

500 M.F.A. Exhibition. Studio work in preparation for required M.F.A. exhibition. Public exhibition to be approved by the student's supervisory committee and must be accompanied by a final oral examination.

Selected materials from the exhibition may be retained by the University on indefinite loan. Documentation may be required. Prerequisite: approval of the student's supervisory committee. Credit, 15 hours.

Special Courses: ART 494, 498, 499, 590, 591, 592, 594, 598, 599. (See pages 48-49.)

ART EDUCATION

ARE 301, 302 Art in the Elementary School. Self understanding through the use of art concurrent with the study of the art work of children of all ages from early childhood to mid adolescence. One lecture, 4 hours laboratory. Credit 3 hours each semester.

412 Art Curriculum and Supervision. Theory materials organization methods and curriculum for the art educator or consultant; art educator's responsibility in human relations and communications. Required of all art education majors. Prerequisite: ARE 480 or concurrently. Credit, 3 hours.

420 Crafts for the Elementary School Teacher. Practical laboratory experiences stressing a variety of media that children can use. Emphasis on three-dimensional activities suitable for classroom teaching. One lecture, 4 hours laboratory. Credit, 3 hours.

425 Crafts in the High School. Teaching contemporary crafts in the secondary school. Alternate teaching strategies, survey of materials, tools and procedures applicable to today's high school crafts programs. Prerequisites: ARE 480 and 412, or concurrently. One lecture, 4 hours laboratory. Credit 3 hours.

480 Art in the High School. Materials, theory and organization for presenting art activities and developments in the arts on the secondary level. Required of all art education majors. Prerequisite: ARE 301, SED 311 or concurrently. One lecture, 4 hours laboratory. Credit, 3 hours.

510 Art in the Self-Contained and Open Classroom. Alternate teaching-learning strategies, art concepts, skills and expressive objectives relevant to elementary school art experiences for teachers. Developmental aspects of art behavior among elementary children in various learning environments. Credit 3 hours.

511 History of Art Education. Historical and theoretical analysis of contemporary trends in American art education. Credit, 3 hours.

515 Foundations of Art Education. Behavioral foundations of education as related to art education. Emphasis on psychological and philosophical frame of reference. Credit 3 hours.

520 Creativity In Art Education. Research into the nature of creative behavior especially as it applies to the visual arts. Creativity and its relation to student growth and performance for contemporary teaching Credit 3 hours

525 Art and Society. Interrelationship of art and society and significance of art education in social change Art as a cultural communication system and its relationship to urban renewal the social development increased leisure effects of automation Credit 3 hours

530 Research In Art Education. Recent research in art education. A critical examination of research methodology and implications for practice. Credit, 3 hours

535 Sensory Awareness Strategies for Teaching. Experience and exploratory analysis of sensory attributes related to teaching art Sharpening perceptual awareness through visual tactile, auditory and other sensory modes and their application to the classroom Credit 3 hours

610 Issues and Trends in Art Education. Recent problems and directions in contemporary art education. Credit, 3 hours

611 Curriculum Development in Art Education. Development of curriculum in terms of philosophy, psychology and social foundations Relationship of objectives to practice Credit 3 hours

Special Courses: ARE 494 498 499 590 591, 592 594 598 599 690 691 692 790 791 792 799. See pages 48-49

ART HISTORY

ARH 100 Introduction to Art. 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 ARH 300 nor used as art history credit by art majors or minors Credit 3 hours

101 History of Art from the Dawn of Civilization to the Renaissance. Ancient Near Eastern Egyptian Greek Roman and medieval European art to the Renaissance Credit 3 hours

102 History of Art from Renaissance to the Present Day. Occidental art during the Renaissance mannerist baroque rococo neo-classical romantic and modern epoch Credit 3 hours

103 Introduction to Oriental Art. Sculpture painting and architecture of Asia Credit 3 hours

110 Indigenous Arts of the New World. History of the religious and decorative arts of the American Indians of North and South America from 2000 B.C. to the present Credit, 3 hours

300 Introduction to Art. Course content same as ARH 100 but requires a higher level of accomplishment and comprehension May not be taken for credit by student who has completed ARH 100 nor used as art history credit by art majors or minors Credit 3 hours

400 American Art I. History of art in the United States from European settlement of the New World to the Columbian Exposition of 1893 Prerequisites: ARH 101 and 102 or approval of instructor Credit 3 hours.

401 American Art II. History of the United States from the last decade of the 19th century to World War I. Prerequisites ARH 101 and 102 or approval of instructor Credit 3 hours

402 Mexican Art. Art of Mexico and related Central American cultures from the prehistoric to the contemporary schools Prerequisites ARH 102 and 110 or approval of instructor Credit 3 hours.

403 Pre-Columbian Art of Central and South America. Architecture, sculpture, painting and minor arts of regions south of the Valley of Mexico prior to the discovery of America Prerequisite ARH 110 or approval of instructor Credit 3 hours

404 North American Indian Art. Indigenous arts from Alaska to Northern Mexico concentrating upon prehistoric and historic styles Prerequisite ARH 110 or approval of instructor Credit 3 hours

405 Southwest Indian Art. Arts and crafts of southwestern American Indians from prehistoric times to the present Prerequisite ARH 110 or approval of instructor Credit 3 hours

406 African Art. Art forms of west and central Africa from prehistoric times to the present Sculpture, architecture and crafts in relation to societies which produced them and their influence on other cultures Prerequisites ARH 101 and 102 or approval of instructor Credit, 3 hours

407 Oriental Art I. Painting sculpture and architecture of India and Southeast Asia Prerequisite ARH 103 or approval of instructor Credit 3 hours

408 Oriental Art II. Arts of China Korea and Japan Prerequisite ARH 103 or approval of instructor Credit 3 hours

409 History of Printmaking. History of the print as an art form and its relation to other modes and forms of artistic expression Prerequisites ARH 101 and 102 or approval of instructor Credit 3 hours

410 Ancient Art. History of painting, sculpture and architecture in Mesopotamia Egypt, and the Aegean Prerequisites: ARH 101 and 102 or approval of instructor. Credit 3 hours

411 Greek Art. Art and architecture of Greece and the Hellenistic Empire Prerequisites ARH 101 and 102 or approval of instructor Credit 3 hours

412 Roman Art. Art and architecture of Etruria Rome and the Roman Empire Prerequisites ARH 101 and 102 or approval of instructor Credit 3 hours

414 Early Christian and Byzantine Art. Art and architecture of the early church and the Byzantine Empire from the 4th to the 15th century Prerequisites ARH 101 and 102 or approval of instructor Credit 3 hours

420 Early Medieval Art. Architecture sculpture and painting in the Latin West from the 7th century to the end of the Ottonian Period. Prerequisites ARH 101 and 102 or approval of instructor Credit 3 hours

422 Romanesque Art. History of sculpture, painting architecture and minor arts in western Europe during the Romanesque period Prerequisites ARH 101 and 102 or approval of the instructor. Credit 3 hours

424 Gothic Art. Painting sculpture and architecture in western Europe during the Gothic period Prerequisites ARH 101 and 102 or approval of instructor Credit 3 hours

428 15th-Century Art in Northern Europe. History of painting sculpture and architecture during the 1400s north of the Alps Prerequisites ARH 101 and 102 or approval of instructor. Credit 3 hours

430 16th-Century Art in Northern Europe. History of painting sculpture and architecture north of the Alps from 1500 to 1600. Prerequisites ARH 101 and 102 or approval of instructor Credit 3 hours

432 Early Renaissance Art in Italy. History of painting sculpture and architecture in Italy from 1300 to 1500 Prerequisites ARH 101 and 102 or approval of the instructor Credit 3 hours

434 Art of the Italian High Renaissance and Mannerism. History of art during the 16th century, especially the achievements and influence of Leonardo da Vinci Raphael and Michelangelo Prerequisites ARH 101 and 102 or approval of instructor Credit 3 hours.

440 Art of the 17th Century in Southern Europe. History of painting sculpture and architecture in 17th century Italy Spain and Portugal Prerequisites ARH 101 and 102 or approval of instructor Credit 3 hours

442 Art of the 17th Century in Northern Europe. History of painting, sculpture and architecture in 17th century Flanders, Holland and France, Germany and England. Prerequisites: ARH 101 and 102 or approval of instructor. Credit: 3 hours.

444 Art of the 18th Century in Northern Europe. History of painting, sculpture, architecture and landscape garden design, concentrating on developments in England and France. Prerequisites: ARH 101 and 102 or approval of instructor. Credit: 3 hours.

446 Art of the 18th Century in Southern Europe. Art of Italy, Spain, Austria and southern Germany during the 1700s. Prerequisites: ARH 101 and 102 or approval of instructor. Credit: 3 hours.

450 Art of the Early 19th Century. History of art from the eve of the French Revolution to the Paris World Fair of 1855. Special emphasis on the neo-classical, romantic and realist movements. Prerequisites: ARH 101 and 102 or approval of instructor. Credit: 3 hours.

452 Art of the Late 19th Century. History of art from the mid-century to 1900. Special emphasis on the pre-Raphaelite, impressionist, symbolist, and art nouveau movements. Prerequisites: ARH 101 and 102 or approval of instructor. Credit: 3 hours.

454 Art of the 20th Century. Developments and directions in art between 1900 and 1940. Prerequisites: ARH 101 and 102 or approval of instructor. Credit: 3 hours.

456 Contemporary Art. Recent and current trends in art since 1940 with special consideration of new concepts and experimentation with media and modes of presentation. Prerequisites: ARH 101, 102 and 454 or approval of instructor. Credit: 3 hours.

460 19th Century Photography. Early history of photography from the medium's prehistory to 1914: personalities, processes, images and ideas. Credit: 3 hours.

462 20th Century Photography. Developments in history of photography from 1914 to present day: personalities, processes, images and ideas. Prerequisite: ARH 460. Credit: 3 hours.

464 Photography and the Victorian Age. Photographs from 1839 to 1902 with special reference to the social, political, cultural, literary, scientific and artistic movements from which they arose. Prerequisites: ARH 460 and 462 or approval of instructor. Credit: 3 hours.

466 History of Photojournalism. Society concerned with photography and its distribution to a mass audience, including a discussion on the ethics of photography

and the mechanics of large-scale print production. Prerequisites: ARH 460 and 462 or approval of instructor. Credit: 3 hours.

498 Pro-Seminar. Credit: 3 hours.

591 Seminar. Credit: 3 hours.

Topics selected from the following for either course:

- (a) Problems in Oriental Art
- (b) Problems in Ancient Art
- (c) Problems in Medieval Art
- (d) Problems in Renaissance Art
- (e) Problems in Baroque Art
- (f) Problems in Modern Art
- (g) Problems in Primitive Art
- (h) Problems in Pre-Columbian North American Indian Art

Special Courses: ARH 492, 493, 494, 499, 590, 592, 598, 599. (See pages 48-49)

AUXILIARY COURSES

ARA 450, 451 Symbolism of Art. Mature appreciation of the arts, emphasizing the relationships of art, music, philosophy and literature. Integrates student skills for majors in art or music and for teachers. Prerequisite: approval of instructor. Credit: 3 hours each semester.

452 Museology I. History of collecting, conservation and restoration. Prerequisite: approval of instructor. Credit: 3 hours.

453 Museology II. Developments in contemporary museums: 20th century concepts in museum planning, construction and establishment. Prerequisite: ARA 452. Credit: 3 hours.

454 Museography I. Museum theories, practices, and methods. Prerequisite: approval of instructor. Credit: 3 hours.

455 Museography II. Museum management with emphasis on the financial aspects: budgeting, taxation, insurance and fund raising. Prerequisite: ARA 454. Credit: 3 hours.

458 Conservation. Conservation, care and preservation of museum collections and related equipment. Prerequisites: ARA 454 and approval of instructor. Credit: 3 hours.

459 Methodology and Bibliography. Materials and methods of art historical research. Credit: 3 hours.

Special Courses: ARA 494, 498, 499, 584, 590, 591 and 598. See pages 48-49.

Humanities

(Center for the Humanities)

Professor:

LAMM (KRAUSE 104)

Associate Professors:

DOEBLER, FRAZIER, WENTZ

Assistant Professors:

CHEN, DONNELL, SHIGEFUJ, WEINSTEIN

Instructor:

MARQUARDT

Lecturer:

HORWITCH

Major Requirements

Bachelor of Arts Degree

Curriculum

The Interdisciplinary Humanities program consists of 45 semester hours of credit selected from the fields of art, architecture, dance, literature (English and foreign language), music, philosophy, religious studies, theatre, and other performing arts. Three fields of study must be chosen and semester hours accumulated in the following pattern: first subject, 21 hours; second subject, 15 hours; third subject, 9-12 hours. In addition there is a required interdisciplinary core program of 28 semester hours.

Approved courses, specific interdisciplinary humanities and comparative arts courses and suggested elective courses are selected in consultation with the advisor. All students registering in a Humanities major program will enroll through the College of Fine Arts. All Humanities degree programs require a minimum of 126 hours for graduation. In addition to the major requirements, General Studies and other academic requirements are listed on page 30 of

this catalog *Minimum* grade point index for retention in the Humanities curriculum: 0–29 hours, 2.00; 30–59 hours, 2.25; 60–89 hours, 2.50; 90 hours, or more, 2.75

Major Teaching Field Requirements

Bachelor of Arts Degree in Humanities Curriculum (Secondary Humanities)

Consists of 60 hours of credit in Humanities plus professional education courses and a foreign language. Individualized course of study worked out in consultation with the advisor.

Bachelor of Arts in Education Degree Curriculum (Secondary Humanities)

Requirements are the same as for the B.A. in Humanities curriculum with the following exceptions: General psychology, American history, one mathematics and one science are required; a foreign language is not required. Either the normal education program or the on-site program may be selected. Students transfer to the College of Education at the end of the sophomore year, but retain their Humanities advisor.

Minor Teaching Field Requirements

A 24 semester hour teaching minor in Humanities in Secondary Education (Bachelor of Arts in Education) is offered in cooperation with the College of Education. This program normally includes 8 semester hours of lower division Humanities courses plus 12 hours of upper division Humanities courses; or, all 20 hours may be upper di-

vision. No more than 12 hours may be taken outside the course offerings of the Humanities Center. Electives may include applied, studio, technical, and laboratory work in the arts and humanities but may not include courses in the teaching major.

An Interdisciplinary teaching minor in Humanities Elementary Education may also be constructed under the 15 semester hour option of academic specialization, with the addition of 9 selected hours in the related field. Individual course of study constructed in consultation with the advisor.

Graduate Program

Consult the Graduate College catalog for requirements in the Interdisciplinary Humanities program leading to the degree of Master of Arts.

Students taking 300- and 400-level courses as part of their approved undergraduate program must indicate the graduate credit option in the appropriate location on the Course Request OpScan form

INTERDISCIPLINARY HUMANITIES

(*Denotes an Interdisciplinary Humanities course in the General Studies program.)

Note. Religious Studies courses (REL) follow HUM courses

***HUM 101, 102 Ideas and Values in the Humanities.** Interrelation of art, architecture, literature, music, philosophy, religion, theatre and other performing arts in the modern world. Class projects including attendance of cultural events are required. Credit 4 hours each semester.

***150 Introduction to Asia.** Introduction to further study on Asia, especially in the social sciences and humanities (Part of programs in Asian studies and humanities) Credit 3 hours. Same as L.A. 150

***301, 302 Humanities in the Western World.** Interrelation of art, architecture, literature, music, philosophy, religion, theatre and other performing arts within the context of the major stylistic periods of

Western culture. Cultural achievements of the past as they relate to contemporary life. Class projects including attendance of cultural events, required. Credit 4 hours each semester

***303, 304 Humanities in the Eastern World.** Interrelation of art, architecture, literature, music, philosophy, religion, theatre and other performing arts in Middle and Far Eastern civilizations. Cultural achievements of the past as they relate to contemporary life. Class projects, including attendance of cultural events are required. Open to undergraduates. Credit 4 hours each semester

***401 Humanities in World Cultures.** A humanities study program of foreign travel and performance arts of the various world cultures. Art, gallery, museum, drama, dance and musical events constitute a basic part of the itinerary. Term paper required. May be repeated for credit. Prerequisites: HUM 301, 302 or 303, 304 or approval of instructor. Credit 6 hours

***402 Technology, Society and Human Values.** Values which motivate mankind to create technology. Areas of conflict and resolution between basic human values and technological society. Reading and discussion with visiting lecturers. Prerequisite: junior standing or above. Credit 3 hours. Also listed under ASE 402

Note: Comparative Arts courses H.M. 403, 404, 405, 406, 407, 408, 409, 410 may be taken concurrently

403 Comparative Arts: The Classical Period. Arts, literature, religion, and the performing arts within the context of social institutions and philosophical perspectives. Early civilization through the Roman Era, emphasis on ancient Greece. Prerequisites: HUM 301, 302 or approval of instructor. Credit 3 hours

404 Comparative Arts: The Arts of Christianity. Arts, literature, religion, and the performing arts within the context of social institutions and philosophical perspectives. Christian Period, Carolingian Renaissance through the Gothic Era. Prerequisites: HUM 301, 302 or approval of instructor. Credit 3 hours

405 Comparative Arts: European Renaissance. Arts, literature, religion, and the performing arts within the context of social institutions and philosophical perspectives. Italian and English Renaissances, beginning of our modern world. Prerequisites: HUM 301, 302 or approval of instructor. Credit 3 hours

406 Comparative Arts: The Age of Reason. Arts, literature, religion, and the performing arts within the context of social institutions and philosophical perspectives. Baroque, neoclassicism and the rococo. Prerequisites: HUM 301, 302 or approval of instructor. Credit 3 hours

407 Comparative Arts: Romanticism to World War I. Arts literature, regions and the performing arts within the context of social institutions and philosophical perspectives. The 19th century positivism, and the emergence of western industrial man. Prerequisites: HUM 301 302 or approval of instructor. Credit 3 hours

408 Comparative Arts: The Twentieth Century. Arts literature regions and the performing arts within the context of social institutions and philosophical perspectives. The modern world especially American the Twenties, jazz and the avant garde. Prerequisites: HUM 301 302 or approval of instructor. Credit 3 hours

409, 410 Comparative Arts in the Eastern World I, II. Arts literature regions and the performing arts within the context of social institutions and philosophical perspectives. Selected thought and monuments of the East and Near East. Prerequisites: HUM 303 304 or approval of instructor. Credit 3 hours each semester

417, 418 Theory and Criticism of the Arts I, II. Analysis of esthetic experience and the artwork social moral and psychological functions of the arts. Concepts of creativity style artistic truth perception forms as concepts of concepts of experiential reality. Development of critical values application of esthetic theory to 20th century concept of the avant garde-criticism of the contemporary arts. Credit 3 hours each semester

470 Women and the Arts. Images of women in the arts and women as artists in society and various cultures. Literature the arts and the role of women will be emphasized. Credit 3 hours

475 Myth and Symbol. Myth and symbol as fundamental language of the humanities and as reflective of values in human experience that transcend the boundaries of time and space. Their expression in literature the visual arts and the performing arts. Credit 3 hours

480 Methods of Teaching the Humanities. Methods of instruction organization discussion and presentation of the courses in the interdisciplinary Humanities. Prerequisites: HUM 301 302 and approval of instructor. Credit 3 hours

***494 Special Topics in the Humanities.** Open to students. Credit 3 hours. Topics may be selected from the following

- a) Historical or Contemporary Cultures
- b) Cultures of Ethnic Minorities
- c) Fine and Performing Arts
- d) Religious Studies

498 Pro-Seminar in the Humanities. For students with a major or minor in Humanities. Other students admitted with approval of instructor. Credit 3 hours.

520 The Esthetics of Film. Theory and criticism in the study of film image and language film medium film as an interdisciplinary art form film and reality the filmmaker and the role and function of the filmmaker. Credit 3 hours

530 Pop Culture in America. The uses of leisure time by the great audience of America from a historical perspective which consumes and thus creates popular culture. Areas of concern will be television and radio film and stage; music art and paperbacks. Credit 3 hours

535 Artistic Styles in World Cultures. The arts as they influence and are influenced by culture and socio-economic factors. Focus on stylistic developments in literature and fine and performing arts. Credit 3 hours

540 Research in the Humanistic Disciplines. Bibliographic methodology main reference sources and research tools necessary for scholarly research in the interdisciplinary Humanities. Knowledge of a foreign language recommended. Credit 3 hours

591 Seminar. Credit 3 hours. Prerequisite: Humanities graduate student or approval of instructor

602 Experimentation and Recent Trends in Humanities Education. Current and in process developments in humanities education. Prerequisite: Humanities graduate student or approval of instructor. Credit 3 hours

603 Curriculum Development in Humanities Education. Issues patterns and procedures in humanities curricula. Prerequisite: Humanities graduate student or approval of instructor. Credit 3 hours

610, 611 Philosophic Foundations of Humanities Education. Basic issues in the actual traditions of the Western world which are foundational to the philosophies of humanities education. Prerequisite: Humanities graduate student or approval of instructor. Credit 3 hours each semester

614 The Gothic Era. Advanced investigation into the age of the cathedra. An interdisciplinary approach to esthetic moments as reflected in the thought and the monuments of the 12th and 13th centuries. Prerequisite: HUM 404 or approval of instructor. Credit 3 hours.

615 Arts in the Age of Elizabeth. Arts and symbols in the life of Elizabethan England. A reconstruction of court life as an image of the ideal major authors iconography of the period. Prerequisite: HUM 405 or approval of the instructor. Credit 3 hours

617 The Age of Romanticism. Origins and development of Romanticism in the imaginative and philosophical literature, and the fine and performing arts of the late 18th and 19th centuries. World view of Faust an man-nature law and the limitations of human reason. Prerequisite: HUM 407 or approval of instructor. Credit 3 hours

618 Contemporary Issues in the Humanities. Social and moral issues and their expression in the performing and literary arts. Prerequisites: HUM 408 or approval of instructor. Credit 3 hours. Additional courses may be selected from: Culture Anthropology Architecture Art Culture Geography Culture History Dance Foreign Languages and English Literature) Mass Communications Music Philosophy Speech and Theatre.

Special Courses: HUM 590 592 594 598 599 600 680 690 691 692 780 784 790 791 792 799. See pages 48-49.)

RELIGIOUS STUDIES

***REL 121 Religion and Humanity.** The nature of religion and human religiousness their role in history. The methods of religious studies. Credit 3 hours

***122 Contemporary Religious Thinkers.** Representative thinkers whose works demonstrate the religious nature of humanity, religious issues in the contemporary world. Credit 3 hours

***123 Religion and Current Social Issues.** The manner in which human religiousness relates to such social concerns as technology the environment poverty and war. Credit 3 hours

***322 Religion in American Life and Thought.** The role of religion in American history. Functions contributions, tensions and perspectives of religion in American culture. Credit 3 hours.

***323 Western Religious Traditions.** Judaism Christianity and Islam. Perspectives patterns of worship ethics historical roots and primary institutional forms of Western religions. Credit 3 hours

***324 Religions of the Far East.** Major religious traditions of the East religious experience thought patterns of worship ethics and institutions. Emphasis will be on Hinduism Buddhism Taoism and Confucianism. Credit 3 hours

***326 Biblical Studies: The Hebrew Bible.** The Torah prophets and writings of the Hebrew tradition a critical understanding of the history and literature that comprise the background and development of Judaism. Credit, 3 hours

***327 Biblical Studies: The New Testament.** Origins

and literature of the early Christian church: historical investigation of the types of oral and written tradition found in the New Testament. Credit 3 hours

420 Mysticism in America. Mystical movements and thinkers in American history from the Colonial period to the present. Credit 3 hours

421 Minority Movements in American Religion. The role of dissent in American religion: particular attention to cultural developments, regions of harmony and peace of mind, and the new regions of the 20th century. Credit 3 hours

422 Religion in Colonial America. Historical perspectives on movements, institutions and religious thought during the Colonial period in America. Prerequisite: previous religious study or approval of instructor. Credit 3 hours.

423 The Shape of Nineteenth Century American Religion. Historical perspectives on movements, institutions and religious thought during the 19th century in America. Examination of the manner in which these issues become the heritage of the 20th century. Prerequisite: previous religious study or approval of instructor. Credit 3 hours

424 Religion in Twentieth Century America. Historical perspectives on movements, institutions and religious thought during the 20th century. Prerequisite: previous religious study or approval of instructor. Credit, 3 hours

428 Buddhism in China and Japan. The development of Buddhism in China and Japan: examinations of the forms of thought and experience unique to Chinese and Japanese history. Credit 3 hours

430 Contemporary Religious Movements in Japan. Religious movements and thinkers in present-day Japan. Credit 3 hours

515 Selected Religious Thinkers: Western World. The life and thought of a representative contemporary religious thinker of the West. Examples: Berdyaev, Buber, Marcel, Martin, Niebuhr, Tillich, etc. Credit 3 hours

518 Selected Religious Thinkers of the East. The life and thought of a non-western contemporary religious thinker. Examples: Aurobindo, Mishima, Rhadakrishnan, Suzuki, etc. Credit 3 hours

Special Courses: REL 494, 498, 591, 598 (See pages 48-49)

Music

Professors:

BROEKEMA (MUS 183A), BRITTON, BRUNSMAN, BULLOCK, CARROLL, DALES, DRESSKELL, ENGLISH, FLETCHER, JOHNSON, LOMBARD, SEIPP, SPINOSA, STELLHORN, STRANGE

Associate Professors:

ANDRESS, ATSUMI, BARBOUR, BOWERS, CASTLE, COHEN, D'ANDREA, HANNA, HINES, LOPRESTI, McEWEN, PRINONOFF, PUTNICK, RATTERREE, RAVE, REYNOLDS, RICKEL, ROBINSON, RUCCOLO, MARGO SMITH, MARION SMITH, STALZER

Assistant Professors:

BARR, CLUTE, FLEMING, HANSEN, HOFFER, HOLDEN, LOCKWOOD, MAGERS, MILLER, RAUSCH

Instructors:

BLOEMENDAAL, GRUBER, PORTER, WILSON

The Department 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 Department 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 sup-

portive of his major concentration. All undergraduate curricula, therefore, provide the following:

1. A conceptual understanding of such musical properties as *sound, rhythm, melody, harmony, texture* and *form* and opportunities for developing a comprehensive grasp of their interrelationships as they form the cognitive affective basis for listening, composing and performing.
2. Repeated opportunities for enacting in a variety of ways the roles of listener (analysis), performer (interpretation), composer (creation), scholar (research), and teacher.
3. A repertory for study that embraces all cultures and historical periods."

Departmental 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 for graduation. In addition to the major requirements listed below, General Studies and other academic requirements are listed on page 30 of this catalog.

Placement Examinations. All students enrolled in an undergraduate music degree program are required to take placement tests in theory, piano and a major performing medium at the time they enter the university. Transfer students who have completed four semesters of theory at another institution must reach a minimum level of achievement on the Theory Placement Exam. Those who fail to reach the minimum level must take and pass one course from the MUS 200 level theory courses.

Students are urged to write the Department of Music for suggestions for auditions in applied music.

Bachelor of Arts Degree Curriculum

MUSIC Consists of 45 semester hours of credit. The following courses are required

Music Theory: MUS 125, 221, 222, 223, 320, 322, 327

Music History and Literature: MUS 241, 242

Major Performing Medium: 8 semester hours (MUP 111 311)

Class Piano: MUP 131, 132, 231, 232 (unless waived by proficiency examination)

Recital Attendance: Six semesters of MUP 100

The remaining hours in music will be selected by the student in consultation with his advisor. At least 18 semester hours of music must be in upper division credit.

Bachelor of Music Degree Curriculum

MAJOR Consists of 84 semester hours of credit. This curriculum offers fields of specialization in choral music, general music, instrumental music, jazz performance, music performance (accompanying, keyboard, orchestral instrument, voice), music theatre, music therapy, and theory and composition. Choral music, 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 MUSIC

Note: This degree program may include a teaching minor in instrumental music.)

Music Theory: MUS 125, 221, 222, 223, 322, 327, 431

Music History and Literature: MUS 241, 242

Conducting: MUP 209, 339

Music Education: MUE 110, 313, 480

Major Performing Medium: Eight semesters of keyboard or voice (MUP 111 311) to attain a proficiency level necessary to meet the graduation recital requirement. MUP 495 completes the requirement

Minor Performing Medium: Eight semester hours of keyboard or voice (whichever is not the major performing medium). No more than 2 semester hours may be passed by proficiency exam.

Ensemble: Eight different semesters of participation including at least six semesters of MUP 352 and or MUP 353.

Recital Attendance: Six semesters of MUP 100

GENERAL MUSIC

Music Theory: MUS 125, 221, 222, 223, 322, 327, 431

Music History and Literature: MUS 241, 242

Conducting: MUP 209, 339

Music Education: MUE 110, 313, 314, 480

Major Performing Medium: Eight semesters of keyboard or voice (MUP 111 311) to attain a proficiency level necessary to meet the graduation recital requirement. MUP 495 completes the requirement

Minor Performing Medium: Eight semester hours of keyboard or voice (whichever is not the major performing medium). No

more than 2 semester hours may be passed by proficiency exam.

Ensemble: Eight different semesters of participation including at least six semesters of MUP 352 and or MUP 353.

Recital Attendance: Six semesters of MUP 100

INSTRUMENTAL MUSIC

Note: It is strongly recommended that the degree program include a minor in choral music.)

Music Theory: MUS 125, 221, 222, 223, 322, 327

Music History and Literature: MUS 241, 242

Conducting: MUP 209

Music Education: MUE 110, 325, 326, 327, 328, 336, 337, 338, 481, 482

Class Piano: MUP 131, 132, 231, 232 (unless waived by proficiency exam)

Major Performing Medium: Eight semesters of study (MUP 111 311) to attain a proficiency level necessary to meet the graduation recital requirement. MUP 495 completes the requirement

Ensemble: Eight different semesters of participation. 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

Recommended Minor: Choral Music MUE 480, MUS 431, MUP 339, 351 or 352 353 (two semesters) and voice 4 hours)

PERFORMANCE (KEYBOARD)

Music Theory: MUS 125, 221, 222, 223, 320 or 321, 322, 325 or 428, 327

Music History and Literature: MUS 241, 242, 445 or 446, 451, 481

Conducting: MUP 209

Major Performing Medium: Eight semesters of study (MUP 127 327) 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 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)

Music Theory: MUS 125, 221, 222, 223, 320, 322, 325, 327

Music History and Literature: MUS 241, 242, 445 or 446, 451 or 481

Conducting: MUP 209, 340

Major Performing Medium: Eight semesters of study (MUP 127 327) 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 hours of large ensembles within a minimum of six different semesters; plus 4 hours of small ensembles within a minimum of four different semesters.

Recital Attendance: Six semesters of MUP 100

PERFORMANCE (VOICE)

Music Theory: MUS 125, 221, 222, 223, 320, 322, 325, 327

Music History and Literature: MUS 241, 242, 445 or 446, 451, 481

Conducting: MUP 209

Major Performing Medium: Eight semesters of study (MUP 127 327) 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 8 hours of ensembles within a minimum of six different semesters to be selected from large and or small ensembles.

Recital Attendance: Six semesters of MUP 100

Additional Requirements: 16 hours of credit in more than one foreign language, chosen from French, German or Italian. A student may elect one year of one language, and either one or two semesters of the other(s), chosen in conference with his advisor.

PERFORMANCE (ACCOMPANYING)

Music Theory: MUS 125, 221, 222, 223, 320 or 321, 322, 327, 428

Music History: MUS 241, 242, two semesters of 250, 445 or 446, 451 (Piano Repertoire), 452, 453

Conducting: MUP 209

Major Performing Medium: Four semesters of MUP 127, four semesters of MUP 311, four semesters 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 381 (chamber music), two semesters of MUP 381 (two-piano ensemble); two semesters of MUP 388; two semesters of ensemble elective (minimum of six different semesters)

Recital Attendance: Six semesters of MUP 100

In addition, the student will elect two semesters of one foreign language (French, Italian, German recommended)

MUSIC THEATRE (VOICE)

Music Theory: MUS 125, 221, 222, 223, 322, 327

Music History and Literature: MUS 241, 242, 446 and 2 elective hours

Conducting: MUP 209

Major Performing Medium: Eight semesters of study (MUP 111 311) 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: Eight semesters of MUP 371 (Music Theatre Workshop) and eight semesters of MUP 373 (Music Theatre Production)

Recital Attendance: Six semesters of MUP 100

Additional requirements: Minimum of 6 semester hours each in theatre and dance

MUSIC THERAPY

(This program has been granted tentative approval accreditation status by the National Association for Music Therapy.)

Music Theory: MUS 125, 221, 222, 223, 322, 327

Music History and Literature: MUS 241, 242

Conducting: MUP 209

Music Education: MUE 211, 313, 325, 327, 335, 336, 337

Music Therapy: MUE 161, 261, 341, 342, 361, 461, 475, 476

Major Performing Medium: Eight semesters of study (MUP 111 311) to attain a proficiency level necessary to meet the graduation recital requirement. MUP 495 completes the requirement.

Piano: Proficiency equal to eight semesters of study

Organ: Proficiency equal to one year of study

Voice: Four semesters of study

Ensembles: Eight semesters of participation with at least four semesters in large groups and at least two semesters in small groups

Recital Attendance: Six semesters of MUP 100

Additional requirements: 4 semester hours of functional dance; specified courses in Social and Behavioral Sciences

Note: Student must apply to the National Association for Music Therapy for registration as a Music Therapist on completion of the requirements for graduation

JAZZ PERFORMANCE

Music Theory: MUS 125, 221, 222, 223, 224, 315, 316, 321, 322, 323 or 482, 327

Music History and Literature: MUS 241, 242, 352 or 353

Conducting: MUP 209, 340, 341

Major Performing Medium: Eight semesters

of study (MUP 111 311) to attain 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 (unless waived by proficiency exam)

Improvisation: Two semesters of MUP 117 and two semesters of MUP 317

Ensemble: Four semesters of large ensemble and four semesters of MUP 386

Recital Attendance: Six semesters of MUP 100

MUSIC THEORY AND COMPOSITION

Music Theory: MUS 125, 221, 222, 223, 320, 321, 322, 323 (four semesters), 325, 327, 428, 429, 430, 433, 482

Music History and Literature: MUS 241, 242, 445, 446 and 3 elective hours

Conducting: MUP 209, 339 340

Applied Music: Eight semesters of study (four semesters may be for instruments other than the major performing medium)

Class Piano: MUP 131, 132, 231, 232 (unless waived by proficiency examination)

Ensemble: Eight semesters of participation

Recital Attendance: Six semesters of MUP 100

Bachelor of Arts in Education Degree Curriculum

MUSIC—Consists of a minimum of 67-70 hours of music credit. This curriculum offers fields of specialization in choral music, general music and instrumental music for those wishing to teach music in the public schools. Each field of specialization requires the following courses:

CHORAL MUSIC

Note: This degree program may include a teaching minor in instrumental music.

Music Theory: MUS 125, 221, 222, 223, 322, 327, 431

Music History and Literature: MUS 241, 242

Conducting: MUP 209, 339

Music Education: MUE 110, 313, 480

Major Performing Medium: Eight semesters of keyboard or voice (MUP 111 311) to attain a proficiency level necessary to meet the graduation recital requirement. MUP 495 completes the requirement

Minor Performing Medium: 8 semester hours of keyboard or voice (whichever is not the major performing medium). No more than 2 semester hours may be passed by proficiency exam.

Ensemble: Eight different semesters of participation including at least six semesters of MUP 352 and or MUP 353

Recital Attendance: Six semesters of MUP 100

GENERAL MUSIC

Music Theory: MUS 125, 221, 222, 223, 322, 327, 431

Music History and Literature: MUS 241, 242

Conducting: MUP 209, 339

Music Education: MUE 110, 313, 314, 480

Major Performing Medium: Eight semesters of keyboard or voice (MUP 111 311) to attain a proficiency level necessary to meet the graduation recital requirement. MUP 495 completes the requirement.

Minor Performing Medium: 8 semester hours of keyboard or voice (whichever is not the major performing medium). No

more than 2 semester hours may be passed by proficiency exam.

Ensemble: Eight different semesters of participation including at least six semesters of MUP 352 and or MUP 353.

Recital Attendance: Six semesters of MUP 100

INSTRUMENTAL MUSIC

Note: It is strongly recommended that the degree program include a minor in choral music.

Music Theory: MUS 125, 221, 222, 223, 322, 327

Music History and Literature: MUS 241, 242

Conducting: MUP 209

Music Education: MUE 110, 325, 326, 327, 328, 336, 337, 338, 481, 482

Class Piano: MUP 131, 132, 231, 232 (unless waived by proficiency exam)

Major Performing Medium: Eight semesters of study (MUP 111-311) to attain a proficiency level necessary to meet the graduation recital requirement. MUP 495 completes the requirement.

Ensemble: Eight different semesters of participation. 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.

Recommended Minor: Choral Music MUE 480, MUS 431, MUP 339, 351 or 352 353 (two semesters) and voice 4 hours)

MUSIC MINOR FOR AN ELEMENTARY EDUCATION MAJOR

Music Theory: MUS 100, 101

Music History and Literature: MUS 340

Music Education: MUE 312

Piano: Four semesters

Electives: 2 semester hours

Minors for students in Secondary Education and students in Liberal Arts are available through the Department of Music. Consult with the music department office for advisement sheets and advisors.

Departmental Graduate Programs

The Department of Music offers the following graduate programs: the Master of Arts degree provides advanced studies in history and literature of music; the Master of Music degree with majors in the fields of theory, composition, performance, performance pedagogy, choral music, general music, instrumental music, music theatre performance or direction, and conducting. The Master of Arts in Education degree, with majors in choral, general or instrumental music, the Doctor of Education degree in Music and the Doctor of Philosophy in Education (Music) are offered in cooperation with the College of Education. Consult the Graduate College catalog. A document on graduate degree programs in music may be obtained by writing to the Department of Music.

Students taking 300 and 400 level courses as part of their approved graduate program must indicate the graduate credit option in the appropriate section on the Course Request Option form.

MUSIC HISTORY AND THEORY

MUS 100 Fundamentals of Music Notation. Provides nonmusic majors with sufficient symbol literacy to begin work in the field of musical learning. No credit for music majors. Credit 3 hours.

101 Foundations of Music Theory. A survey of music theory. Prerequisite: MUS 100 or approval of instructor. No credit for music majors. This course may be used to meet the music theory requirements for a minor in music. Credit 3 hours.

107 Introduction to Music. Correlation of music with literature, science and art. A nontechnical course in the humanities for nonmusic majors. Credit, 2 hours.

125 Basic Music Theory. For music majors, designed to develop aural and notational skills. Meets daily. Credit 3 hours.

221 Music Theory—18th Century. 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: MUS 125. Credit 3 hours.

222 Music Theory—19th Century. Musical compositions chosen from the late 18th and the 19th centuries. Harmonic progressions, melodic construction and rhythmic developments. Development of related aural, visual and keyboard skills. Prerequisite: MUS 221. Credit 3 hours.

223 Music Theory—20th Century. 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: MUS 222. Credit 3 hours.

224 Survey of Jazz Styles. Large ensemble compositions and recorded improvisations. Prerequisite: MUS 221. Credit, 2 hours.

241,242 Music History and Literature. Western music from the Greeks to the present day. Prerequisite: MUS 221. Need not be taken in sequence. Credit 3 hours.

250 Diction for Singers. Use of phonetics in the study of song and opera literature. May be repeated for credit. Credit, 1 hour.

315 Modern Arranging. Technical arranging for the contemporary jazz radio television and studio orchestra. Prerequisite: MUS 223. Credit 2 hours.

316 Modern Arranging. Continuation of MUS 315. Prerequisite: MUS 315. Credit 2 hours.

320, 321 Counterpoint. First semester strict coun-

terpo nt in modal style second semester, strict and free tonal counterpo nt Prerequis te MUS 221 Need not be taken in sequence. Credit 2 hours.

322 Musical Acoustics. Properties of sound and tone Harmon c series instruments, the ear and for'um acoust cs and the reproduct on of sound A thorough know edge of musica notation, nterva s sca es and harmony or two years of mus c theory w'l be assumed Same as PHY 320 Credit 4 hours.

323 Composition. Creat ve wr ting n the sma ler forms nclud ng the use of harmon c textures and contrapunta dev ces Prerequis te MUS 223 May be repeated for credit Credit 2 hours.

325 20th Century Theory. Analyt ca methods and au ra techn ques for 20th century music Prerequis te MUS 223 Meets da y Credit 3 hours.

327 Form and Analysis. Organ z ng e ements n the most mportant contrapuntal and homophon c musi cal forms from the Rena ssance through the 19th century Prerequisite MUS 223. Credit 2 hours

340 Survey of Music History and Literature. Major periods composers and compos t ons n the h story of mus c A humanities course n the Genera Stud es program; may be used to meet the mus c h story requ rement for a m nor in mus c Credit 3 hours

352 The Evolution of Jazz. Or gin deve opment and styles of jazz mus c and its exponents Prerequis te MUS 223. Credit 3 hours

353 History of Afro American Music. Afro Amer an mus c traced from its orig ns n Afr ca to the present w th emphasis on jazz and an analysis of the contri but ons of ts ma or contributors Prerequis te MUS 223 Credit 3 hours

355 Survey of American Music. Growth and deve opment of Amer ca s music A human ties course n the Genera Stud es program. Credit 2 hours

356 Survey of the Musical Theatre. Mus c s p ace n the theatre viewed n terms of its histor cal impor tance and re at ve funct on A human ties course n the Genera Stud es program Credit 2 hours

357 Esthetic Perception in Music Performance. n troduces the nonmus c major to the esthet cs of per formance by stressing the r physical and emot ona nvo vement n the d rect on motion ntens ty and co or spectrum of mus c A human ties course n the General Stud es program. Credit 3 hours

428 Form and Analysis. Organizing pr nc p es of the large forms of musica compos t on n the 19th and 20th centuries Prerequis te MUS 327 Credit 2 hours.

429, 430 Canon and Fugue. Polyphonic stud es n

form and techn que Prerequisite MUS 321 Credit 2 hours each semester.

431 Choral Arranging. Pract ca stud es n ed t ng and arranging for choral organ zat ons Preparation of su table mater als for young cho rs and advanced groups Study of accompaniments. Prerequis te MUS 223. Credit 2 hours

433 Orchestration. Theoret ca and pract cal study of scor ng for orchestra nstruments n var ous comb nat ons, ranging from sma ensemb es to symphon c orchestra and concert band Prerequis te MUS 223. Credit 2 hours

436 Electronic Studio Techniques. Pr nc ples of e ec tron c music systems and their appl cations n the compos t on and record ng of e lectronic mus c May be repeated for credit. Credit 2 hours

438 Music in the Classic Era. Deve opment of the class c style of the 18th century major works of Haydn Mozart, and Beethoven Prerequis tes MUS 241 242 327; the latter may be taken concurrent y Credit 3 hours.

439 Music in the 19th Century. European art mus c after Beethoven Prerequis tes MUS 241 242 327, the latter may be taken concurrent y Credit 3 hours

441 Music of the Baroque Era. Works of major com posers and sty stic tendenc es of the per od. Prerequis tes MUS 241 242 327 the atter may be taken concurrent y Credit 3 hours.

445 20th Century European Music. nd vidual d oms and sty ist c currents among ma or composers Prerequis tes MUS 241 242 327 the atter may be taken concurrent y. Credit 2 hours

446 20th Century American Music. Amer can re sponse to European trad t ons nd vidual ty n compos t on and jazz Prerequis tes MUS 241 242 327; the latter may be taken concurrent y Credit 2 hours

451 Repertoire. L terature ava lab e for performance n al performing med a Prerequis te: junior stand ng n major performance f e d May be repeated for cred t. Credit, 2 hours.

452 Song Literature. Ear y taian, Eng sh German and French art song. Credit 2 hours

453 Song Literature. Amer can Russian Spanish Scand nav an and contemporary song Credit 2 hours

481 Performance Pedagogy and Materials. Pr n cip es and methods of performance techn ques for each performance f e d Prerequis te: sen or stand ng or approval of nstructor May be repeated for credit Credit, 2 hours

482 Theory of Rhythm. Mus ca organizat on through

phys ologica and psycholog cal princ p es based upon rhythmic perception Prerequis tes MUS 428, 445 MUP 339 or 340. Credit 2 hours.

501 Theory Techniques. Two hours a week Credit 2 hours

510 Introduction to Graduate Study. Acqu nts the graduate student w th bas c research mater als n mus c B b iograph c and technical mater a s w be ncorporated nto the preparat on and wr ting of re search papers Credit 2 hours.

520 Advanced Analytical Techniques. Analyt ca techn ques systemat ca y applied to music. Concen trat on on structura and compos t onal procedures. Credit 2 hours.

523 Advanced Composition. Creative wr ting n the larger forms for chorus orchestra and band. Prerequis tes MUS 323 428 445 or equ va ent May be re peated for credit Credit 2 hours.

525, 526 Pedagogy of Theory. Practices and pr n cip es of teaching mus c theory Emphas zes most des rab e and pract cal offer ngs poss b e Compar at ve stud es of ex st ng practices Credit 3 hours each semester

527, 528 Evolution of Musical Theory. Theory from Pythagoras to the present Need not be taken n se quence. Credit 3 hours each semester

532 Music Bibliography. Major histor ca and ana yt ca wr tngs systemat c and h stor cal co ect ons of music Reading know edge of a foreign language recommended Credit 3 hours

535 Medieval Music. Mus c of Europe n the Midd e Ages Gregorian chant, secu ar monophony to 1430 Credit 3 hours

536 Music of the Renaissance. Mus ca thought n Europe w th emphasis on sty ist c concepts arfd changes c 1430–1580. Credit 3 hours.

541 The Art Song. Solo song from ts begn ng to the present day Credit 3 hours

542 Keyboard Literature. From the Rena ssance to the present day. Credit, 3 hours

544 World Music I. Music of nonl terate cu tures fo k music of Europe and the Amer cas Credit 3 hours.

545 World Music II. Folk and art music of non West ern cu tures Credit 3 hours

553 Advanced Choral Arranging. Chora techn ques n compos t on and arrang ng Vocal wr t ng through ana ysis of chora works. Projects n both arrang ng and compos t on Credit 2 hours.

554 Advanced Scoring Problems. nstrumentat on Playing character st cs of each nstrument wr t ng and arrang ng d omat c mus c for the instrument

Projects in both scoring and composition. Credit 2 hours

575 History of Choral Music. Major choral works. Credit 3 hours

580 Psychology of Music. The nature of music therapy and its evaluation. A review of recent research. Credit 3 hours

Special Courses: MUS 492 493 494, 498 499 580 590, 591, 592, 594 598, 599 690 (See pages 48 49)

MUSIC EDUCATION

MUE 110 Orientation to Music Education. The larger field of music education. Aesthetic objectives and instructional procedures. Nonverbal learning teaching in school observations. Prerequisite or corequisite for MUE 313 480 481. Credit,

161 Introduction to Music Therapy. Includes requirements and qualifications of the music therapist and expectations placed upon him in the field. Visits to facilities for handicapped in the community. Credit 2 hours

211 Music in Recreation. Materials, methods and organizational structures appropriate for recreational music. Credit 2 hours

261 Hospital Orientation. Weekly experiences in an approved psychiatric hospital or other approved agency. Weekly consultation with instructor. Prerequisite MUE 161. Credit 2 hours

310 Music in Early Childhood Education. Identifying and understanding music needs of young children. Methods and materials for program development for classroom teachers. Credit 3 hours

311 Music for the Classroom Teacher. Development of the classroom music program in the elementary school. No previous music experience or course work required. Not for music majors or minors. Credit 3 hours.

312 Classroom Music (Minors). Materials and methods for teaching music in the elementary school by the music minor. Emphasis on the specific grade level(s) at which the student intends to teach. Prerequisite MUS 100. Credit 3 hours

313 Music in the Elementary School. Methods of instruction, organization and presentation of appropriate content in music. For music majors only. Credit 3 hours.

314 Music in the Elementary School. Selected problems in elementary school classroom music and choral program. Observation and participation in school music classrooms. Prerequisite MUE 313. Credit 3 hours

325, 326 Educational Methods for Strings. String instrument teaching and playing skills for school music teachers. Three hours a week. Credit 1 hour.

327, 328 Educational Methods for Brass. Brass instrument teaching and playing skills for school music teachers. Three hours a week. Credit 1 hour

335 Educational Methods for Guitar. Guitar teaching and playing skills for school music teachers. Three hours a week. Credit 1 hour.

336 Educational Methods for Percussion. Percussion instrument teaching and playing skills for school music teachers. Three hours a week. Credit 1 hour.

337, 338 Educational Methods for Woodwinds. Woodwind instrument teaching and playing skills for school music teachers. Three hours a week. Credit 1 hour

341 Psychology of Music I. Acoustical and psychoacoustical aspects of music emphasizing problems of perception, experimental aesthetics, musical function, measurement and diagnosis of musical ability. Prerequisite MUE 261. Credit 2 hours

342 Psychology of Music II. A laboratory and research course emphasizing acoustical and psychoacoustical aspects of music perception, experimental aesthetics, musical function and measurement and diagnosis of musical ability. Prerequisite MUE 341. Credit 2 hours

361 Music in Therapy. Application of music as a therapy to various types of handicapped children and adults. Prerequisite MUE 341. Credit 2 hours.

461 Influence of Music on Behavior. Effect of music on both physical and mental health. Physiological, psychological, neurological, sociological and aesthetic relationships. Prerequisite MUE 361. Credit 2 hours

475 Therapy Practicum. An activity class involving the music therapy major in the musician's roles of arranging, conducting and organizing and maintaining small and large music ensembles. Experiences in directing music earning activities with special education students. Emphasis on adolescent and adult behavior. Prerequisite MUE 261. Credit 3 hours

476 Internship in Music Therapy. A six-month residency in an approved institution. Credit 1 hour

480 Choral Music Practicum. Methods of instruction, organization and presentation of appropriate content in choral music classes. Credit 3 hours

481, 482 Instrumental Music Practicum. Instrumental music as a means of development of music skills, understandings and attitudes in elementary and secondary school students. Credit 5 hours each semester

550 Studies in Music Curricula. Scope and sequence of musical experiences. Development of criteria for the evaluation of music curriculum. Credit 3 hours

551 Advanced Studies in Elementary School Music. For experienced teachers. Organization and content of the general music classes in kindergarten and the first six grades of elementary school. Emphasis on teaching music reading and ear training to young children. Credit 3 hours

552 General Music, Music Theory and Music History Classes in the Junior and Senior High School.

Organization and content of school music classes which are not performance oriented. Credit 3 hours

564 Instrumental Music, Advanced Rehearsal Techniques. Formulation of varied musical education and aesthetic rehearsal objectives. Observation and review of current practices and materials. Development of individual methods of teaching in a rehearsal situation. Credit 3 hours

566 Instrumental Literature for Schools. Comprehensive study and analysis of all types of instrumental music. Credit, 3 hours

568 Choral Music, Advanced Rehearsal Techniques. Musical and vocal techniques necessary for presentation of choral literature. Analysis and experimentation with psychological, acoustical and other problems of rehearsal and performance. Credit 3 hours

570 Choral Literature for Schools. Comprehensive study and analysis of all types of choral music. Credit 3 hours.

610 Music Coordination and Administration. Administrative principles, procedures and organizations for directing and coordinating music programs in the schools and institutions of higher learning. Credit 3 hours

733 Experimental Projects and Recent Trends in Music Education. Recent trends and research developments which challenge traditional practices. Credit 3 hours

744 Major Problems in the Education of Music Teachers. Patterns of music teacher education and a projection of course outcomes designed to accommodate the most comprehensive demands of the changing school music curriculum. Credit 3 hours

755 Philosophies of Music Education. History of music education and the psychological and philosophical influences changes in curriculum content and teaching procedures. Credit 3 hours

Special Courses: MUE 494 498 499 580 590 591 592, 594 598 599 680, 790 791 792 799. (See pages 48 49)

MUSIC PERFORMANCE

MUP 100 Concert Attendance. Required of all music majors for six semesters in each degree program with a minimum of seven (7) concerts attended each semester. No credit.

111, 311, 511 Studio Instruction. For majors in music degree programs. Placement audit on required. Piano organ harps chord voice, flute, oboe clarinet saxophone bassoon trumpet, cornet horn euphonium, trombone tuba percussion harp, violin viola cello contrabass. May be repeated for credit. Minimum contact of one hour plus studio class weekly. May not be taken for audit. Credit 2 hours each semester.

117, 317 Improvisation Workshop. Ensemble workshops in improvisational techniques related to the field of jazz. Emphasis on chord symbol reading patterns ear training analysis of recorded improvised solos and melodic concept. Prerequisite: MUS 125. Two hours per week. May be repeated for credit. May not be taken for audit. Credit 1 hour each semester.

121, 321, 521 Studio Instruction. For secondary or minor instrument instruction and nonmajors in the university. Placement examination and audition required. Piano organ harps chord voice flute oboe clarinet saxophone bassoon trumpet cornet horn euphonium trombone tuba percussion violin viola cello contrabass. May be repeated for credit. Minimum contact of one-half hour per week. May not be taken for audit. Credit 1 hour each semester.

127, 327, 527 Studio Instruction. For performance majors in Bachelor or Master of Music degree programs only. Placement examination and audition required. Piano organ harps chord voice, flute oboe clarinet saxophone bassoon trumpet cornet horn euphonium trombone, tuba percussion harp violin viola cello, contrabass. May be repeated for credit. Minimum contact of one hour plus studio class weekly. May not be taken for audit. Credit 4 hours. 2 or 4 hours each semester for MUP 527.

131, 132, 231, 232 Class Piano. A four semester sequence of courses designed for those lacking piano experience and those who need piano as a classroom tool. Emphasis on keyboard technique sight reading simple accompaniments and improvisation. Two hours a week. May not be taken for audit. Credit 1 hour each semester.

133, 134, 233, 234 Class Voice. Open to all students interested in the development of basic singing techniques. Two hours a week. May not be taken for audit. Credit 1 hour each semester.

209 Elements of Conducting. Essentials of con-

ducting techniques used by both choral and instrumental conductors. Two hours a week. Credit 1 hour.

234, 235 Jazz Piano. Jazz keyboard experience. Emphasis will be on chord symbol reading simple improvisation and voicing. Prerequisite: MUP 232. Two hours per week. May not be taken for audit. Credit 1 hour each semester.

301 Studio Instruction. For choral, general and therapy majors only. Piano organ. Emphasis on improvisation accompaniments and harmonizations. Prerequisite: MUP 232 or proficiency. Placement examination required. One-half hour lesson a week. May be repeated for credit. May not be taken for audit. Credit 1 hour.

337 Studio Instruction—Accompanying. Lessons for accompanying majors only. Repertoire to be selected from vocal and instrumental literature. Placement examination required. One hour lesson a week. May be repeated for credit. Credit 2 hours.

339 Choral Conducting. Elements of choral conducting technique and interpretation. Prerequisite: MUP 209. Three hours a week. Credit 2 hours.

340 Instrumental Conducting. Fundamentals of score reading and interpretation of instrumental music. Prerequisite: MUP 209. Three hours a week. Credit 2 hours.

341 Jazz Conducting and Field Experience. Training and supervised practice in conducting jazz ensembles with emphasis on literature programming and rehearsal techniques. Prerequisite: MUP 340. Two class hours and two field experience hours each week. Credit 3 hours.

345 Symphony Orchestra. Open to all students who can qualify on the basis of auditions with the director. Over a four-year period the student is introduced to the masterpieces of symphony orchestra literature. Five hours a week. May be repeated for credit. Credit 1 hour.

351 Choral Union. Open to all students in the University and to interested singers in the community. Time devoted to preparation and performance of the larger choral works. May be repeated for credit. Credit 1 hour.

352 Concert Choir. Membership chosen by audition. May be repeated for credit. Four hours a week. Credit 1 hour.

353 University Choir. Membership chosen by audition. May be repeated for credit. Four hours a week. Credit 1 hour.

355 Men's Glee Club. Open to all male students in the University who can qualify on the basis of aud-

itions with the director. Rehearsal and performance of music for male voices. Three hours a week. May be repeated for credit. Credit 1 hour.

357 Women's Chorus. Membership chosen by audition. Three hours a week. May be repeated for credit. Credit 1 hour.

361 Symphonic and Marching Band. 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, masterpieces of symphonic band literature. Meets daily. May be repeated for credit. Credit 1 hour.

362 Concert Bands. Membership chosen by audition. May be repeated for credit. Credit 1 hour.

371 Music Theatre Workshop. Open to all students who can qualify on the basis of auditions with the instructor. May be repeated for credit. Section 1 (Interpretation). Exercises improvisations and musical dramatic interpretation for the singing actor. Section 2 (Opera Scenes. Rehearsal and production of opera scenes. Section 3 (Music Comedy). Musical dramatic interpretation of musical materials. Each section. One lecture-demonstration, 1 laboratory per week. Credit 1 hour.

372 Music Theatre Orchestra. Open to all students who can qualify on the basis of auditions with the instructor. Participation in Lyrical Opera Theatre productions. May be repeated for credit. Section 1 (Opera Orchestra) 2½ hours per week; Section 2 (Chamber Opera Orchestra) 4 hours per week. Credit 1 hour.

373 Music Theatre Production. Open to all students who can qualify on the basis of auditions with the instructor. Participation in Lyrical 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. Credit 1 hour.

381 Chamber Music Ensembles. String brass, woodwind percussion keyboard vocal and mixed ensembles. Prerequisite: approval of instructor. Two hours a week. May be repeated for credit. Credit 1 hour.

382 Collegium Musicum. Singers and instrumentalists specializing in the performance of early and unusual music. Prerequisite: approval of instructor. Two hours a week. May be repeated for credit. Credit 1 hour.

383 University Singers. Small choral ensemble chosen by audition. Two hours a week. May be repeated for credit. Credit 1 hour.

384 Brass Choir. Specializing in public performance of music written for brass instruments. Prerequisite: approval of instructor. Two hours a week. May be repeated for credit. Credit, 1 hour.

385 Percussion Ensemble. Rehearsal and performance of standard and original repertoire for the percussion ensemble and related instruments. Membership by approval of the instructor. Two hours a week. May be repeated for credit. Credit, 1 hour.

386 Stage Band. Rehearsal and performance of literature for the stage band. Membership by approval of the instructor. Four hours a week. May be repeated for credit. Credit, 1 hour.

387 Accompanying. Keyboard and majors Piano accompaniments found in vocal and instrumental literature, discussion of styles and performance practices experience in public performance. May be repeated for credit. Two hours a week. Credit, 1 hour.

388 Accompanying. Accompanying majors (others at the discretion of instructor). Piano accompaniments found in vocal and instrumental literature discussion of styles and performance practices experience in public performance. May be repeated for credit. Two hours a week. Credit, 1 hour.

495 Solo Performance. For Bachelor of Music and Bachelor of Arts in Education degree candidates where one half recital is a graduation requirement. No credit.

496 Solo Performance. For Bachelor of Music in Performance degree candidates where a full recital is a graduation requirement. Prerequisite: MUP 495. No credit.

539 Advanced Conducting. Advanced baton technique for band and orchestra. Score reading mechanics of conducting and individual criticism of style. Prerequisites: MUP 339, 340 or equivalent. Credit, 2 hours.

595, 596 Solo Performance. For Master of Music candidates in applied music only. May be full recital major or operatic role solo performance with orchestra or an ensemble or lecture recital. Credit, 1 hour each semester.

Special Courses: MUP 494, 498, 499, 580, 590, 591, 594, 598, 690. See pages 48-49.)

Speech and Theatre

Professors:

ARNOLD (STAUF 412), CLUFF, DAVIS
MOWRER RICHARDS, STITES YEATER

Associate Professors:

CASE, DOYLE, GOHEEN, PERRILL WITT

Assistant Professors:

ABRAMSON AUSBERGER, BARTZ, BELL
BULEY, CHUBRICH DOBKIN EAKINS ELSEA,
HETHERINGTON HEWES HIRSCH NGLS
SMITH, WRIGHT

Departmental Major Requirements Bachelor of Arts Degree Curriculum

COMMUNICATION. Consists of 45 semester hours, of which at least 30 hours must be in Communication courses and a minimum of 15 hours in one or more related fields approved by the advisor. The core courses COM 100 and 333, are required and at least 18 hours of the major must be in upper division courses. Specific courses to fulfill the major are selected by the student in consultation with his/her advisor. The major is designed to provide a liberal education for any student and is appropriate as preparation for graduate study and for such professions as law, politics, and the ministry.

THEATRE. Consists of 45 semester hours of credit selected in consultation with an advisor to provide a balanced representation of courses within areas of theatre specialization. The selected program must include THE 100, 101 or 105, 213, 214, 215, 320, 321, 330, 340, 345 and at least two hours credit in THE 301, chosen from at least two different production options, and ac-

cumulate at least three hours of credit in THE 325. The theatre major normally will include 15 semester hours of course work in such related studies as art, dance, English, mass communication, music and communication.

GENERAL STUDIES: To meet the General Studies requirement for the B.A. degree in Communication or Theatre, all students must take a minimum of 54 semester hours of credit of which 12 semester hours must be in the humanities and fine arts, 12 in social and behavioral sciences, and 8 in sciences and mathematics. Majors in Communication or Theatre have somewhat different specific requirements in General Studies; therefore, students should refer to current check sheets for recommended courses. Courses utilized to fulfill General Studies requirements may not be counted as part of the major.

FOREIGN LANGUAGE REQUIREMENT: Knowledge of a foreign language is optional but a foreign language course may be used as General Studies elective.

Bachelor of Science Degree Curriculum

COMMUNICATION. Consists of 45-55 semester hours, of which at least 30 must be in Communication courses and a minimum of 15 in one or more related fields approved by the advisor. At least 18 semester hours must be in upper division courses. All students must complete the core curriculum of COM 100 and 333, and at least two courses must be at the 400 level. In General Studies, the student must meet the College requirements for the Bachelor of Science degree and must complete at least 12 semester hours in the social and behavioral sciences and at least 12 semester hours in science

and mathematics. Specific courses are selected by the student in conference with his/her advisor to provide recommended specialization in particular areas of communication study and behavior. This degree program intends to provide preparation for such fields as business and organization communication, human communication research, public service, law and graduate study.

COMMUNICATION DISORDERS Consists of 45-55 semester hours of credit and provides areas of emphasis in speech pathology and in audiology. The speech pathology emphasis requires 27 semester hours in speech pathology and 3 in audiology, with the remainder in related fields such as psychology and special education. The audiology emphasis consists of a core of 14 semester hours in audiology and 10 in speech pathology, with the remainder selected from courses in physics, mathematics, psychology and electronics. Students pursuing either emphasis should plan the program of studies carefully with an academic advisor in speech pathology or audiology. This is a pre-professional program which assumes subsequent admission to a graduate program and the completion of a master's degree for certification. A student should have a minimum grade point average of 2.75 in the major by the junior year and must have at least an overall GPA of 2.5 at that time in order to remain in the program.

**Bachelor of Fine Arts
Degree Curriculum**

THEATRE This professional degree is available in the areas of child drama or directing only. Applicants must have completed at least 15 hours of course work in theatre, including THE 215, with a 3.00 average or

above in the major. Students in child drama must also complete THE 311. Freshman students should register in a B.A. program until these requirements are met. A 3.00 average in the major is also required for retention in the program. The core curriculum for the degree shall include 36 hours in General Studies with a minimum of 12 hours in approved courses in the humanities and fine arts, 12 in social and behavioral sciences and 8 in sciences and mathematics with at least one laboratory course. Courses in the major or areas related to the major may not be counted as General Studies. A minimum of 84 hours is required in the major. Students should refer to current check sheets for recommended electives in these programs. The student in the child drama emphasis is required to take THE 100, 105, 106, 113, 213, 214, 215, 301, 311, 318, 330, 340, 345, 411, 418, COM 480, EDF 200 or SED 310; EDP 310, SED 311, 411, 433; FIE 314, 333, 335; REA 467, 480. The student in the directing emphasis is required to take THE 100, 105, 106, 113, 205, 206, 213, 214, 215, 301, 305, 315, 316, 320, 321, 325, 340, 345, 415, 416, 417, and 450, with remaining courses selected from electives in the major or approved courses in areas directly related to the major.

**Departmental Major Teaching
Field Requirements
Bachelor of Arts in Education
Degree Curriculum**

COMMUNICATION ARTS Consists of 60 semester hours and is designed to provide preparation for teaching in three fields. Students may place their major emphasis in either Theatre or Communication. Students placing their major emphasis in Theatre must complete a minimum of 24 hours in Theatre, 18 hours in Communication, and

18 hours in a related field, preferably English. Students placing their major emphasis in Communication must complete a minimum of 24 hours in Communication and 18 hours in each of two approved related fields. Those in Communication must complete the core courses, COM 100 and 333, and at least 12 hours must be in upper division course work. Communication Arts majors must earn a minimum of 2 hours in two separate activities courses (COM 301 and or THF 301) but not more than six hours in activities courses may be counted toward the major. Specific courses, from the minor fields options, are selected by the student in consultation with the advisor.

COMMUNICATION Consists of 36 semester hours and anticipates the addition of an approved minor of at least 24 hours. The core courses, COM 100 and 333, are required and at least 18 hours must be in upper division course work. A minimum of 2 hours must be earned in two separate activity courses (COM 301) but not more than 6 hours in activity courses may be counted toward the major. Specific courses to complete the major and the minor are selected by the student in consultation with his advisor.

THEATRE Consists of 42 semester hours of credit which will include THE 100, 105, 106, 113, 213, 214, 215, 301, (3 hours minimum in different areas), 320, 321, 325, (3 hours minimum), 330, 340, 345. Each major will also stage one production with high school students. A teaching minor in Communication or English is strongly recommended to accompany this major.

MINOR IN COMMUNICATION Consists of 24 semester hours in Communication and will normally include COM 100, 220, 333

and 480. At least 9 hours must be in upper division courses.

MINOR IN THEATRE Consists of 24 semester hours in theatre courses. THF 100, 101, 213, 214, 215 are required; plus one additional course in theatre history and two additional courses in technical theatre.

Departmental Graduate Programs

The Department of Speech and Theatre offers programs leading to the degrees of Master of Arts and Master of Science. Consult the Graduate College catalog for requirements.

Students taking 300 and 400 level courses is part of their approved graduate program must indicate the graduate credit option in the appropriate location on the Course Request Option form.

COMMUNICATION

COM 100 Introduction to Human Communication. Focus on the basic theory and dimensions of human interaction, including individual and group experiences in human communication. Credit 3 hours

110 Personal Communication I. Demonstration and practice of communication techniques for meeting people, developing rapport, changing relationships and maintaining a relationship over time. Credit 3 hours

200 Human Communication Systems. Human communication processes and systems: major areas of theory and research and the scientific bases of human communication behavior. Credit 3 hours

210 Personal Communication II. Considers how the qualities of a person affect his communication, and how communication affects the quality of a person's life. Credit 3 hours

220 Survey of Speech Communication. Speech communication as an academic discipline. Theory and limited practice. Surveys speech science, listening group communication, public speaking, interpretation and criticism. Credit 3 hours

221 Voice Improvement. Intensive personal and group experience to improve normal vocal usage, including articulation and pronunciation for platform, stage or mass media. Credit 3 hours.

241 Introduction to Oral Interpretation. Presentational modes of the interpretation of literature. Voice improvement, nonverbal behavior, interface of interpreter, literature and audience and dramatic analysis of literary modes. Credit 3 hours

300 Group Communication. Principles and processes of major group communication. Attitudes and skills for effective participation and leadership in small groups. Small group problem solving and decision making. Not open to freshmen. Credit 3 hours

301 Communication Activities. Communication activities: forensics, interpreters, theatre and teacher apprenticeship. May be repeated for credit. Prerequisite: approval of instructor. Credit 1-3 hours

303 Interviewing. Training as an interviewer and interviewer in various types of interviews: informational, persuasive, appraisal and employment. Not open to freshmen. Credit 3 hours

305 Large Group Communication. Theory, methods and individual communication behavior relevant to large group interaction systems. Public discussion and parliamentary procedure in various types of public and deliberative assemblies. Not open to freshmen. Credit 3 hours

311 Public Speaking. Verbal and nonverbal communication in platform speaking. Discussion and practice in vocal and physical delivery and in purposeful organization and development of public communication. Prerequisite: COM 100 or approval of instructor. Credit 3 hours

312 Argumentation and Debate. Philosophical and theoretical foundations of argumentation and forensics, emphasizing problems in argumentation and debate. Credit 3 hours

320 Communication and Consumerism. Critical evaluation of messages designed for public consumption. Perceiving, evaluating and responding to political, social and commercial communication. Credit 3 hours

330 Nonverbal Communication. The effects of space, time, body language, environment, objects and voice qualities on communication. Credit 3 hours

333 Criticism and Research Methods in Communication. Critical analysis and historical descriptive and quantitative research methods for communication. Credit 3 hours

341 Interpretation in Social Contexts. Literature as an extension of life in conflict situations in crisis as therapy, role playing and symbolic behavior. Prerequisite: COM 241 or approval of instructor. Credit 3 hours

369 Language in Communication. Intrapersonal and interpersonal influences of language on communication. Development of meaning and theories of semantics. The social functions of language. Not open to freshmen. Credit 3 hours.

380 Communication Perspectives for the Teacher. Creating classroom processes to be analyzed in terms of communication principles, concepts and skills. For future teachers. Credit 3 hours.

400 Leadership in Group Communication. Theory and process of leadership in group communication, emphasizing philosophical foundations, contemporary research and applications to group situations. Prerequisite: COM 300 or approval of instructor. Credit 3 hours

405 Communication in Business and Profession. Interpersonal group and public communication methods and practices in business and profession with emphasis on theory and communication behavior relevant to the organizational setting. Credit 3 hours

411 Message Construction and Communication. Advanced theory of the composition, presentation and evaluation of public communication with emphasis on verbal and nonverbal cues, intensive practice in organizing, developing and presenting persuasive messages. Prerequisite: COM 100, 311 or approval of instructor. Credit 3 hours

412 Argument. Comparison of closed and open systems of argument. Possible applications: esthetic argument, science as argument, shared reality as argument. Prerequisite: upper division standing. Credit 3 hours

415 Teaching Communication in the Elementary School. Communication behavior development in pre-school and elementary children. Symbolic behavior materials and methods for effecting desired changes in communication behavior. Credit 3 hours

441 Interpretation as Literary Criticism. Literature through the medium of performance. Problems of content, structure and style of various literary genres—poetry, drama and prose—narrative analysis and communication. Prerequisite: COM 241 or approval of instructor. Credit 3 hours

442 Interpretation and Mass Media. The modern media and the use of literary and dramatic forms. Interfacing process: eye of the camera, script and performance. Credit 3 hours

443 Interpreters Theatre. Theory and practice in Interpreters Theatre. Problems in choral reading, story theatre and concert reading methods of presentation. Analysis, editing, adapting, directing and staging. Credit 3 hours

mater a Prerequisite COM 241 301 or approval of instructor Credit, 3 hours

444 Oral Traditions. Cultures through their oral literature such as myths legends folktales and fables Prerequisite COM 241 or approval of instructor Credit 3 hours

450 Topics in Public Address. The history and criticism of a) American speakers (1700 to 1900) b) contemporary speakers 1900 to the present and c) British speakers Topics offered alternate semesters Credit 3 hours each semester

460 Contemporary Criticism. Contemporary critics and theorists such as A. Richards Kenneth Burke and Marshall McLuhan Prerequisite upper division standing. Credit 3 hours

473 Persuasion. Communication variables which influence and modify attitudes and behavior of receivers Prerequisite COM 100 or 312 Credit 3 hours

476 Political Communication. Theory and research related to political campaign communication The persuasive process of political campaigning the role of the media the candidate and image creation Prerequisite upper division standing Credit 3 hours

480 Methods of Teaching Communication and Theatre. Analysis, organization and presentation of textual and other classroom materials Credit 3 hours

481 Teaching Practicum. Teaching high school students the fundamentals of forensics Offered in Summer Session only Credit 2 hours.

494 Special Topics. Credit 3 hour Special topics including the following which are regularly offered are open to all students freshmen by approval of instructor only.

- a) Criticism of Empirical Research.
- b) Measurement in Communication
- c) Quantitative Methods in Communication Research
- d) Organization Communication
- e) Urban Communication
- f) Crisis Communication
- g) Intercultural Communication
- h) Studies in Communication Education
- (i) Speech Writing and Manuscript Speaking
- (j) Preachers and Preaching
- k) Women's Communication
- l) Ethics in Communication
- m) Methods of Organization and Control

591 Seminar. Credit 3 hours. Topics may be selected from the following

- a) Classical Rhetorical Theory
- b) Modern Rhetorical Theory
- (c) Contemporary Rhetorical Theory
- d) Rhetorical Criticism
- (e) Persuasion
- f) Interpretation History and Criticism
- (g) Interpretation Poetic Theory
- h) Group Communication Theory
- i) Empirical Research in Communication
- j) Theories of Communication.
- k) Organizational Communication.
- l) Communication Education
- (m) Theory and Model Construction in Communication

Special Courses: COM 500 580 584 590 592 594, 598, 599 See pages 48-49)

COMMUNICATION DISORDERS

CDX 167 Language Acquisition in Early Childhood. The process of language development in the normal child from birth through preschool Observations of child language behavior Credit 2 hours.

300 Developmental Psycholinguistics. Child language acquisition and how it has been influenced by current theoretical developments in linguistics and psycholinguistics. Observations of a child in the process of acquiring language Credit 3 hours.

305 Survey of Communication Disorders. Evaluation and treatment of communication disorders. Role of parent teacher and others in development of children in environment, adult and gerontological problems in communication disorders Not open to Communication Disorders majors Credit 3 hours

310 Anatomy and Physiology of Speech. Anatomy and physiology of the neuromuscular and skeletal systems which subserve human speech behavior Credit 3 hours

311 Anatomy and Physiology of Hearing. Anatomy and physiology of the peripheral and central systems which subserve hearing Credit 2 hours.

315 Acoustics in Communication. Physical characteristics and behavior of acoustic energy in speech and hearing science Prerequisites algebra trigonometry and general physics Credit 3 hours

320 Introduction to Audiology. Normal process of hearing and the nature and causes of auditory pathology Prerequisite CDX 311 Credit 3 hours

350 Phonetics. Speech sounds and the application of the international Phonetic Alphabet American speech Credit 3 hours

370 Psychology of Language. The nature of language Relationship between language and thought stressed Credit 3 hours

380 Introduction to Communication Disorders. Each student must spend a minimum of two clock hours a week in laboratory as an aide in the University Speech and Hearing Clinic Open to majors in Communication Disorders only Prerequisite CDX 310 or approval of the instructor Credit 4 hours

390 Problems of Articulation. Detailed analysis of disorders of articulation Prerequisite CDX 380 or approval of instructor Credit 2 hours

395 Methods in Modification of Communication Disorders. Principles and techniques of modifying speech and language behavior Two lectures 4 hours laboratory Prerequisite approval of instructor Credit 4 hours

400 Methods of Audiometry. Techniques and instrumentation used in measuring auditory threshold and audiogram interpretation Prerequisites CDX 315 and 320 Three hours lecture 1 hour laboratory. Credit 4 hours

402 Hearing Conservation in the Public Schools. Participation in public school audiological testing programs with classroom discussion Prerequisites CDX 167, 310 350 May be taken concurrently with CDX 320 Credit 2 hours

427 Practicum in Audiometric Testing. Practical application of techniques in audiometry Two hours discussion 6 hours laboratory Prerequisite approval of instructor. Credit 3 hours

430 Psychology of Hearing Handicap. Discussion of the intellectual personality and educational problems that confront the hearing handicapped individual Credit 2 hours

431 Tests and Measurements of the Hearing Handicapped. Evaluation procedures in hearing ability as applied to the preschool child plus discussion of the intellectual social, personality speech and language measures as they apply to the hearing handicapped. One hour laboratory per week Prerequisite CDX 430 or approval of the instructor Credit 2 hours

432 Hearing Rehabilitation. Theories and practices in rehabilitation of the hearing handicapped person Prerequisite CDX 431 Credit 3 hours

433 Practicum in Hearing Rehabilitation. Practical application of techniques of habilitation and rehabilitation of the auditory impaired Prerequisite approval of instructor. Credit 2 hours

435 Noise and Society. Effects of noise on individuals and communities and practical solutions to noise problems Prerequisite: CDX 315 or approval of the instructor Credit, 3 hours

451 Practicum in Communication Disorders. Supervised practice in treating speech disorders with the University Speech and Hearing Clinic Prerequisite: approval of the instructor Credit 3 hours

475 Language and the Culturally Different Child. Problems of children who are culturally different and who have not learned standard English How to assist such children to cope with school Credit 3 hours

485 Language and the Mentally Retarded Child. Special features that mentally retarded children encounter in acquiring language, language intervention strategies for retarded children Persons enrolled will observe, and when possible work with, a retarded child Credit 3 hours.

491 Disorders of Fluency. Causes, therapies and current trends in problems of speech fluency Credit, 3 hours

502 Advanced Audiology. Procedures in different diagnosis of auditory pathologies Prerequisite: CDX 427. Credit, 2 hours

504 Auditory Prosthetics. Methods of hearing amplification Measurement and evaluation of amplification systems as they apply to the hearing impaired individual Prerequisite: CDX 400 Credit 3 hours

519 Research Procedures in Communication Disorders. Research philosophy and methods as applied to data collection, evaluation and reporting in the field of communication disorders Credit 3 hours

521 Therapy Techniques for Disorders of Fluency. Selected therapeutic procedures currently used to improve speech fluency Two hours lecture 3 hours laboratory in technique applications Prerequisite: CDX 491 or equivalent Credit 3 hours

527 Advanced Practicum in Audiometric Testing. Supervised clinical aspects in hearing testing and evaluation of auditory pathology One hour discussion 5 hours laboratory May be taken concurrently with CDX 502 Prerequisites: CDX 427 502 and approval of instructor May be repeated for credit Credit 3 hours

530 Administration of Public School Speech Therapy Services. Present practices in public school therapy programs and designs for innovative change Credit 3 hours

541 Evaluation of Communication Disorders. Methods of evaluating communication disorders. Two lec-

tures 3 hours laboratory. Prerequisite: approval of the instructor Credit, 3 hours.

542 Advanced Evaluation of Communication Disorders. Selected procedures for evaluating communication disorders One lecture, 2 hours laboratory Prerequisites: CDX 541 and approval of instructor. Credit 2 hours

551 Advanced Treatment of Communication Disorders. Supervised professional services in communication disorders Six to 10 hours laboratory per week. Prerequisite: approval of instructor May be repeated for credit Credit 3 hours

552 Individual Experiences in Professional Services. Selected therapy experiences under selected faculty. Prerequisite: CDX 551 and approval of the instructor May be repeated for credit Students may enroll in more than one section concurrently Credit 1-3 hours.

564 Internship in Communication Disorders. Off campus directed experiences in either speech pathology language disorders or hearing disorders Students must enroll by mid semester of the previous semester Specific permission from the department is required May be repeated for credit Credit 1-6 hours

570 Professional Issues in Communication Disorders. Professional issues facing graduating students in communication disorders as they relate to individual class members and their involvement in the profession Credit 3 hours

575 Neurological Disorders of Speech—Aphasia. Communication disorders related to damage to the central nervous system assessment and treatment Credit 2 hours

576 Neurological Disorders of Speech—Cerebral Palsy. Communication disorders related to cerebral palsy assessment and treatment Credit 2 hours

577 Oro-facial Disorders of Speech—Cleft Palate. Communication disorders related to anomalies of the orofacial structures including cleft lip and palate and dental malocclusion Prerequisite: CDX 310 or approval of instructor Credit 2 hours

578 Disorders of Voice. Communication disorders related to dysfunction and the phonatory and resonance systems of voice production assessment and treatment Credit 2 hours

Special Courses: CDX 494 498 590 591, 592 598 599 See pages 48-49)

THEATRE

THE 100 Introduction to Theatre. Elements of the theatre: playwrighting, directing acting design and architecture Credit 3 hours

101 Introduction to the Art of Acting. Lectures exercises and projects in acting. For theatre minors nonmajors and students who plan no additional acting courses. Credit 3 hours

105 Acting: Expression. Exercises and techniques for freeing the emotional physical and vocal capabilities of the actor Five hours a week Credit 3 hours

106 Acting: Theatre Techniques. Physical and vocal disciplines for the actor, including the use of International Phonetic Alphabet for stage speech Five hours a week Credit 3 hours.

113 Acting: Make-up. Techniques of theatrical make-up laboratory projects Credit 3 hours.

200 Introduction to Film as Theatre. Elements of the theatrical film cinematography sound editing directing acting, scriptwriting production and criticism. Three lectures, 2 hours laboratory Credit 3 hours

205 Acting: Workshop. Rehearsal and public performance of assigned scenes May not be taken concurrently with THE 315 Prerequisites: THE 100 105, 106 and written approval of instructor Two hours performance lecture 6 hours rehearsal laboratory Credit 3 hours

206 Acting: Character Analysis. Problems methods and procedures of actors in preparing a role for presentation on the stage through the most frequent uncredited plays in the world repertoire Credit 3 hours

213 Introduction to Technical Theatre. Design and construction of scenery, lighting and properties Prerequisite: Theatre major minor or approval of instructor. Credit 2 hours

214 Technical Theatre Practicum. Demonstrations and laboratory projects in procedures of technical theatre production Three hours laboratory Prerequisite: THE 213 or approval of instructor May be taken concurrently with THE 213 Credit 2 hours

215 Directing: Theatre Techniques. Basic tools of the director: composition, blocking footprints, stage business auditions rehearsal techniques etc Prerequisites: THE 105 205 213 and or written approval of instructor Credit 3 hours

301 Theatre Production. Participation in University Theatre productions Prerequisite: written approval of instructor. May be repeated for credit Credit, 1-3 hours

305 Acting: Modern Workshop. Rehearsal and public performance of modern, realistic, avant-garde and musical plays. May not be taken concurrently with THE 415. Prerequisites: THE 205, 206 and/or written approval of instructor. Two hours performance-lecture; 6 hours rehearsal-laboratory. Credit, 3 hours.

306 Acting: Period Workshop. Rehearsal and public performance of period plays from the Greeks to the advent of modern realism. May not be taken concurrently with THE 416. Prerequisites: THE 205, 206 and/or approval of instructor. Two hours performance-lecture; 6 hours rehearsal-laboratory. Credit, 3 hours.

311 Creative Drama. Theories, procedures and materials for creative drama in the elementary and junior high schools. Related drama activities—story telling, choral speaking and puppetry. Not open to freshmen. Credit, 3 hours.

315 Directing: Workshop. Rehearsals and public performance of scenes and short plays. May not be taken concurrently with THE 205. Prerequisites: THE 106, 213, 215 and/or approval of instructor. Two hours performance-lecture; 6 hours rehearsal-laboratory. Credit, 3 hours.

316 Directing: Analysis and Style. Play analysis and production style for the director, including preparation of complete prompt books for a modern and a period play. Prerequisites: THE 315 and/or approval of instructor. Credit, 3 hours.

318 Theatre for Children. Dramatic literature for children. Experience in acting, directing and production technique for child audiences. Credit, 3 hours.

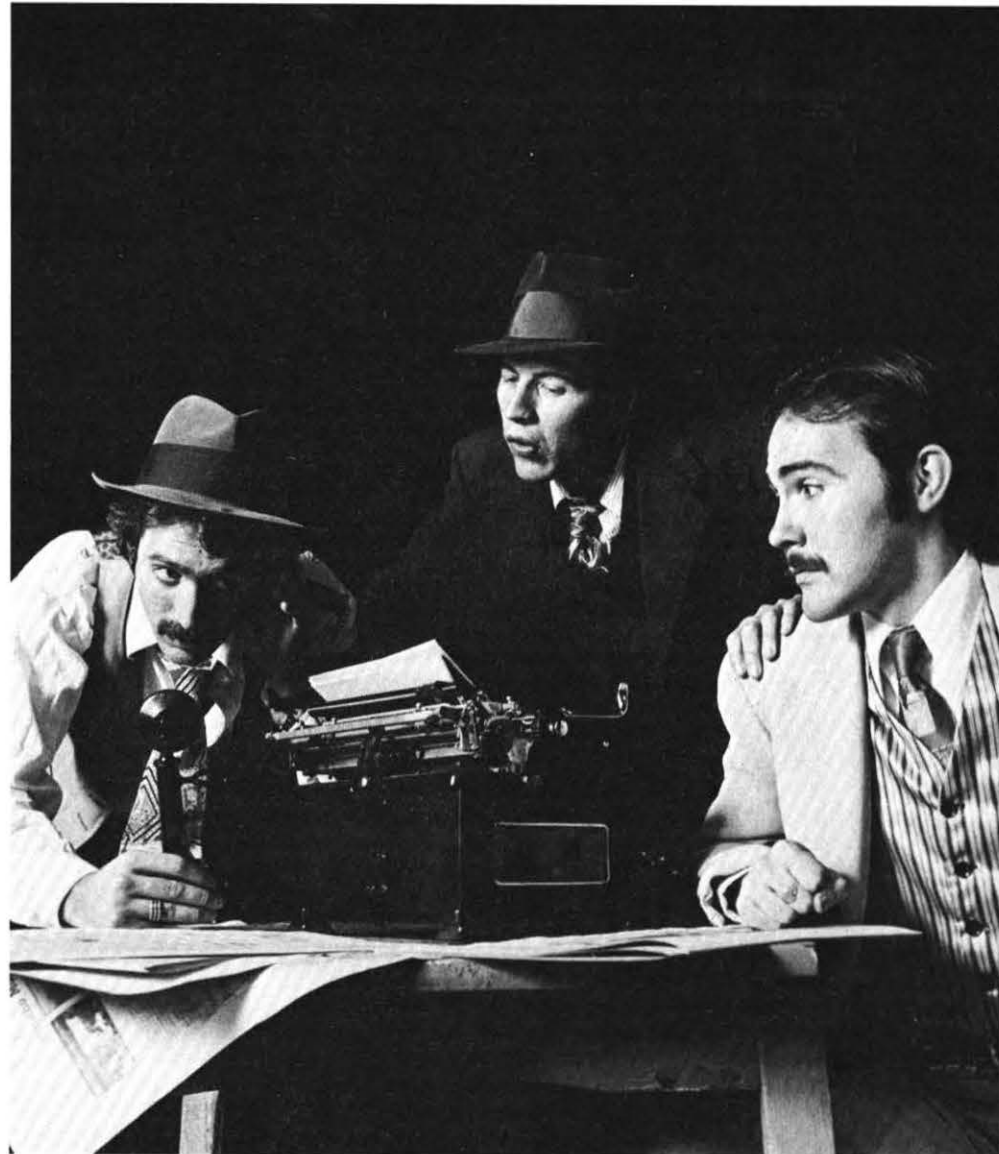
320, 321 History of the Theatre. First semester traces major developments in theatre production from its beginning through the 17th century; second semester continues the survey to modern times. Credit, 3 hours each semester.

325 Play Reading. Readings and familiarization with plays most frequently included in the modern theatre repertoire. May be repeated to a maximum of 3 hours credit. Credit, 1 hour.

330 Introduction to Costuming. History of theatrical costume. Laboratory experience in construction of costumes. Three lectures, 2 hours laboratory. Credit, 3 hours.

331 Costume Construction. Uses of materials and techniques for stage costumes with actual construction of period apparel. Prerequisite: THE 330. Credit, 3 hours.

335 Technical Theatre. Selection of materials, drafting of working drawings, tool operation and construction techniques. Two lectures, 3 hours labo-



ratory. Prerequisite THE 213 214 or approval of instructor. Credit, 3 hours.

340 Scene Design. Studio projects in designing realistic scenery for the contemporary proscenium stage. Prerequisite THE 213 or 214 or approval of instructor. Credit 3 hours.

345 Lighting Design. Electrical and design principles of modern stage lighting. Two lectures, 3 hours laboratory. Prerequisite THE 213 214 or approval of instructor. Credit 3 hours.

405 Acting: Stage Dialects. Major dialects for the stage based upon study of the International Phonetic Alphabet. Prerequisite THE 106 and or written approval of instructor. Credit 3 hours.

406 Acting: Manners and Movement. Physical movement for period plays, movement in costume and use of properties. Prerequisite theatre major or approval of instructor. Credit 3 hours.

407 Acting: TV Film. Special technical aspects of acting before a camera. Four hours a week. Prerequisite: THE 106 and or written approval of instructor. Credit 3 hours.

411 Advanced Studies in Creative Drama. Application of theories, techniques and materials for dramatic composition. Regular participation with children. Prerequisite THE 311 or approval of instructor. Credit 3 hours.

413 Acting: Special Make-up Problems. Special problems, styles and materials for stage make-up. Prerequisites THE 113 and or approval of instructor. Credit 3 hours.

415 Directing: Modern Workshop. Rehearsal and performance of modern realistic avant-garde and musical plays. May not be taken concurrently with THE 305. Prerequisite THE 316 and or approval of instructor. Two hours performance-lecture, 6 hours rehearsal-laboratory. Credit 3 hours.

416 Directing: Period Workshop. Rehearsal and performance of plays from the Greeks to the advent of modern realism. May not be taken concurrently with THE 306. Prerequisite THE 316 and or approval of instructor. Credit 3 hours.

417 Stage Management. Readings in stage management and participation as a stage manager in a University Theatre production. Prerequisite written approval of instructor. Credit 3 hours.

418 Advanced Studies in Theatre for Children. Experimentation with the creation, direction and production of plays for children. Innovative uses of movement, visual effects, music, etc. will be explored. Credit 3 hours.

420 History of the American Theatre. History of the plays, artists and events in the development of the American theatre from colonial to modern times. Credit 3 hours.

421 History of the English Theatre. History of the plays, artists and events in the development of the theatre in England and from the Middle Ages to the present. Credit 3 hours.

425 History of the Oriental Theatre. History and production techniques of theatre forms in India, China and Japan. Prerequisite six hours of theatre history or approval of instructor. Credit 3 hours.

430 Costume Design. Principles of costume design with special projects in period and modern styles. Prerequisite THE 330. Credit 3 hours.

440 Advanced Scene Design. Advanced studio projects in designing non-realistic scenery for a variety of stage forms. Prerequisite THE 340 or approval of instructor. Credit 3 hours.

441 Scene Painting. Studio projects in painting stage scenery. Prerequisite THE 340 or approval of instructor. Credit 3 hours.

445 Advanced Lighting Design. Specialized techniques in stage lighting including design practices for arena and thrust stages. Prerequisite THE 345 or approval of instructor. Credit 3 hours.

450 Theatre Organization and Management. Principles of administrative, professional and non-professional theatre production organization. Credit 3 hours.

460 Dramatic Composition for the Stage and Screen. Fundamentals and practice of writing for the theatre, the motion picture and television. Credit 3 hours.

494 Special Topics. Credit, 1–4 hours. Topics may be selected from the following:

- a) Storytelling and Oral Reading
- b) Curriculum and Supervision of Child Drama in the School
- (c) Drama in Recreation
- (d) Puppetry

503 Studies in Theatre History. Resources, ideas and trends in major eras of theatre history with application to modern theatre production. Credit 3 hours.

504 Studies in Dramatic Theory and Literature. Major or dramatic themes from the classical period to the present. Related readings in dramatic literature. Credit 3 hours.

505 Studies in the Theory and Practice of Acting and Directing. Major theories and actual practices in world theatre. Credit 3 hours.

506 Studies in Scenic Environments. Coordinated studies in conceptualizing the scenic environment with emphasis on innovative visual statements appropriate to actual production. Credit 3 hours.

510 Studies in Literature. Assigned readings in standard sources and masterpieces in theatre literature. May be repeated for different sections. Credit 1 hour. Topics may be selected from the following:

- a) Acting Directing
- b) Design Technica
- (c) History
- (d) Criticism

584 Internship in Child Drama. Practical application of creative drama in the classroom or on the playground. Supervised regular creative drama sessions with children. Credit 1–3 hours.

591 Seminar. Credit 3 hours. Topics may be selected from the following:

- a) Theatre History and Criticism
- b) Theatre Production
- c) Creative Drama and Theatre for Children

594 Conference and Workshop in Child Drama. Credit 3 hours.

Special Courses: THE 498 592 598 599. See pages 48–49.

Center of Criminal Justice

I. GAYLE SHUMAN, Ed.D.,
Director

Purpose and Philosophy

The primary purpose of the Center of Criminal Justice is to provide the foundations for professional development to pre-service and in-service personnel in the field of criminal justice.

Criminal justice is a multi-disciplinary, problem oriented field of scholarship, research, and teaching, embracing those aspects of social, behavioral, natural, and forensic sciences relevant to understanding crime and social deviance, and entailing a critical examination of the systems which have evolved for handling attendant problems.

Degrees

Bachelor of Science in Criminal Justice.

The curriculum for the degree of Bachelor of Science in Criminal Justice is designed to provide the student with a broad, liberal education. The curriculum maintains a strong multi-disciplinary foundation, is social science oriented, academic in content, and has as its objective the preparation of students as generalists for entry level positions in the criminal justice system.

Master of Science in Criminal Justice.

The Master of Science in Criminal Justice curriculum is designed to prepare students for professional positions in functional criminal justice agencies, for teaching positions in community and four year colleges, or for further study and research in the field of criminal justice. Information on the Master of Science in Criminal Justice is detailed in the Graduate Catalog.

Degree Requirements

The Center of Criminal Justice awards a

Bachelor of Science degree in criminal justice upon the successful completion of a curriculum of 126 semester hours consisting of:

	<i>Semester Hours</i>
General Studies Requirements	54
Criminal Justice Core Requirements	30
Related Criminal Justice Courses	15
Electives	27
<i>Total</i>	<i>126</i>

In addition, the student must fulfill the following requirements:

1. Have accumulated a minimum of 50 semester hours of upper division courses.
2. Have completed a minimum of 30 semester hours, including 24 in the Criminal Justice Core Curriculum, at this University.
3. Have obtained a cumulative grade point index of 2.00 or better for all criminal justice courses taken at this University.
4. Have met the University's residency and scholarship requirements.
5. Have demonstrated a reasonable proficiency in written English by receiving a grade of "C" or better in both ENG 101 and FNG 102, or in FNG 104 or its equivalent.

General Studies Program. To meet the University's general studies requirements, and to assure breadth and depth of the student's education, all criminal justice students must complete a total of 54 semester hours of general studies courses, excluding all criminal justice courses and the 15 hours of related courses counted toward the major, with the designated minimum semester

hours in each of the following fields:

HUMANITIES AND FINE ARTS: 12 hours.

Architecture (APH courses *only*)
Art History (ARH courses *only*)
English *except* ENG 101, 102, 104)
Foreign Languages
Humanities
Music (MUS courses *only*)
Philosophy

SOCIAL AND BEHAVIORAL SCIENCES: 12 hours.

Anthropology
Economics
Engineering
Geography (GCY courses *only*)
History
Political Science
Psychology (PGS courses *only*)
Sociology

SCIENCES AND MATHEMATICS: 12 hours. (At least one *must* include a laboratory section.)

Botany and Microbiology (all BIO, BOI and MIC courses)
Chemistry
Geography Physical (GPH courses *only*)
Geology
Mathematics
Physics (PHY and AGS courses *only*)
Psychology (PSY courses *only*)
Zoology (all BIO, ENT and ZOI courses)

OTHER GENERAL COURSES: 18 hours. All Criminal Justice students must complete a course in speech, unless waived, as a part of these 18 hours. Additional courses may be taken from the above fields as limited by the exceptions indicated, or other fields as approved by the student's advisor.

Criminal Justice Program. Consists of 45 semester hours of credit, of which 30 must be in Criminal Justice and 15 from related fields approved by the Center of Criminal Justice. The 30 hours must include CRJ 100, 301, 310, 360, 402, and 463. The remaining 12 hours can be selected from CRJ 311, 320, 440, 461, 462, 480, 494, 498, and 499.

The 15 hours of related courses must include one course from each of the following groups.

Basic Courses.

ANT 102 Introduction to Cultural and Social Anthropology
ANT 311 Principles of Social Anthropology
POS 100 Government and Politics
POS 200—Problems of American Government
SOC 101 Introduction to Sociology
SOC 250—The Community
SOC 301 Principles of Sociology
SOC 470 Community Resources

Cultural and Historical Background Courses.

ANT 351 Culture and Personality
HIS 303 American Cultural History
HIS 304—American Cultural History
SOC 341 Modern Social Problems
SOC 360 The Social System and the Individual
PGS 350—Social Psychology

Ethnic and Minority Groups.

ANT 321—Southwestern Ethnology
ANT 342 Human Races
HIS 333 The Black American Experience
HIS 339 The Mexican American Experience
POS 439 Minority Group Politics in America
SOC 440 Racial and Ethnic Minorities

Understanding of Management.

POS 420—Introduction to Public Administration
POS 423 Public Personnel Administration
MGT 301 Principles of Management
MGT 311 Personnel Administration
ECN 201 Principles of Economics
ECN 202 Principles of Economics
ECN 305 Contemporary Economic Issues

Understanding of the Helping Process.

CDE 456 Parent Adolescent Relationships
PGS 459 Attitude and Attitude Change
PGS 466—Abnormal Psychology
PGS 458—Group Dynamics
SOC 340 Sociology of Deviant Behavior
SOC 352 Social Change
SOC 446—Sociology of Crime
SOC 447 Sociology of the Judicial System
SOC 371 Social Welfare as a Social Institution
SOC 372 Social Welfare as a Social Institution

Electives. A student is encouraged, in consultations with his advisor, to select an area of concentration in utilizing his 27 semester hours of electives. Chemistry, Economics, Education, Engineering, Management, Political Science, Psychology, Quantitative Systems, and Sociology are only a few of the academic units offering specialized knowledge of value to the criminal justice practitioner.

Transfer of Community College Credits.

Credits transferred from accredited community colleges will be accepted as lower division credits up to a maximum of 64 semester hours. The acceptance of credits will be determined by the Director of Admissions and the applicability of credits toward degree requirements will be determined by the Center of Criminal Justice

Criminal Justice

Professors:

HEGARTY

Associate Professors:

SHUMAN ASB 304 BROWN BR NS
GERBER KENNEDY

Assistant Professors:

MELICHAR SCHADE

Lecturers:

IREY, JESPERSON, STRICKLAND ZETTLER

CRJ 100 The Criminal Justice System. An overview of the criminal justice system. Roles of law enforcement personnel, the courts and correctional agencies. Philosophical and theoretical views in historical perspective. Credit, 3 hours

301 Research and Statistics in Criminal Justice. Introductory exposure to methods of statistical analysis. Application of social science research methods to criminal justice problems. Problem formulation study and analysis of data in the context of contemporary agency needs. Prerequisite: CRJ 100 or approval of instructor. Credit 3 hours

310 Rehabilitation of the Criminal Offender. Custodial supervision within the criminal justice system. Compatibility of therapeutic processes with societal needs for protection. Concerns of law enforcement, courts and corrections for control of deviant behavior and the rehabilitative treatment of the individual offender. Prerequisite: CRJ 100 or approval of instructor. Credit 3 hours

311 Prevention of Delinquent and Criminal Behavior. Theories of prevention, individual, group, and community approaches; intervention at appropriate stages; contemporary law enforcement and corrections practices. Prerequisite: CRJ 100 or approval of instructor. Credit 3 hours

320 Social Class and the Criminal Justice System. Social and economic status as factors on the operation of the criminal justice system. Societal factors that enhance merit, or deny access to the system's benefits. Different perceptions of the system as associated with social class and status. Prerequisite: CRJ 100 or approval of instructor. Credit, 3 hours

360 Law and Social Control. 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: CRJ 100 or approval of instructor. Credit 3 hours

402 Criminal Justice Theory. A conceptual examination of the criminal justice system. Integration of contemporary thought into an operational frame of reference. Prerequisite: 6 hours in Criminal Justice or approval of instructor. Credit 3 hours

440 Organization and Administration of the Criminal Justice System. System-wide analysis of organizational structures. Management and administrative policies of criminal justice agencies in law enforcement, courts and corrections. Prerequisite: 6 hours in Criminal Justice or approval of instructor. Credit 3 hours.

461 Substantive Criminal Law. Criminal liability. Crimes against persons, property and society. Governmental sanctions of individual conduct as formulated by legislatures and the courts. Prerequisite: CRJ 360 or approval of instructor. Credit 3 hours

462 Procedural Criminal Law. The criminal process. Constitutional and legal problems associated with criminal procedures. Due process of law. Prerequisite: CRJ 360 or approval of instructor. Credit 3 hours

463 Discretionary Justice. Use of discretionary authority throughout the phases of the criminal justice system. Cross-purpose effect of discretionary justice. Constitutional limitations on and judicial review of discretionary authority. Prerequisite: CRJ 360 or approval of instructor. Credit 3 hours.

480 Internship in Criminal Justice. Assignments in a criminal justice agency designed to further the student's integration of theory with practice. Placements are arranged through consultation with students and agencies. Prerequisite: 6 hours in Criminal Justice or approval of instructor. Credit, 3 hours

494 Special Topics in Criminal Justice. Topics chosen from various fields of criminal justice. Prerequisite: 6 hours in Criminal Justice or approval of instructor. Credit, 1 to 3 hours

498 Pro-Seminar. Small group study and research for advanced students. Prerequisite: 6 hours in Criminal Justice or approval of instructor. Credit 3 hours

499 Independent Study. Original study or investigation in the advanced student's field of interest. Prerequisite: 6 hours in Criminal Justice or approval of instructor. Credit, 1 to 3 hours

500 Criminal Justice Research Methods. Theories and methods of research with emphasis on development of designs most relevant to criminal justice data and problems. Credit 3 hours.

501 The System of Criminal Justice. Historical con

temporary and comparative analysis of the criminal justice system. Interaction among law enforcement, courts and corrections agencies and their relation to institutions and groups external to the system. Credit 3 hours

502 Organization and Management in Criminal Justice. Criminal justice organization and management utilization of current research studies with reference to law enforcement, courts, and corrections agencies. Credit 3 hours

503 Approaches to Understanding and Changing Criminal Behavior. Major theories of psychopathology with specific emphasis on criminal and delinquent behavior. A survey of intervention approaches currently employed to rehabilitate. Credit 3 hours

510 Understanding the Offender. Contemporary personality theories and their relevance in understanding the juvenile and adult offender. Analysis of learning theory, ego psychology and psychoanalytic and humanistic psychology concepts. Prerequisite: completion of core or permission of instructor. Credit 3 hours

511 Criminal Behavior: Programs and Techniques for Change. Effectiveness of current intervention techniques and programs utilized with juvenile and adult offenders. Community-based efforts and institutional programs. Current research on the experimental analysis of behavior of the offender. Prerequisite: completion of core or permission of instructor. Credit 3 hours

512 Treatment Delivery Systems. Treatment delivery systems utilized in the prevention and rehabilitation of criminal and delinquent behavior. Social, school and government agency networks as resources in planning for individuals. Prerequisite: completion of core or permission of instructor. Credit 3 hours

530 Criminal Justice Education. Development and philosophy of criminal justice education and training. Problems of curriculum development and evaluation. Examination and evaluation of teaching methodologies and instructional aids. Prerequisite: completion of core or permission of instructor. Credit 3 hours

540 Criminal Justice Administration. Administrative policies and practices used in criminal justice agencies and their application to the various facets of the criminal justice administrative process. Prerequisite: completion of core or permission of instructor. Credit 3 hours

541 Criminal Justice Planning: Innovation and Change. Normative factors in planning for standards and goals in the criminal justice system. Application of innovation and change techniques in an interdependent system. Prerequisite: completion of core or permission of instructor. Credit 3 hours

Special Courses. CRJ 584 590 591 592 593 594 598, 599 See pages 48-49.

College of Law

Purpose

The prime function of the College of Law is to train young men and women for the practicing legal profession and related professional assignments. In addition, the College has the responsibility to contribute to the quality of justice administered in our society.

Juris Doctor Degree

The College of Law offers a three year program of professional studies at the graduate level leading to the degree of Juris Doctor and entry into the many branches of the legal profession and careers in government, business, finance, industry and education.

To fulfill the requirements for a J.D. degree, a student must satisfy all of the following: (1) 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 85 hours of academic credit with a cumulative weighted average of 70 or better; (4) Completion of all required College courses; (5) Completion of moot court requirements; (6) Completion of first year writing research program.

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 two semesters in the College immediately preceding the granting of a degree.

Admissions

First year students are admitted only for the fall semester. The formal requirements for admission to the College of Law are

- 1) An undergraduate degree from an accredited four year college or university (B.S., B.A., or equivalent).
- 2) A score on the Law School Admission Test (administered by the Educational Testing Service, Box 944, Princeton, N.J., in centers throughout the country).

both at a level of achievement giving the applicant reasonable prospect for success in law study.

The deadline for completed applications with college transcripts on all completed course work, the Law School Data Assembly Service Report and the Law School Admission Test score in the hands of the College of Law, is April 1.

Each year many more students apply than can possibly be accommodated within the educational program of the College. Accordingly, the admission process is selective. Basic factors for evaluation are the undergraduate academic record and the score on the Law School Admissions Test, which are given roughly equivalent weight. The higher the GPA and LSAT scores the better. These are not the only factors considered, however. The admission requirements are flexible and other evidences of ability and an applicant's prospect for significant contribution to the educational program of the law school and to public service will be carefully considered by the Admissions Committee with the object of selecting those who are likely to succeed in law study. As a state institution, the College weighs residency as a factor in admission.

Course of Study

The program of study in the College of Law is designed for full-time students. In the first year of the three-year program, the course of study is prescribed and incorporates the time-proven techniques of legal education. This first year gives the student —by the “case method,” by the “problem method,” by “moot court” and through other techniques—an intensive exposure to the basic legal processes. The second year includes both prescribed and elective courses; a student is required to take at least 10 of 16 designated courses. The third year offers distinctive educational experiences in the nature of a “clinical year”—featuring practice-oriented professional subjects; small group seminars; publication of a law review; and participation in the actual rendition of legal services under licensed practitioners through internships with a law clinic and other public law offices.

Grading. FIRST- AND SECOND-YEAR COURSES. Performance in first- and second-year law courses is graded under the following numerical scale:

95–88	A, Distinction
87–80	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.

THIRD-YEAR COURSES. Third-year courses are graded under the following categories:

Credit	Non-Credit
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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 the first academic year and at the end of each semester, summer session and quadrant of the second and third years, respectively.

Any student whose average for the first semester falls below the 70 level is automatically placed on probation. Continuation of enrollment shall be upon such terms and conditions as the College may impose. A student whose cumulative average thereafter falls below the 70 level will be dismissed but may petition the faculty through the Office of the Dean for 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 conditioned on achieving a level of performance higher than the overall 70 average.

Special Honors at Graduation. At the time of graduation, students with academic distinction in the study of law may be awarded the respective designations *cum laude*, *magna cum laude* and *summa cum laude*. Recipients of these awards are selected by the Law Faculty on the basis of graded performance in courses for the first two years and evidence of academic achievement in the third year.

Law Building and Law Library

The John S. Armstrong Law Building is in the central campus near other graduate schools of the University and the Hayden Library. The Law Building provides every modern facility for legal education and has been described by experts on planning law



buildings as setting a new standard in functional design.

With an “open stack” policy of accessibility to all law students and a rated seating capacity of three-fourths of the total student body, the Law Library contains a substantial collection of law and law-related books. The modern facility has shelf capacity for approximately 200,000 volumes. The goal is to make the Arizona State University Law Library one of the most outstanding in the country.

Accreditation

The College is fully accredited by the American Bar Association and by the Association of American Law Schools.

Information

Further detailed information concerning the course of study, advice on pre-law courses, admission practices, expense and financial assistance will be found in the Bulletin of the College of Law. Requests for the Bulletin and for application forms should be addressed to the Admissions Office, College of Law, Arizona State University, Tempe, Arizona 85281.

Law

Professors:

(AH 102D), BERCH CANBY CLEARY DAHL
EFFLAND FURNISH LEE MATHESON
MORRIS PEDR CK ROSE, SCHROEDER

Associate Professors:

ALTMAN, BRUFF LA SOTA LESLIE,
MOULTON STRONG ZLLMAN

Assistant Professors:

DELGADO VENABLE

Visiting Professors:

DENECKE, LOCKHART

Directors:

C VIL CLINIC, R CH
PUBL C DEFENDER CLINIC MESH

LAW 501 Contracts I. Contract doctrines and the role of the judge in a process. Judicial doctrines and where applicable the Uniform Commercial Code are studied in the context of contracts covering employment, personal and family arrangements, building and construction, the sale of goods, loans, assignment of wages and accounts receivable. Also examined are statutes of limitations; payment and settlement remedies and measure of damages; problems of advocacy and counseling. Credit 3 hours

502 Contracts II. Continuation of 501. Credit 3 hours

503 Torts I. Protection through the judicial process of personal property and real interests against physical, appropriational and defamatory harms. Doctrines of trespass, nuisance, negligence, conversion, deceit, privacy and false seduction. A nation of affectations makes our prosecution inducement of breach of contract and unfair competition are studied in a variety of factual settings. Credit 3 hours

504 Torts II. Continuation of 503. Credit 2 hours

505 Procedure I. The nature of judicial power viewed in the context of historical development and constitutional grants and limitations. Credit 3 hours

507 Property I. Law of real and personal property various legal and equitable estates and life estates remainder concurrent interests, executory interests, limitations on creation of future interests. Modern concepts of property and an introduction to the modern efforts to

define the public interest in relationship to the use of the property. Credit 3 hours.

508 Property II. Continuation of 507. Credit 3 hours

510 Constitutional Law. Role of courts in the federal system distribution of powers between state and federal governments role of procedure in litigation of constitutional questions fundamental protection for person, property, political and social rights. Credit 4 hours

511 Criminal Law and Procedure I. Legislation and judicial formulations designed to deal with antisocial activity the substantive elements of particular crimes problems in the administration of criminal law and the penal system generally. Criminal procedures as affected by the requirement of the Federal Constitution are examined. The role and responsibilities of the legal profession in the administration and improvement of our system of criminal justice. Credit 3 hours

512 Criminal Law and Procedure II. Continuation of 511. Credit 3 hours

513 Legal Research and Writing I. Techniques of research use of the law library; preparation of legal memoranda. Credit 1 hour

514 Legal Research and Writing II. Continuation of 513. Credit 1 hour

600 Administrative Law. Administrative process emphasizing nature of powers exercised by administrative agencies of government, problems of procedure and scope of judicial review. Credit 3 hours

601 Antitrust Law. 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 as well as concentration of industry and commercial control through mergers. Credit 3 hours

602 Commercial Law. Law of negotiable instruments sale and secured transactions with emphasis on the Uniform Commercial Code. Legal problems arising in the distribution of goods. Credit 4 hours.

603 Conflict of Laws. 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. Credit 3 hours

604 Corporations. The corporation as a legal tool for organizing the business enterprise in comparison with sole proprietorship and partnership. Relations of stockholders and management varieties of stock ownership problems of corporate finance and government regulation to achieve investor protection. Credit 4 hours

605 Evidence. 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. Credit 3 hours

606 Federal Income Taxation. Federal income tax in relation to concepts of income, property arrangement, business activity and current tax problems with focus upon the process of tax legislation and administration. Credit 3 hours

607 Procedure II. 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. Credit 2 hours

608 Procedure III. Litigation through appeal, including jurisdiction, right to jury selection of jury withdrawal of case from jury, instruction of jury, verdicts, judgments, appellate review. Credit 2 hours

609 Trusts and Estates. Substantive concepts involved in transmitting wealth, including intestate succession on 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. Credit 4 hours

610 Administration of Criminal Justice.

Administration of the adult criminal justice system including issues arising in the initial police stage of the system, the trial process and the sentencing and correctional stages. Credit 3 hours

611 Estate Planning I. 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. Credit 3 hours

612 Family Law. Legal and nonlegal problems which an individual may encounter because of his status as a member of a family. Credit 3 hours

613 Federal Courts. Federal judicial system, relationship of federal and state law; jurisdiction of federal courts and the relationship to state courts. Credit 3 hours

614 Labor Relations. 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. Credit 3 hours

615 Public International Law. Role of law in international disputes. Drafting and interpretation of treaties and multilateral conventions which are considered. Credit 3 hours

701 Legal History. Lawyer's contribution to society, emphasizing the lives of eminent lawyers, judges, legal

scholars and law trained statesmen and lawmakers
Cred t, 3 hours

702 Jurisprudence. Philosophical problems raised by application of laws to society; major schools or legal philosophy as they relate to traditional and contemporary problems Cred t 3 hours

703 State and Local Taxation and Finance. State and local government and fiscal federalism legal political economic and social aspects of property, sales corporate and personal income and other taxes, bonds and government indebtedness social problems facing state and local governments and possible fiscal utilities tax exemption and tax immunity problems of litigation Cred t 3 hours

704 Corporate Finance. Application of legal materials in and judgment to problems of small and large scale corporate enterprises Problems include selection of the capital structure public offerings of corporate securities, reorganization of solvent corporate enterprises and corporate dissolution Cred t 3 hours

705 Corporate Taxation. Problems in taxability of the corporation corporate distributions and corporate reorganizations Cred t 3 hours

706 Indian Law. Inquiry into legal problems specific to American Indians and tribes Cred t 3 hours

707 Advanced Indian Law. Advanced individual and group study in selected problems of administration of tribal justice economic development rights of individual Indians Prerequisite LAW 706 Cred t 3 hours

708 Law in a Technological Society. Impact of technology on law and society Such developments as computer science nuclear energy and high speed transportation will be considered Cred t 3 hours

709 Law and Medicine. Problems raised by the interaction of law and medicine Cred t 3 hours

710 Natural Resources Development. Legal problems relating to the acquisition and distribution development and conservation of natural resources federal state and interstate problems environmental control; public lands. Cred t 3 hours.

711 Insurance. Current trends in the business of insurance role of government in the insurance field Cred t 3 hours

712 Creditor-Debtor Relations. Creditors remedies in satisfaction of claims and debtors protection and relief under bankruptcy, other laws Cred t 3 hours

713 Legislative Problems. Research methods and the drafting of legislation. lawyer's role as a legislative advocate Cred t 3 hours

714 Constitutional Litigation. Selected constitutional cases from inception through judicial decision. Emphasis

on special problems of framing constitutional issues and overcoming obstacles peculiar to constitutional adjudication Cred t 3 hours

715 Professional Sports. Unique legal problems relating to professional sports, including the relationship to antitrust laws the nature of the payer contracts and associated tax problems Cred t, 3 hours

716 Securities Regulation. Selected problems arising under the major statutes concerned with regulating the securities market Cred t, 3 hours

717 Selected Problems in Securities Regulation. Development of private rights of action under the Securities Exchange Act of 1934 Cred t 3 hours

718 Selected Problems in Taxation. Cred t 3 hours

719 Consumer Protection. Problems of the individual purchaser in mass markets Fraud breach of warranty holder in due course usury and unconscionable contracts for voiding contracts new protective legislation on Cred t 3 hours

720 Legal Problems of the Poor. Legal problems of the poor in such areas as welfare housing and consumer law Techniques for attacking these problems through constitutional provisions and court processes. Cred t 3 hours

721 Education and the Law. Current legal problems affecting institutions of higher education relating to public school government agencies, faculty and students; scope of authority public ability, financial control Cred t 3 hours

722 Water Law. Acquisition of water rights water use controls interstate conflicts Cred t 3 hours

723 Environmental Law. Litigation administrative law and regulation relating to problems of environmental quality such as air and water pollution pesticides and radiation Cred t, 3 hours

724 Selected Problems in Tort Law. Cred t, 3 hours

725 Election Law. Right to vote voter registration party organizations, arrangement of the ballot, third party candidates campaign financing advertising, campaign literature broadcast participation by public employees conduct of election day recounts districting initiative, referendum and recall president a nominating conventions the electoral college computers and elections Cred t 3 hours

726 Legal Profession. 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. Cred t, 3 hours

727 Professional Responsibilities. The ethical responsibilities of the legal profession and professional canons

and ethics for the bar and judiciary. Credit, 2 hours

728-729-730 Selected Problems: Legal Profession. Cred t 1 to 3 hours

731 Professional Skills: Interviewing and Counseling. Skills and techniques involved in interviewing and counseling, including interdisciplinary materials from other fields such as psychology and psychiatry Cred t 3 hours.

732 Professional Skills: Problems in the Practice of Law. Skills of negotiation including a variety of situations and drafting of typical legal instruments Cred t 3 hours

733 Lawyers and Leadership in Society. Research techniques in the social sciences skills in the use of mass media and techniques of public action as related to the needs of the modern lawyer Cred t 3 hours

734 Selected Problems in the Administration of Justice. Court congestion role of paralegal personnel judicial selection methods arbitration group legal services the adversary process techniques and justice lawyer's role in society Credit 3 hours

735 Estate Planning II. Preparation of actual estate plans and implementation of 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 Cred t 3 hours

736 Planning for the Business Client. Planning Transactions involving business organizations with special emphasis on income tax and corporate considerations Cred t 3 hours

737 Planning Private Real Estate Developments. 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 and use Cred t 3 hours

738 Practice Court. Students act as lawyers in conducting a case through all stages of trial from commencement of the action to final judgment Credit 3 hours.

739 Techniques of Advocacy. Designed to familiarize students with the skills of the advocate by observation instruction and participation Cred t, 3 hours

740 Problems of Litigation. Current developments in the fields of practice procedure and evidence. Cred t 3 hours.

741 Freedom of Speech. Freedom of speech and its association in competition with a number of governmental and individual interests including those of preserving order morality fair trial and privacy Credit 3 hours

742 Equality in Modern Society. 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. Credit 3 hours

743 Freedom of Religion. Problems arising under the establishment and free exercise clauses of the First Amendment including the separation of church and state. Theoretical and practical bases of current federal state and local governmental policy toward religious institutions. Credit 3 hours

744 Protections from Bureaucracy. Proposed and existing mechanisms for protection of individuals from governmental action or inaction. Case studies of the operation of the ombudsman, police civil review boards and other such institutions. Credit 3 hours

745 The Supreme Court. Intensive examination of selected current decisions of the U.S. Supreme Court. Credit 3 hours

746 Legal Aspects of Community Renewal. Basic social structure in a community and possibilities of changing the structure to achieve a renewal of the community. Legal devices to make more effective the participation of minorities in urban affairs; organization and distribution of legal services in urban areas. Credit 3 hours

747 Federal and Local Participation in Urban Problems. Federal programs designed to aid urban areas in solving the problems of an urban society. Report on the progress of these programs to local governments and various groups within the community. Credit 3 hours

748 State and Local Government. Legal problems involved in the organization and administration of governmental units including the city, county, town, village, school district and special district. Credit 3 hours

749 Area Planning. Selected legal problems relating to regional development and to the roles of private and public planning for such development. Emphasis on growth and use controls available to local, state and federal governments such as zoning, condemnation, development regulations and special renewal programs. Federal programs relating to housing and urban development are also covered. Credit 3 hours

750 Labor Arbitration and Mediation. Role of the arbitrator and mediator in the settlement of labor management disputes. Enforceability of awards, procedure and the operation of arbitration associations. Credit 3 hours

751 Selected Problems in Labor Law. Advanced questions in the collective bargaining area. Credit 3 hours

752 Modern Social Legislation. Significant legislative programs of social insurance and governmental re-

sponses to such problems as unemployment and disability. Credit 3 hours

753 Criminal Behavior and Criminal Law. Legal problems raised by the various systems of social control. Objectives of the criminal justice system, theories as to the dynamics of criminal behavior and specific questions raised by the behavior of categories of offenders. Credit 3 hours.

754 Juvenile Justice System. Specific problems in the juvenile system. Credit 3 hours

755 Law and Psychiatry. Mental health system as a companion to the adult criminal system and the juvenile justice system in controlling antisocial behavior. Credit 3 hours

756 Criminal Appeals Seminar. Actual research and preparation of the brief for a criminal case on appeal in the state courts. Credit 3 hours

757 The Legal Monopolies: Patent, Copyright and Labor. Legally created and sanctioned monopolies will be examined and compared on the basis of the justifications, objectives and motivations. Credit 3 hours

758 The Competitive Economy. Legal and economic characteristics of selected problems of the industrial organization in the modern economy. Prerequisite: LAW 601. Credit 3 hours

759 Regulated Industries. Nature and extent of regulation imposed on selected industries and of the techniques adopted by administrative agencies in seeking to achieve the varied objectives of public control. Credit 3 hours

760 Advanced Regulated Industries. Intensive and detailed examination of one or more of the regulated industries. Prerequisite: LAW 601-759. Credit 3 hours.

761 Selected Problems in Antitrust. Analysis of the private enforcement techniques in antitrust. Review and analysis of the various defenses, procedural problems and damage issues. Credit 3 hours

762 Regional Organizations. Role of economic and political community organizations and associations. Credit 3 hours.

763 Selected Problems in International Law. Advanced consideration of selected problems. Credit 3 hours

764 Comparative Law. Comparison of laws and legal institutions of major world legal systems. Credit 3 hours

765 Selected Problems in Comparative Law. Advanced studies on subjects to be decided. Credit 3 hours

766 Latin American Legal Institutions. Legal systems of the western hemisphere nations. The activities of

American nations in these nations. Credit 3 hours

767 Selected Problems in Developing Nations. Study of the effect of law on social change and development through agrarian reform, industrial development, economic integration. Emphasis on Latin America. Credit 3 hours.

768 International Business Transactions. Problems and policy considerations involved in international trade, tariffs, international monetary controls, development plans, etc. Credit 3 hours

770 Law Journal. Academic credit for successful completion of work by a member of the staff of *Arizona State Law Journal*. 3 credit hours maximum. Credit 1 hour

771-779 Internships in Law. Supervised practical experience with such agencies as Legal Aid, Public Defender Office, District Attorney's Office and other state and local governmental departments. Credit 3 or 6 hours

780 Moot Court. Academic credit for successful completion of work as a member of the Moot Court Board of Directors. 3 credit hours maximum. Credit 1 hour

781-782-783 Individual Study. With the approval of a faculty member, a student may research a legal subject of special interest and prepare a paper suitable for publication. Credit 1 to 3 hours

790 Field Work. Specialized study outside the law school in a particular area where law has an impact. The work must be approved and supervised by a member of the faculty. Credit 1 to 6 hours

791 Seminar in Law. Credit 3 hours

Graduate School of Social Service Administration

HORACE W. LUNDBERG, PH.D.,
Dean

The graduate program in social work is a two year program leading to the degree of Master of Social Work (M.S.W.).

The curriculum is designed primarily for full time study through four semesters; a limited number are admitted for half-time study. Entry is restricted to the fall semester. Some part time coursework is available, but no more than ten hours taken as a part time student may be applied to the M.S.W. degree.

The need for professional social workers is high throughout the United States. The School's program affords the student experience in integrated classroom and field experiences for professional practice in the ever expanding field of social work. The diverse heritage and cultures to be found in Arizona also offer stimulating educational experiences preparing for service in the Southwest as well as throughout the nation.

The admissions requirements are equivalent to and consistent with the University and the Graduate College. A well-rounded undergraduate background is desirable, including 30 hours in social sciences (e.g., social welfare, sociology, psychology, economics, anthropology, political science and public administration). All applicants are strongly urged to take the aptitude section of the Graduate Record Exam. It is required when the overall grade point average is below 3.0.

Application is made directly to the Graduate School of Social Service Administration. For information regarding the course of study, admissions procedure and application form, write to the Office of the Dean.

The Graduate School of Social Service Administration employs a credit-no credit grading system. See the School's *Bulletin* for details regarding grading and the required re application to the second year.

SOCIAL SERVICE ADMINISTRATION

Social Service Administration

Professors:

LUNDBERG WEST HALL) CRANMER MECH

Associate Professors:

BRAND COUDROGLOU, ENGELHARDT H LL
POLENZ, TEAGUE WOODMAN

Assistant Professors:

BANKHEAD, BAUR, BIGPOND BOYD
BRUTON CARTSONIS, GARNER GL CKEN,
HARRIS, MANN, N CHOLS, RU Z

GSA 591 Seminar. Topics offered in special areas Credit 1 3 hours

594 Conference and Workshop. Topics offered in special areas Credit 1 3 hours

602 Social Services and Policy I. Historical antecedents and current programs designed to meet social needs Social political and economic forces affecting development of social services Historical development of social work profession Credit 2 hours

603 Social Services and Policy II. Option of examination: 1 Current social problems welfare policies and provisions within the network of social services and social work principles Relationship to Phoenix and Arizona agencies 2 Poverty as focus for social policy Analysis of international national and local income maintenance programs within the framework of social work principles and income security concepts Credit 2 hours

609 Community Mental Health. Philosophy theory and knowledge relative to community mental health practice and the influence on the development of intervention strategies. Credit 2 hours

610 Human Behavior in the Social Environment I. Using a social systems approach understanding the biopsychosociocultural development process Credit 3 hours

611 Human Behavior in the Social Environment II. The minority experience problems of race and ethnic minorities and subsequent effects on human behavior Concepts of culture, subculture lifestyle, socialization values acculturation racism and discrimination Credit 3 hours.

612 Substance Abuse. Psychological and socio-cultural determinants of substance abuse. Overview of social policies and treatment approaches. Credit, 2 hours.

615 Social Work Methods I. Methodological base of social work practice. Investigations of major areas of knowledge, values and skills basic to social work helping process with individuals, families, nonrelated groups and communities. Credit, 2 hours.

616 Social Work Methods II. Social problem situations and steps leading to resolution. Focus on differential solutions to problems in social functioning. Credit, 2 hours.

620 Basic Group Dynamics. Theoretical aspects of group behavior related to the development of the individual. Laboratory experience in discovering influence of group membership on the growth of self. Credit, 2 hours.

621 Group Process in Social Work. Application of small group theory and group dynamics knowledge to the practice of social work. Developing small group theory for use by the student in roles of worker and group member. Credit, 2 hours.

630 Practice-Oriented Research. Application of scientific principles to student's field practice. Emphasis is on problem development, intervention procedures and impact assessment. Special materials fee required. Credit, 2 hours.

631 Evaluation of Human Services Programs. Alternate models for evaluating human services programs: corrections, education, health manpower, and welfare. Credit, 2 hours.

640, 641 Field Instruction. Two consecutive semesters in social work practice in a qualified agency. Credit, 4 hours each semester.

650 Social Services and Policy III. Social services and structure in selected medical, correctional, public school and social welfare agencies. Credit, 2 hours.

651 Social Issues, Problems and Policy. Social planning in context of contemporary social issues, societal problems and policy. Role of social work profession. Credit, 2 hours.

655 Social Welfare Administration. Administrative structure of social agencies and aspects of social worker's job. Administration as a process. Differential administrative role. Credit, 2 hours.

660 Human Behavior III (Psychopathology). Review of major emotional disorders as they represent the individual's attempts to cope with overtaxing stress situations. Defensive systems used in pathology; in-

fluence of organic and environmental factors. Credit, 2 hours.

661 Human Behavior IV (Specified Aspects of Behavioral Theory). Select from: 1. Family dysfunctioning; perspectives and manifestations of problems in family functioning. 2. Comparative personality theories; personalities in terms of their basic assumptions, key concepts and helping consequences. Credit, 2 hours.

665 Social Work Methods III. Advanced application of principles. Practice in context of selected philosophies and theories of change. Credit, 2 hours.

666 Social Work Methods IV. Select from: 1. Social work supervision. 2. Helping individuals. 3. Social work with nonrelated groups. 4. Strategies for intervention with families and children. 5. Strategies for environmental and community change. Credit, 2 hours.

680, 681 Field Research. Select one of three options: A. *Policy-Oriented Research.* Policy and planning em-

phasis on analyzing institutional factors in developing responsive human services programs. Mini-project and policy report.

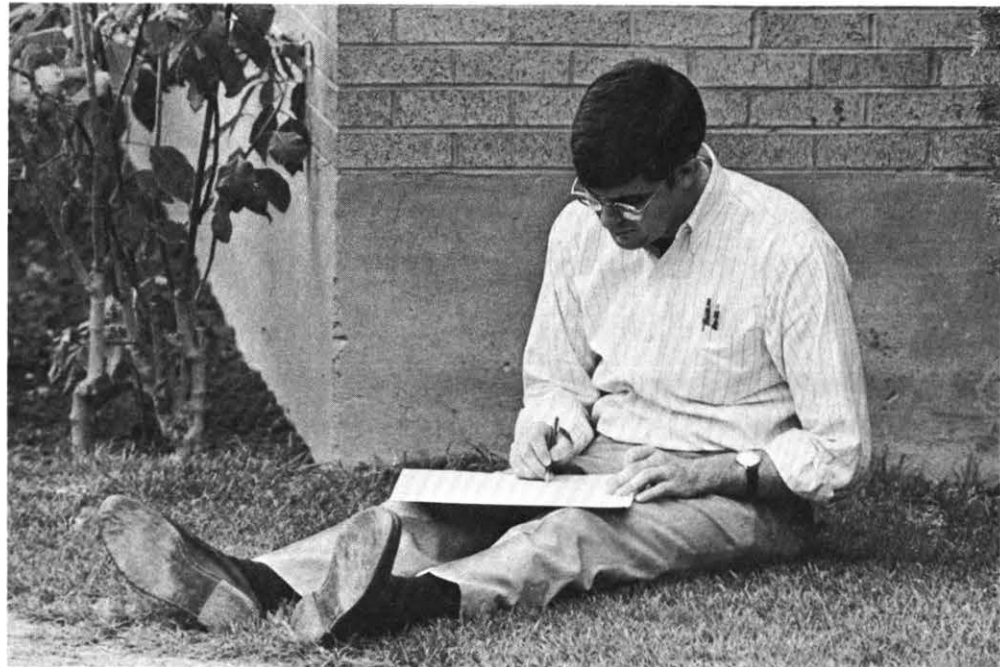
B. *Knowledge Assessment for Practice.* Ability to critically analyze, evaluate and synthesize empirical research efforts in a topical area related to social work practice and to derive specific implications for the practicing professional.

C. *Knowledge Building.* Empirical research and the project method. Systematic study of a human services problem. Projects are experimental, exploratory, or descriptive-survey in type. Special materials fee required for each option. Credit, 2 hours each semester.

693, 694 Field Instruction. Two semesters continuation of 640, 641 in a different agency. Credit, 4 hours each semester.

695, 696 Elective Field Instruction. Field instruction in specialized area. Credit, 1-2 hours each semester.

Special Courses: GSA 690. (See pages 48-49.)



Graduate College

The development and interpretation of new knowledge and creative work are important functions of the University and matters of specific concern to those involved in the programs available in the Graduate College. For students who have demonstrated a high level of ability and promise at the undergraduate level, graduate work offers an opportunity for further intellectual challenge in advanced and more specialized areas.

The primary purposes of the Graduate College are to provide the student with opportunities for advanced study, and to foster the spirit of scholarship and research. The critical analysis of information and the ability to arrive at a level of understanding beyond that already existing plays an integral role in graduate education.

Under the supervision of the Graduate Council and the Dean of the Graduate College, programs for graduate study are offered by the various departments, schools, centers and colleges. The Graduate Council is responsible for the development and formulation of general policies and the approval of procedures essential to the organization and administration of graduate programs. The Graduate Council acts as the appeals body for graduate students seeking redress on academic decisions regarding their graduate programs. The Dean of the Graduate College is directly responsible for the administration of policies and graduate programs.

Graduate Degree Programs Offered

- Master of Arts
- Master of Science
- Master of Architecture
- Master of Arts in Education
- Master of Business Administration

- Master of Counseling
- Master of Fine Arts
- Master of Health Services Administration
- Master of Music
- Master of Natural Sciences
- Master of Public Administration
- Master of Science in Engineering Education Specialist
- Doctor of Business Administration
- Doctor of Education
- Doctor of Philosophy

Master of Arts and Master of Science.

The master's degree is offered in: Accounting, Agriculture, Anthropology, Art, Biological Sciences, Botany, Chemistry, Economics, Engineering, English, French, Geography, Geology, German, History, Home Economics, Humanities, Mathematics, Microbiology, Music, Nursing, Philosophy, Physical Education, Physics, Political Science, Psychology, Sociology, Spanish, Speech, Speech Pathology, Technology, Theatre and Zoology.

Doctor of Philosophy. The Ph.D. degree is offered in the following fields: Anthropology, Botany, Chemistry, Economics, Education, Engineering, English, Geography, Geology, History, Mathematics, Physics, Political Science, Psychology, Sociology, Spanish and Zoology.

Admission to Graduate College

A student who has earned a bachelor's degree or a graduate degree from an accredited college or university is eligible to apply for admission to the Graduate College of Arizona State University. All decisions on admissions are made without regard to

sex, creed or ethnic origin. Application forms may be obtained by writing to the Admissions Office, Graduate College

At least two months before the first enrollment, the Graduate College should have received the application for admission and two transcripts of all undergraduate and graduate work. Certain departments have earlier deadlines. The student is advised to check with the department in which he plans to work regarding specific departmental admissions deadlines. The transcripts are to be sent directly to the Admissions Office, Graduate College by the registrar of each college or university which the applicant previously attended. The applicant should write to the registrars concerned and then allow them time to process and mail the transcripts. A qualified applicant, whose application has been filed later than the deadline, may be permitted to enroll in graduate classes as a nondegree student. He will maintain that status until all of the required forms and transcripts have been received and a decision regarding his admission to a program has been reached by the college or department concerned and by the Graduate College.

A student's official status for a semester is determined by his status at the end of that semester.

All documents received by the University in connection with such applications for admission become the property of Arizona State University. Under no circumstances will they be duplicated, returned to the applicant, or forwarded to any agency or other college or university. Admission documents of applicants who do not enroll in the University may be destroyed after one year.

Applicants who have earned a bachelor's or graduate degree from an accredited college or university are eligible for considera-

tion for admission. Certain departments require the submission of scores received on the Graduate Record Examination, or other predictive measures, and letters of recommendation. Applicants will be notified of these requirements by the department. Letters of recommendation should be sent directly to the department. In all instances, the college or department in which the student wishes to study must indicate its willingness to admit the student. All applications for admission must be approved by the Dean of the Graduate College. When faculty or facilities are limited, a department may set standards higher than those established by the Graduate College and may recommend denial of a student whose academic record is superior to the minimum requirements described below.

Applicants may be admitted to a graduate program under two classifications:

Regular Admission. Applicants are ordinarily granted regular admission to the Graduate College if they have achieved a grade point average of "B" (3.0) or better in all work leading to the bachelor's degree and on the recommendation of the department or academic unit in which they plan to study. An applicant may also qualify for admission if his undergraduate overall grade point average is at least 2.5, and in addition, his undergraduate major average is "B" or his average in the last two years of undergraduate work is "B". Letters of recommendation, test scores, and completed graduate work are also considered in determining admission classification.

Provisional Admission. An applicant may be granted provisional admission to the Graduate College if the department or academic unit in which he plans to study requires additional evidence of his qualifica-

tion for admission with regular status. No student may maintain provisional status indefinitely. Normally, final determination of status will be made by the time the student has completed 12 hours of approved graduate study. If an applicant has extensive deficiencies requiring an additional year or more of preparatory study, he may be advised to enroll in an undergraduate program.

Nondegree Status. An applicant with an undergraduate degree who is not pursuing a graduate degree program may be registered in the Graduate College in a nondegree status.

Foreign Student Admission. Applicants from foreign countries should write to the Admissions Office, Graduate College at least one year prior to the date they plan to begin study. They will receive the necessary instructions and application blanks which are to be completed and returned to that office. Applicants should make sure that other documents are sent at about the same time, especially transcripts from colleges and universities attended, letters of recommendation, results of the Test of English as a Foreign Language (TOEFL), and a statement of financial responsibility.

Prospective foreign students should not make plans to leave their country until they have received notification of admission. Ordinarily such a statement regarding admission is required before the student can be issued a passport or visa.

Re-entry to the Graduate College. Any former graduate student who has not been in attendance at Arizona State University for one or more regular semesters must obtain an application for re-entry from the Admissions Office, Graduate College. This ap-

plication should be submitted at least one month prior to the beginning of the semester in which the student plans to re enter. Official transcripts of any additional work taken elsewhere must be sent directly to the Admissions Office, Graduate College at Arizona State University from the Office of the Registrar at the institution where such credit was earned.

Student Responsibility. It is the responsibility of the graduate student to become conversant with and observe all procedures and requirements of the Graduate College as defined in the *Graduate Bulletin* and to be familiar with the University's policy regarding student conduct as described in the section, "Student Membership in the University," of the *General Catalog*. The student should particularly inform himself about the general regulations concerning the degree he plans to take and any special requirements within his department or academic unit.

Transient Graduate Students. A graduate student in good standing at another university who wishes to earn credits for transfer to that institution may register for a limited number of credit hours either during a summer session or during a regular semester. He will be admitted as a "transient graduate student," and will not be required to submit an academic transcript. A letter from the student's graduate dean, stating that the applicant is in good standing and is authorized to register for specified courses, must be received by the Dean of the Graduate College at least three months prior to registration.

Graduate Study by Arizona State University Faculty Members. A member of the University faculty holding the rank of as-

sistant professor or higher may not earn a graduate degree at Arizona State University. He may, however, be permitted to enroll in graduate courses on a nondegree basis or to take courses for transfer to another institution.

Graduate Course Enrollment by Undergraduates. Undergraduate students at Arizona State University may enroll in graduate courses with the approval of their advisor, the course instructor, the chairperson of the department, and the Dean of the College offering the course. If the course is not used to meet an undergraduate graduation requirement, it may be eligible for use in a future graduate program on the same basis as work taken by a nondegree graduate student.

Course Load. The course load is determined by the supervisory committee but is not to exceed 15 semester hours of graduate credit. At the graduate level, course work, whether or not formal in nature, serves mainly as a guide for independent study. Students are expected to exceed minimum requirements and to master subjects rather than simply to pass courses. Students must be registered when using university facilities or faculty time including the semester or summer session when their comprehensive or final examination is held.

Scholarship. Academic excellence is expected of students doing graduate work. A student who is not doing satisfactory work may be withdrawn from the degree program by the Dean of the Graduate College upon the recommendation of the department or academic unit concerned.

The grading system applicable to graduate courses is as follows:

A	Excellent (4.0)
B	Good (3.0)
C	Passing (2.0)
D	No Graduate Credit (1.0)
E	Failure
P	Pass
Y	Credit
NC	No Credit
W	Withdrawal
I	Incomplete
X	Audit

¹Cannot be applied toward a graduate degree but is included in calculation of grade point average

To be eligible for a degree in the Graduate College, a student must achieve a grade point average of "B" (3.0) or better in all work taken for graduate credit, exclusive of deficiencies, and in all work specifically included in his program of study. Grades below "C" cannot be used to meet the requirements for a graduate degree. Grades on transfer work will not be included in computing grade point averages. Graduate course work, other than research or thesis, reported "Incomplete" must be completed within one year of the official ending of the course. If a grade of "Incomplete" ("I") is not removed within one year, it becomes part of the student's permanent record.

A student receiving a grade of "D" or "E" must repeat the course in the regular class if he wishes to include it in his program of study.

The mark of "W" is given in a course whenever a student (1) officially drops from a course during the first six weeks of the semester; (2) officially withdraws from the University during the first six weeks of the semester; (3) officially drops a course after the first six weeks only if passing at the time of withdrawal; (4) officially withdraws from the University after the first six weeks only if passing at the time of withdrawal.

Graduate Credit Courses. Courses carrying graduate credit are numbered 500, 600, and 700. Courses at the 400 level bear graduate credit when taken by graduate students. However, only those courses appearing on the approved program of study may be applied toward a graduate degree.

Foreign Language Requirement.

Language requirements for graduate degrees are determined by the departments concerned. If a foreign language is required, a student must demonstrate at least a reading knowledge of the language which is recommended by his committee and approved by his department chairperson. Normally these will be selected from French, German, Russian or Spanish, although other languages may be recommended when there is adequate justification.

Language competency is certified by the Graduate College Foreign Language examinations (ETS examinations) are administered by the University Testing Service Examinations in languages other than those available through ETS are administered by the Department of Foreign Languages. Students planning to take the ETS Foreign Language examination must register at the University Testing Service at least one month prior to the examination date. Only three attempts will be permitted. Satisfactory ETS scores achieved as an undergraduate will be accepted within a six-year time limit. Students who maintained at least a "B" average in the second full year of language taken at an accredited university and completed within the last six years may petition to be exempt from the test.

The language requirement may be fulfilled by special reading knowledge courses for graduate students given by the Department of Foreign Languages. Students are certified as having a reading knowledge in a par-

ticular language upon completion of the two semester course, providing a grade of "A" or "B" has been achieved in the second semester of the course.

Graduation. Students should apply for graduation no later than the date specified in the *Graduate Bulletin* calendar. All fees are payable at that time.

Master's Degree

Admission to the Master's Degree Program. Students wishing to enroll in a master's degree program at Arizona State University are admitted according to the procedure described on page 276. Since graduate work presupposes adequate preparation in a selected field at the undergraduate level, deficiencies will be specified at the time of admission by the department or academic unit involved.

Credit Requirements. A minimum of 30 semester hours of course work approved by a student's supervisory committee and the Graduate College is required. More than 30 semester hours may be required in certain programs.

Supervisory Committee. Upon admission of the applicant with regular or provisional status, a supervisory committee, consisting of a chairperson and other members, will be appointed by the Dean of the Graduate College. This committee establishes a program of study with the student, directs his thesis or graduate project, and administers his final examination(s). Appointments are made by the Dean of the Graduate College on the recommendation of the head of the student's department or academic unit.

Whenever a minor field is involved, one

of the members of the committee shall be from the minor field. In the Master of Arts in Education degree programs involving an academic field, the chairperson of the supervisory committee shall be from the College of Education and a co-chairperson shall be from the academic field. Other members may be from either field.

It is in the student's best interest to have an official program of study filed with the Graduate College at the earliest possible date. Changes in the planned program may be made by the student's supervisory committee, with the approval of the department chairperson, and the Dean of the Graduate College. Forms for the submission of the program of study are available in the graduation section of the Office of the Registrar, 134 Moeur Administration Building.

Program Requirements. A minimum of 18 semester hours of approved graduate work in courses taken for resident credit at Arizona State University is required.

A maximum of 6 semester hours of resident graduate credit taken at other institutions may be transferred for credit toward a master's degree, provided the courses are included in the approved program of study. Such courses must be acceptable toward graduate degrees at the institution where the courses were completed.

Only courses with an "A" or "B" grade may be transferred. Grades on transferred credit cannot be included in the grade point average.

Up to 12 semester hours toward a master's degree program may be earned in courses taken for extension credit. The total of all transfer and extension courses is limited to 12 semester hours. Extension courses completed through the University of Arizona or Northern Arizona University after January, 1973 are eligible for transfer

on the same basis as resident courses, provided the extension courses were taught by resident faculty of one of the two universities. Extension courses offered by other universities cannot be transferred.

A maximum of 10 semester hours of coursework completed while on nondegree status may be included in a program of study.

Foreign Language Requirement.

Language requirements are determined by the department concerned. For certification of proficiency, see page 278.

Thesis Requirements. The requirement of a thesis is determined by the department or academic unit concerned. The final copy of the thesis must be reviewed by the student's supervisory committee and submitted to the Dean of the Graduate College at least six weeks before the degree conferral date. Copies of *Guide to Thesis Preparation* are available in the Graduate College office.

Final Examinations. A final examination, written, oral or both, administered by the department or academic unit, is required. The dates of the written examinations are set by the Graduate College once each semester and once each summer session, as listed in the *Graduate Bulletin* calendar. A student is not eligible to apply for the comprehensive or any final examination until he has filed a program of study and fulfilled any language requirement.

Failure in the comprehensive or any final examination will be considered final unless the supervisory committee recommends, and the Dean of the Graduate College approves, a re-examination. Only one re-examination is permitted. A re-examination may be administered no sooner than three months and no later than one year from the

date of the original examination.

The final oral examination in defense of the thesis must be conducted at least three weeks before the degree conferral date. The examination will be conducted by the supervisory committee and others appointed by the Dean of the Graduate College. Applications for the final examinations are available in the Graduate College office.

Maximum Time Limit. All work offered towards a master's degree program must be completed within six consecutive years.

Education Specialist Degree

The Education Specialist degree program is designed to provide opportunity for professional persons in the field of education to develop skills as highly competent practitioners in the various areas of education.

Programs of study for the Education Specialist degree are offered in: Adult Education, Counseling and Student Personnel, Curriculum and Instruction, Educational Administration and Supervision, Elementary Education, School Psychology, Secondary Education, Social and Philosophical Foundations of Education, Teaching Specialist—Secondary Education Subject Matter Fields. (See list in the Graduate College catalog under Secondary Education Subject Matter fields.)

Admission to the Education Specialist Degree Program. To be eligible to apply for admission, the student must have a bachelor's degree from an accredited institution. At least one year of successful teaching experiences is required in all programs. Normally the student will have a master's degree when he enters. Admission is determined by a variety of criteria in addition to grade point averages. These criteria

are specific to particular programs. Information is available from departments offering the particular programs.

Supervisory Committee. The Dean of the Graduate College, upon recommendation of the department chairperson, appoints the supervisory committee. Each area of study included in the degree program will be represented on the committee. The supervisory committee shall approve the program of study, prepare and administer qualifying and comprehensive examinations, approve the applied project, and serve on the final oral examining committee.

Program of Study. A minimum of 60 semester hours are required beyond the bachelor's degree. This may include no more than 30 semester hours in a master's degree program. At least 48 hours of course work in the program must be earned in courses at the 500-level or above.

Credits may be transferred from other accredited institutions. The number of credits accepted for transfer will depend upon the objectives approved by the supervisory committee. Grades on transferred credit cannot be included in the grade point average. A minimum of 24 semester hours in the approved program of study shall be taken at Arizona State University, following admission to the program.

Residence. Normally the candidate must expect to spend the equivalent of two full academic years in graduate study, which may include one year spent in attaining the master's degree. One academic semester or a ten week summer session must be spent in full time residence at the University before admission to candidacy for the Education Specialist degree. Additional residence may be required by certain depart

ments in order to meet special needs. A graduate student is considered to be a "full-time student" in a semester if he is enrolled in 10 or more semester hours. Full-time graduate students shall not be employed more than a maximum of one-half time as either a graduate assistant, a graduate associate or in other employment. Individual departments may, with the approval of the Dean of the College of Education and the Dean of the Graduate College modify this definition in particular cases. At least 30 semester hours of approved graduate work must be completed at Arizona State University.

Comprehensive Examinations. When the student has essentially completed the program of study, he will apply to the Graduate College through his supervisory committee for permission to take his oral and written comprehensive examinations. Failure in the comprehensive examinations will be considered final unless the supervisory committee recommends, and the Dean of the Graduate College approves, a re-examination. Only one re-examination is permitted. A re-examination may be administered no sooner than three months and no later than one year from the date of the original examination.

Admission to Candidacy. A student should apply for admission to candidacy and graduation promptly after he has completed 45 hours of course work, passed the written and oral comprehensive examinations, and has had the problem and title of his applied project approved by his supervisory committee.

Applied Project. Upon recommendation of the supervisory committee, a student may enroll for the applied project after comple-

tion of 12 hours of approved course work in the degree program.

Final Examination. The final oral examination for the Education Specialist degree program in defense of the applied project report is administered by the supervisory committee and others appointed by the department. This examination is scheduled through the chairperson of the supervisory committee and department chairperson and must be held at least three weeks before the degree conferral date as listed on the *Graduate Bulletin* calendar.

Graduation. After the final oral examination has been passed the student is eligible for graduation.

Maximum Time Limit. The Education Specialist degree requirements must be completed within three years after the comprehensive examinations have been passed.

Doctor of Philosophy Degree

The Doctor of Philosophy degree is granted upon evidence of high attainment in a special field and demonstration of independent scholarship. Such attainment must be demonstrated by original research or creative work presented in a dissertation. The degree is never conferred solely on the basis of courses completed or formal study extending over a prescribed period of time.

Admission to the Ph.D. Degree Program. The general requirements for admission to the Graduate College are given on page 276. Graduate students may apply for admission to the Ph.D. degree program by filing a written application with the Admissions Office, Graduate College.

Supervisory Committee. Upon recommendation of the department chairperson or head of the academic unit, the Dean of the Graduate College appoints the student's supervisory committee, consisting of a chairperson and at least four other members.

Program of Study. The program of study should be submitted as early as possible and must have the approval of the student's supervisory committee, his department chairperson, and the Dean of the Graduate College. The courses may be taken entirely within one department or they may be taken in a combination of departments. Credits from other recognized institutions may be transferred provided the courses meet the objectives of the program as defined by the supervisory committee and are approved by the Dean of the Graduate College. Only courses with an "A" or "B" grade may be transferred.

Residence. In general, the Ph.D. degree student should expect to devote to his program of study the equivalent of at least three academic years (84 semester hours) beyond the bachelor's degree. At least two semesters subsequent to the first year (30 semester hours) of graduate study must be spent in continuous full-time residence at Arizona State University, and at least 30 hours of approved graduate credit must be completed at this institution.

Foreign Language Requirements for the Ph.D. Degree. Language requirements are determined by the department concerned. For certification of proficiency see page 278.

Comprehensive Examinations. When a student has essentially completed the course work in an approved program of study and has satisfied any departmental

foreign language requirement, he should request permission from the Graduate College to take his comprehensive examinations. These written and oral examinations are designed to test the student's mastery of his field of specialization. Failure in the comprehensive examinations will be considered final unless the supervisory committee recommends, and the Dean of the Graduate College approves, a re-examination. A re-examination may be administered no sooner than three months and no later than one year from the date of the original examination. Only one re-examination is permitted.

Admission to Candidacy. The student should apply promptly for admission to candidacy and for graduation after he has passed the comprehensive examinations and has had the subject and title of his dissertation approved by his supervisory committee.

Research and Dissertation. Each candidate must register for a minimum of 24 semester hours credit for research and dissertation. The final copy of the dissertation must be reviewed by the supervisory committee and the Dean of the Graduate College at least six weeks before the degree conferral date. Copies of *Guide to Preparation of the Doctoral Dissertation* are available in the Graduate College Office.

Final Examination. The final oral examination in defense of the dissertation will be scheduled by the Dean of the Graduate College. This examination may not be scheduled earlier than three weeks after the completed dissertation has been reviewed by the supervisory committee and the Dean of the Graduate College. The examination will be conducted by the supervisory committee and others appointed by the Dean of the

Graduate College. All final oral examinations must be conducted at least three weeks before the degree conferral date.

Graduation. After the final oral examination has been passed and the dissertation has been accepted and filed in the Graduate College the student is eligible for graduation.

Maximum Time Limit. The candidate must take the final oral examination in defense of the dissertation within five years after passing the comprehensive examinations. Any exception must be approved by the supervisory committee and the Dean of the Graduate College and ordinarily will involve repetition of the comprehensive examinations.

Doctor of Education Degree

The basic purpose of the Doctor of Education degree program is to provide opportunity for those interested in the field of education to do advanced scholarly study and research in preparation for professional practice. A dissertation based upon this research is required. The degree is never conferred solely as a result of study extending over any prescribed period of time or the completion of a given number of courses. The program for the Doctor of Education degree requires at least the equivalent of three academic years of full-time study beyond the bachelor's degree or two academic years of full-time study beyond the master's degree.

The Doctor of Education degree is offered in the following areas: Adult Education, Art Education, Business Education, Counseling Psychology, Curriculum and Instruction, Educational Administration and Supervision, Educational Technology, Elementary Education, Health and Physical

Education, Industrial Education, Mathematics Education, Music Education, Physics Education, Science Education, Secondary Education, Social and Philosophical Foundations of Education.

Admission to the Doctor of Education Degree Program. A student who seeks admission is expected to have acquired a minimum of one year post baccalaureate teaching or equally relevant experience. An applicant may be required to take special qualifying examinations prepared and evaluated by the graduate committee of the department to which he applies. The general requirements for admission to the Graduate College are given on page 276. In addition, a variety of criteria are employed to determine admission. Specific information may be received by consulting the appropriate department chairman.

Supervisory Committee. The Dean of the Graduate College upon recommendation of the department chairperson appoints the supervisory committee. Each area of study included in the degree program will be represented on the committee.

Program of Study. A minimum of 90 semester hours of work taken beyond the bachelor's degree is required. At least 28 semester hours of course work must be taken in Education, exclusive of the dissertation. The student is expected to complete three semester hours in statistics and design, 12 semester hours of psychological social foundations, and 15 semester hours of practicum internship. At least 59 semester hours of the learning experiences should be at the 500 level or higher.

Upon approval of the supervisory committee, the student may start research activity in connection with the dissertation after

he has completed 15 hours of work in the program beyond the master's level.

Credit may be granted for courses taken at other recognized institutions. The number of credits accepted on transfer depends upon the recommendation of the supervisory committee and approval of the Dean of the Graduate College. Only courses with "A" or "B" grades may be transferred.

Reading knowledge of a foreign language is not required for the Ed.D. degree.

Residence. The candidate should expect to spend the equivalent of three full academic years in graduate study, which may include one year spent in attaining the master's degree. The amount of time a student must spend in official residence on the campus depends to some extent on his individual program of studies. However, he must satisfy a minimum residence requirement by completing 30 semester hours within a period of 18 consecutive months. Not more than 10 semester hours of dissertation credit may be included in the course work used to meet the residence requirement. Additional full-time residence may be required by certain departments in order to meet special needs.

General Regulations. In all matters not specified above, the standard procedures established by the Graduate College for the Ph.D. degree will apply.

Doctor of Business Administration Degree

The objectives of the Doctor of Business Administration (D.B.A.) program are to prepare individuals for faculty positions in university or collegiate schools of business, and to prepare individuals for positions in business or government where the required

educational background is doctoral-level study. The D.B.A. degree program is designed to provide a broad study of the inter-related areas of business administration and a high degree of professional competence in three fields of specialization.

The degree is granted upon the completion of an approved program of graduate study, successful completion of comprehensive written and oral examinations, and submission of an acceptable original research project presented in a dissertation.

Admission to the D.B.A. Degree Program. A student applies for admission to the D.B.A. degree program by filing a written application with the Admissions Office, Graduate College. The application is considered by the Graduate Committee of the College of Business Administration in consultation with the academic department of the applicant's major field and a recommendation is then made to the Dean of the Graduate College. Admission is based upon the applicant's entire record. The Admission Test for Graduate Study in Business is required, together with three letters of recommendation.

A student normally completes a master's degree or equivalent before entering the D.B.A. degree program. In an exceptional case, a candidate with a bachelor's degree may be admitted, in which case he shall complete the requirements of the master's degree program before pursuing the doctoral core and specialized fields.

A student who applies for admission to the program without all of the business core courses required by the American Assembly of Collegiate Schools of Business for admission to graduate study in business may be admitted provisionally until all business core courses are satisfactorily completed. Currently core courses include basic work

in each of the following seven areas: accounting, economics, finance, management, marketing, statistics and business law. A student with no previous course work in basic calculus is to take a course incorporating such coverage after admission to the D.B.A. program.

Supervisory Committee. The Dean of the Graduate College, upon recommendation of the Dean of the College of Business Administration, appoints a supervisory committee of five faculty members. The chairperson is selected from the student's field of concentration, two members are selected from the student's supplementary fields, and two members are selected at large from the faculty of the College of Business Administration. The supervisory committee approves the program of study, guides the student through his entire period of study, and serves on his examining committee for the general oral examination. A dissertation committee will be appointed after completion of the general oral examination.

Program of Study. The program is planned to fit the student's background and objectives. The degree is granted upon evidence of demonstrated competency and scholarly achievement, rather than upon the accumulation of hours in a series of prescribed courses. A minimum of 30 semester hours of credit beyond the master's degree is required of all doctoral students, exclusive of the dissertation and the prerequisite business courses generally required by the American Assembly of Collegiate Schools of Business for admission to graduate study in business. For most students, the program will consist of 36 to 54 semester hours of course work beyond the master's degree, depending on the student's academic background.

Reading knowledge of a foreign language is not required for the D.B.A. degree.

Residence. The entire program, including course work and dissertation, normally requires at least the equivalent of two academic years of work beyond a master's degree. Students must spend at least one academic year of the last two years (summer sessions excluded) in full-time course work in residence. The dissertation may be completed in absentia with permission of the student's dissertation committee and the Dean of the College of Business Administration.

Comprehensive Examinations. During the final semester of course work, the student must apply to the Graduate College through the supervisory committee and the Dean of the College of Business Administration for permission to take his comprehensive written examinations. Examinations are required in the field of concentration and each supplementary field and are designed to test the student's comprehensive knowledge of the fields rather than the subject matter of the specific courses taken. Comprehensive written examinations must be taken in two consecutive sittings. If a student does not pass a written comprehensive examination, he must file a revised program of study which normally reflects prescribed additional formal course work. He must also complete the course work before permission for a second examination will be granted. Upon satisfactory completion of all course work and comprehensive written examinations, the student must complete a general oral examination which covers the entire doctoral program, except the dissertation. For either written or oral examinations, only one re-examination is permitted. A re-examination may be administered no



sooner than three months and no later than one year from the date of the original examination.

Admission to Candidacy. A student applies for candidacy when he has completed his general oral examination and has a dissertation subject submitted to and approved by his dissertation committee. If a candidate fails to complete his dissertation oral examination within five years after completing his comprehensive examinations, it will be necessary for him to be re-admitted to candidacy.

Dissertation. The dissertation requires major research of an original and creative nature. After a subject has been selected for the dissertation, each candidate is expected to present his dissertation topic in a special seminar open to all faculty and doctoral students in the College of Business Administration.

The final copy of the dissertation must be reviewed by the committee appointed to direct the dissertation research and also by the Dean of the Graduate College at least six weeks before the degree conferral date.

General rules of the Graduate College for dissertation procedures, format, and microfilming will be followed. Copies of *Guide to Preparation of the Doctoral Dissertation* are available in the Graduate College office.

Dissertation Oral Examination. The final oral examination in defense of the dissertation will be scheduled by the Dean of the Graduate College. All final oral examinations must be conducted at least three weeks before the degree conferral date. The candidate will present and defend his dissertation before members of his dissertation committee and others appointed by the Dean of the Graduate College at a meeting open to all faculty members.

Graduation. After the final oral examination has been passed and the dissertation has been accepted and filed in the Graduate College, the student is eligible for graduation.

General Regulations. In all matters not specified above, the standard procedures established by the Graduate College for the Ph.D. degree will apply.

University Extension and Summer Sessions

DENIS J. KIGIN, ED.D.
Dean and Director

University Extension

The opportunity for continuing education is offered through University Extension. The following services are provided: credit extension classes, correspondence study, community services, instructional television, and assistance in the development and administration of conferences, institutes and other non credit activities.

Extension Classes. Extension classes are organized to provide continuing education for adults who are unable to undertake full time or regular evening classes at ASU. These classes fill a variety of needs such as providing courses leading to undergraduate degrees, post baccalaureate studies leading to professional or graduate degrees, opportunities for individuals to continue development as citizens and members of the community, and augmenting the general responsibility of the university to give individuals an understanding of the importance of continuing education throughout their lives.

Extension courses may be applied toward a bachelor's or advanced degree requirements. Extension courses offered on or off campus and taught by resident faculty are considered as resident credit courses. For courses taught by associate (off campus) faculty, up to 12 semester hours of credit may be applied toward an advanced degree program. Six hours of courses may be transferred to the University of Arizona or Northern Arizona University. Extension courses completed through the University of Arizona or Northern Arizona University are eligible for transfer on the same basis as resident courses. However, only those credits earned in Extension courses taught by

resident faculty of one of the three universities qualify for transfer.

The fee for extension courses is \$22.00 per semester hour and is payable at the time of registration. Extension fees are separate from regular on campus fees and students who have paid General University fees must also pay extension fees if they desire to enroll in extension courses. For further information write the Office of University Extension, Arizona State University.

Correspondence Study. The services of teaching faculty and departments are extended through the mails. College credit correspondence courses offered by Arizona State University are specifically designed for the student who cannot attend classes on campus. They are offered for those who are seeking to fulfill degree objectives as well as for those who wish to increase their occupational, professional or intellectual skills.

A correspondence course generally consists of eight lesson assignments for each semester hour of credit and usually requires the same amount of work as the course taken in residence. Eight to ten hours are normally required in preparing each assignment.

Students who receive a failing grade in an on campus course or in a course offered through University Extension may not use correspondence study to make up the deficiency. No student taking six hours or more residence may register for a course by correspondence without first obtaining approval of the Standards Committee of the college in which the student is enrolled.

Students are limited to one correspondence study course enrollment with the proviso that when one half of the lessons are successfully completed enrollment

in a second course is possible. Students are limited to a maximum of two courses at any one time. Students are expected to complete a course within a calendar year.

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 \$16.00 per semester hour of credit and is payable at the time of registration. Persons desiring to enroll in correspondence study should write to the Correspondence Study Office, University Extension, for an enrollment form and a brochure listing the courses available.

Admission to Extension and Correspondence Courses Programs:

Registration in an extension or correspondence course does not constitute admission to a degree candidacy. At Arizona State University, admission as a degree candidate is a separate procedure.

Community Services Program. The Community Services Program is an agency of ASU, designed to bring the resources of the University—its faculty, staff, students and facilities—to bear on the problems of the disadvantaged and the community.

Administered through University Extension, the program is designed to assist other community agencies and individuals in developing and coordinating programs which are dedicated to eliminating poverty and social injustices.

Instructional Television Services.

Television is a convenient, effective and available educational delivery system.

Through television, it is possible to deliver education opportunities to all the adult population of Arizona in the places where they live, work and play. Instructional Television Services will advance television as an educational delivery system capable of turning homes, businesses and schools in rural and urban communities into learning environments.

Instructional Television Services seeks to make the limited resources of higher education more effective in meeting the needs of the poor and the unemployed, in correcting social and environmental debilitation, and in assisting community leaders as they cope with new responsibilities by calling upon university resources to serve the continuing educational needs of adults in Arizona.

Non-Credit Continuing Education.

Arizona State University recognizes the responsibility of providing effective continuing education activities including conferences, consortiums, institutes, seminars, short courses and workshops. Activities must be educational in nature, involve University faculty, be approved by the administrative head of the appropriate college or service, and be in conformance with established University regulations and policies. All non-credit continuing education activities must be sponsored by an academic department, college, division or other approved agency of the University. Activities may be co-sponsored or conducted in cooperation with outside agencies or groups provided there is internal University involvement and control and provided that the purpose of the activity is educational.

The Office of University Extension is responsible for providing operating assistance, encouraging program development, and coordinating all continuing education activities.

sponsored by University administrative units and departments. The Office of University Extension is further responsible for the development of guidelines, checklists and general operating procedures which serve to insure coordination and the uniform operation in the various agencies which sponsor continuing education activities including conferences and professional meetings.

Summer Sessions

The Summer Sessions provide an opportunity for students to complete degree requirements in less than the normal four year period. The opportunities for study are much the same as those of the academic year. A broad selection of courses is available for both graduate and undergraduate students, as well as for those seeking to enhance or to refresh their subject matter interests. All classes are held in air conditioned classrooms and laboratories.

The opportunity for foreign travel and study is available during the summer through selected study tours. The tours are directed by regular faculty members and allow students to earn undergraduate or graduate credit. All summer programs are available to the residents of the State of Arizona, as well as those from out of state. Professional conferences, institutes, workshops and seminars are also offered on campus during the summer.

Terms: The Summer Sessions consist of three sessions: one of eight weeks and two of five weeks. The eight week session and the first five week session run concurrently.

Credit and Residence Requirements.

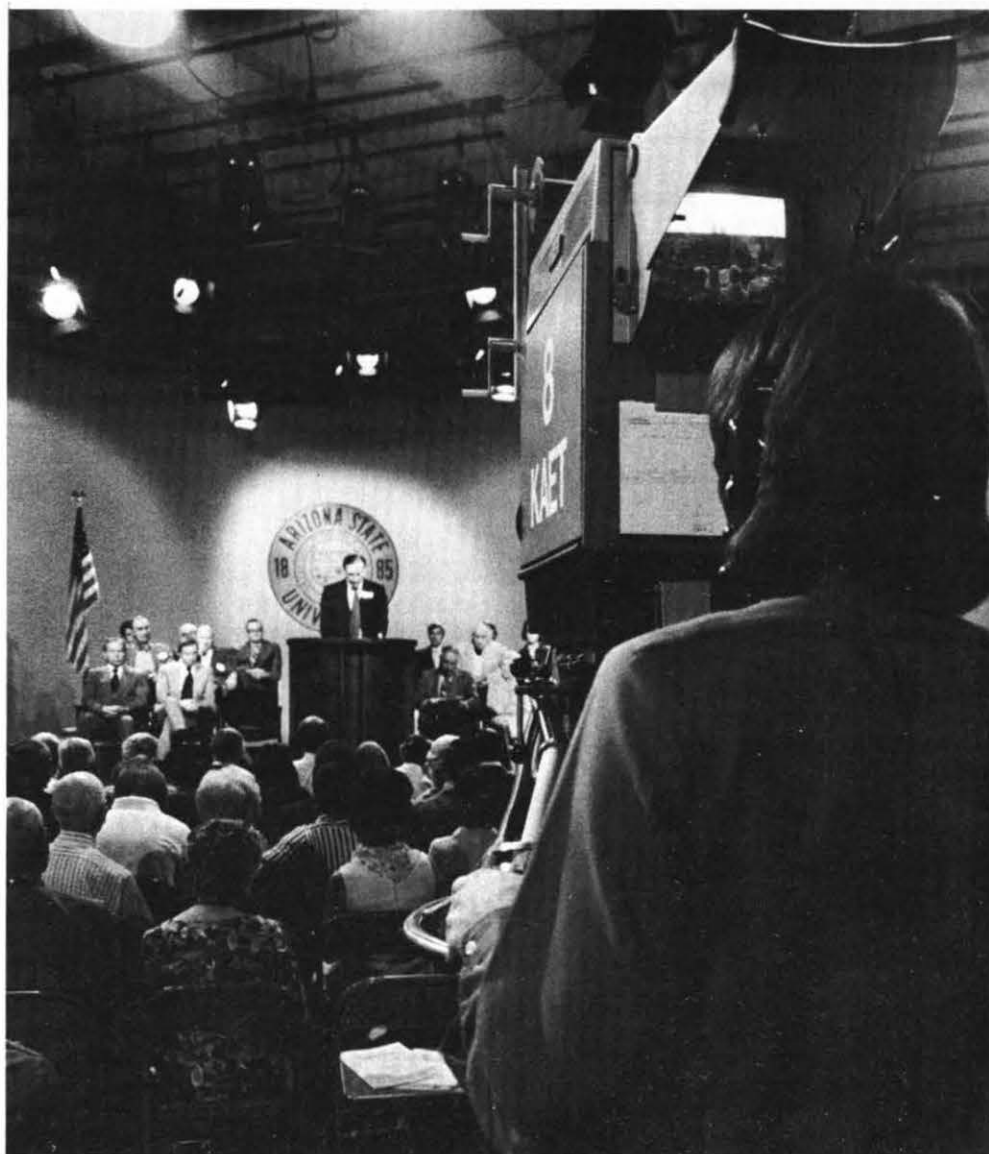
Students are permitted to earn a maximum of 6 semester hours of credit each five-week session and 9 semester hours of credit each eight-week session. Under certain circumstances, it is possible for a student to satisfy the University residence requirement by attending summer sessions. Students entering as freshmen from high school are invited to begin their university work in the summer.

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. Mature students, over 21 years of age, may be admitted without the above qualifications, but with the understanding that all admission requirements must be satisfied before they can become candidates for the bachelor's degree.

Graduate Study. Summer Sessions offer an excellent opportunity for B.A. or B.S. degree holders to continue their professional development. Candidates for graduate degrees should pay particular attention to the requirements for graduate admission and study.

Fees and Expenses. The Summer Sessions fee is \$22.00 per semester hour, which includes the student activity fee. Textbooks and supplies are available for purchase at the University Bookstore on campus. Room and board for the summer are available on campus at the prevailing rates.

Information. Requests for the Summer Sessions *Schedule of Courses* or for other information should be addressed to the Office of Summer Sessions at Arizona State University, Tempe, Arizona, 85281.



Faculty, University Offices and Services

Arizona Board of Regents

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Rud H. Castro, B.A., J.D., LL.D. *Governor of Arizona*
 Carolyn Warner *Superintendent of Public Instruction*

Appointed

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Lawrence F. Woodal, B.S.	<i>Executive Coordinator</i>

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 B.S., North Missouri State College, *Professor of Political Science*
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 A.B., Valparaiso University; M.A., Indiana University; *Professor of History*
 Ph.D., University of Chicago

George F. Hamm *Vice President Student Affairs*
 B.S., South Dakota State College, *Professor of Education*
 M.A., Ph.D., University of Wyoming

. *Vice President Graduate Studies*
Dean, Graduate College

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 B.S., M.S., University of Arkansas, *Professor of Economics*
 Ph.D., University of Missouri

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 B.A., University of South Dakota, M.A., University of Iowa

Charles M. Woolf *Dean, College of Liberal Arts, Professor of Zoology*
 B.S., M.S., University of Utah, Ph.D., University of California - Berkeley

Hugh Burgess *Dean, College of Architecture, Professor of Architecture*
 B.S., University of Utah; M.S., Cornell University

Glenn D Overman *Dean College of Business Administration*
 B.S. Central State College, *Professor of Marketing*
 M.S., Oklahoma State University; D.B.A., Indiana University

Delbert D. Weber *Dean College of Education; Professor of Education*
 B.A., Midland College; M.Ed., Ed.D., University of Nebraska

Lee P. Thompson *Dean, College of Engineering and Applied Sciences*
Director, School of Engineering; Director, Engineering
 B.A., Indiana University, *Research Center, Professor of Engineering*
 M.S., Ph.D., Texas A & M University

Henry A. Bruinsma *Dean College of Fine Arts*
 B.M., M.M., Ph.D., University of Michigan, *Professor of Music*

Juanita F. Murphy *Dean College of Nursing*
 A.B., Oklahoma Baptist University, *Professor of Nursing*
 M.S., Ph.D., Case Western Reserve University

. *Dean College of Law*

Horace W. Lundberg *Dean Graduate School of Social Service*
 B.S., M.S., University of Utah, *Administrative Professor of Social Work*
 M.S.W., University of California Berkeley, Ph.D., University of Minnesota

Denis J. Kigin *Dean University Extension Director,*
Summer Sessions; Professor of Industrial Technology
 B.S., Mankato State Teachers College; M.S., The Stout Institute
 Ed.D., University of Missouri

Koeppe, Donald W. *University Librarian*
 A.B., Wisconsin State College; M.I.S., University of Wisconsin,
 D.L.S., University of California, Berkeley

Resident Faculty

Abbott, John C. (1956) *Professor Emeritus of Education*
 B.S., M.S. in Ed., Ed.D., Indiana University

Abbott, Nancy C. (1971) *Assistant Professor of Nursing*
 B.S.N., Arizona State University; M.S., University of California, San Francisco

Abdow, Miriam J. (1965) *Instructor in French*
 Licencees Lettres, M.A. in French; University of Paris (France)
 M.A. (Spanish), Arizona State University

Abraham, Willard (1953) *Professor of Education;*
Chairman, Department of Special Education
 B.S., Illinois Institute of Technology; M.Ed., Chicago Teachers College,
 Ph.D., Northwestern University

Abramson, Martin L. (1973) *Assistant Professor of Speech and Theatre*
 B.S., M.F.A., Temple University

Acevedo, Roberto M. (1964) *Assistant Professor of Spanish*
 B.A., University of California Berkeley; M.A., Ph.D., University of Arizona

Acker, William J. (1970) *Associate Professor of Geography*
 B.S., Purdue University; M.S., University of Kansas,
 M.A., Ph.D., Syracuse University

Adams, Vaughn P. Jr. (1968) *Assistant Professor of Industrial Design*
 B.S., M.S., Arizona State University; P.F.

Adams, Wallace E. (1958) *Professor of History;*
 B.S., M.A., University of Oregon; *Chairman, Department of History*
 Ph.D., Stanford University

Adeason, Roger D. (1974) *Assistant Professor of History*
 B.A., George Washington University; M.A., Washington University
 B.Litt., Oxford University; Ph.D., Washington University

Ahearn, Maureen V. (1972) *Associate Professor of Spanish*
 B.A., University of New Hampshire,
 Bachelor, Doctor en Letras, Universidad Nacional Mayor de San Marcos

Ahmadzadeh, Akbar (1966) *Associate Professor of Physics*
 B.A., Ph.D., University of California Berkeley

Alarcón, Justo S. (1968) *Assistant Professor of Spanish*
 B.A., M.A. Theology, Serafica Spain;
 M.A. (Social Science), Laval University, Canada;
 M.A. (Spanish), Arizona State University; Ph.D., University of Arizona

Acock, John (1972) *Associate Professor of Zoology*
 B.A., Amherst College; Ph.D., Harvard University

Aldrich, Frank T. (1969) *Assistant Professor of Geography*
 B.A., University of Texas; M.S., Ph.D., Oregon State University

Alsky, Marvin (1957) *Professor of Physical Science*
 B.A., M.J., Ph.D., University of Texas

Allen, Gary W. (1973) *Assistant Professor of Chemistry*
 B.A., University of Washington; Ph.D., Wesleyan University

Allen, Theodore Jr. (1959) *Professor of Engineering*
 B.S.M.E., M.S.M.E., Texas A & M University; P.F.

Altman, Michael L. (1971) *Associate Professor of Law*
 A.B., Bowdoin College; J.B., Boston College; J.L.M., Harvard University

Alvarado, Ronald H. (1974) *Professor of Zoology*
 B.A., University of California, *Chairman, Department of Zoology*
 M.S., Ph.D., Washington State University

Anderson, Bruce A. (1966) *Associate Professor of Mathematics*
 B.A., M.S., Ph.D., University of Iowa

Anderson, Dwight C. (1974) *Assistant Professor of Finance*
 B.S., M.B.A., Louisiana Polytechnic Institute; Ph.D., University of Alabama

Anderson, Ethel C. (1966) *Associate Professor of Education*
 B.S., Utah State University, *Counselor, University Counseling Service*
 M.Ed., Ed.D., University of Wyoming

RESIDENT FACULTY

- Anderson, Marlowe R. (1968) *Assistant Professor of Technology*
B.S.E.F., University of Colorado, M.B.A., Auburn University
- Anderson, Mary R. (1974) *Assistant Professor of Engineering*
B.A., Hope College; M.S., Ph.D., University of Iowa
- Anderson, Melvin S. (1967) *Associate Professor of Real Estate*
B.S., M.S., Oklahoma State University; Ed.D., University of Arkansas
- Anderson, William A. (1969) *Associate Professor of Sociology*
B.A., University of Akron, M.A., Kent State University,
Ph.D., Ohio State University
- Andress, Barbara I. (1972) *Associate Professor of Music*
B.A., M.A., Arizona State University
- Andrews, Frances E. (1974) *Assistant Professor of Home Economics*
B.S., M.S., University of Alabama, Ph.D., Ohio State University
- Antonie, James S. (1973) *Instructor of Art*
B.F.A., Layton School of Art; M.F.A., University of Illinois
- Aprilado, Vincent P. (1969) *Associate Professor of Finance*
B.S., University of Portland; M.B.A., University of Oregon;
Ph.D., University of Michigan
- Appleton, Nicholas R. (1972) *Assistant Professor of Education*
B.A., San Francisco State College, M.A., Santa Fernando Valley State College,
Ed.D., University of Massachusetts
- Archer, Jerome W. (1963) *Professor of English*
B.A., M.A., Marquette University; Ph.D., Northwestern University
- Archer, Stanley J. (1974) *Assistant Professor of Microbiology*
B.S., M.S., Abilene Christian College; Ph.D., University of Tennessee
- Armstrong, Robert L. (1967) *Associate Professor of Education*
B.A., State Teachers College of Iowa, M.S., University of Iowa
Ed.D., University of Arizona
- Arner, Douglas G. (1959) *Professor of Philosophy*
B.S., Creighton University, M.A., Ph.D., University of Michigan
- Arnold, William E. (1973) *Professor of Speech and Theatre,
Chairman, Department of Speech and Theatre*
B.S., M.A., Northern Illinois University, Ph.D., Pennsylvania State University
- Aronson, Jerome M. (1966) *Professor of Botany*
B.A., Ph.D., University of California, Berkeley
- Ashe, Robert W. (1955) *Professor of Education*
A.B., M.A., Arizona State University,
Ed.D., University of Southern California
- Atsum, Takayori (1968) *Associate Professor of Music*
B.M.A., Kunitachi Music College (Japan)
M.M., New England Conservatory of Music
- Ausberger, Carolyn (1972) *Assistant Professor of Speech and Theatre*
B.A., University of Missouri, Kansas City, M.A., University of Iowa
- Autenrieth, Bertha (1946) *Professor Emeritus of Music*
B.M., New England Conservatory, M.M., University of Michigan
- Autore, Donald D. (1959) *Associate Professor of Engineering*
B.S.E., University of Michigan, M.S.E., Arizona State University; P.E.
- Avery, James P. (1960) *Professor of Engineering*
B.S.M.E., M.S.E.M., University of Michigan, Ph.D., Purdue University, P.E.
- Ax, Leland S. (1959) *Associate Professor Emeritus of Engineering*
B.S.E., B.S.R.F., Tri State College, M.S., Kansas State College
- Axelrod, Morris (1972) *Professor of Sociology*
B.A., Ph.D., University of Michigan
- Baca, H. Rene (1974) *Assistant Professor of Quantitative Systems*
A.B., University of Southern California;
M.S., University of California, Los Angeles
- Bachmann, Betty J. (1969) *Assistant Professor of Health,
Physical Education and Recreation*
B.S. Nursing, M.P.H., University of California, Los Angeles
- Backus, Charles E. (1968) *Associate Professor of Engineering*
B.S.M.E., Ohio University, M.S., Ph.D., University of Arizona
- Bagley, Weldon D. (1961) *Instructor in Technology*
B.S., Utah State University; M.A., Arizona State University
- Bahr, Donald M. (1967) *Associate Professor of Anthropology*
A.B., M.A., Ph.D., Harvard University
- Bailey, Greg W. (1971) *Assistant Professor of Technology*
B.A., M.A., San Diego State College; Ed.D., Arizona State University
- Bailey, James E. (1974) *Assistant Professor of Engineering*
B.S., M.S.I.E., Ph.D., Wayne State University
- Bailey, Robert N., Major (1973) *Assistant Professor of Military Science*
B.S., Sain Diego State University; M.B.A., University of Georgia
- Baker, Donald H. (1965) *Instructor in Health, Physical Education
and Recreation; Assistant Football Coach*
B.S., M.A., North Texas State University
- Baker, Georgianne R. (1971) *Associate Professor of Home Economics*
B.S., Marygrove College; M.S., Ohio State University,
Ph.D., Michigan State University
- Baker, Virgil R. (1966) *Professor of Geography*
B.S., M.S., University of Nebraska; Ph.D., University of Utah
- Ball, Rachel S. (1947) *Professor Emeritus of Psychology*
A.B., University of Missouri; Ph.D., University of Chicago
- Barber, Melvin W. (1974) *Assistant Professor of Sociology*
B.A., Inter American University of Puerto Rico; M.A., University of Kansas

- Barbour, Richard L. (1974) *Associate Professor of Music*
 B.A., University of Oregon; M.M.E., University of Colorado;
 Ph.D., University of Oregon
- Bardewick, 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 of Psychology*
 A.B., Ph.D., University of California, Los Angeles
- Barkley, Margaret V. (1963) *Professor of Home Economics*
 B.S., Millikin University; *Supervisor for State Department of Education*
 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
- Barnett, Andrew H. (1974) *Assistant Professor of Accounting*
 B.B.A., M.B.A., Baylor University
- Baron, C. David (1971) *Associate Professor of Accounting;*
Research Associate Bureau of Business and Economic Research
 B.A., Southwest Missouri State University; M.A., University of Missouri;
 Columbia; Ph.D., University of Illinois, Urbana; C.P.A. Kansas and Arizona
- Baroody, Wilson G. (1957) *Assistant Professor of English*
 B.A., Grand Canyon College; M.A., University of Arizona
- Barrett, Thomas W. (1950) *Professor of Agriculture*
 B.S., Brigham Young University; M.S., Ph.D., Cornell University
- Bartel, Carl R. (1968) *Professor of Industrial Technical Education*
 B.S., M.S., Kansas State College of Pittsburg;
 Ed.D., University of Missouri - Columbia
- Bartz, Donna R. (1968) *Assistant Professor of Speech and Theatre*
 B.F.A., M.A., University of Colorado
- Bassford, Gerald (1969) *Associate Professor of Management*
 B.S., M.S., University of Wyoming; M.B.A., Indiana University
- Batchelor, Harold W. (1943) *Professor Emeritus of Library Science*
 B.A., University of Oregon; B.S. in L.S., M.S., University of Illinois
- Baty, Wayne M. (1962) *Professor of Administrative Services*
 B.S. in Ed., Southwest Missouri State College; M.A., Northwestern University;
 Ph.D., University of Southern California
- Baumann, Victor H. (1964) *Professor of Education*
 B.A., Grinnell College; M.A., Northwestern University;
 Ed.D., University of Southern California
- Baur, Patricia Ann (1972) *Field Instructor of Social Work*
 B.A., University of Arizona; M.S.W., Washington University - St. Louis, Mo.
- Beakley, George C. Jr. (1956) *Professor of Engineering*
Associate Dean College of Engineering and Applied Sciences
 B.S.M.E., Texas Technological College; M.S.M.E., University of Texas;
 Ph.D., Oklahoma State University, P.E.
- Becker, R. James (1965) *Professor of Public Affairs*
 B.S., M.A., Bradley University; Ph.D., University of Illinois
- Becker, Walter G. (1955) *Associate Professor of Finance*
 A.B., M.A., Loyola University; Ph.D., University of Iowa; C.F.A.
- Bedient, Jack D. (1963) *Associate Professor of Mathematics*
 A.B., Abilene College; M.B.S., Ed.D., University of Colorado
- Bedworth, David D. (1963) *Professor of Engineering*
 B.S.I.F., Lamar College of Technology; M.S.I.E., Ph.D., Purdue University, P.E.
- Bell, Carol Kay (1974) *Assistant Professor of Speech and Theatre*
 B.A., Methodist Lutheran College; M.A., University of Wyoming
- Bell, James W. (1966) *Professor of Education*
 A.B., Washburn University; M.Ed., Ed.D., University of Kansas
- Bell, John E. (1965) *Professor of Education;*
Chairman, Department of Secondary Education
 B.S., University of Nebraska; M.A., Ed.D., University of Wyoming
- Bell, Mary E. (1970) *Associate Professor of Education*
 B.S., Indiana State Teachers College; M.S., Butler University;
 Ed.D., Indiana University
- Belok, Michael V. (1959) *Professor of Education*
 B.S., Indiana University; M.A., Arizona State University;
 Ph.D., University of Southern California
- Bender, Bert A. (1971) *Assistant Professor of English*
 B.A., University of Washington; Ph.D., University of California, Irvine
- Bender, Gordon L. (1953) *Professor of Zoology*
 B.S., Iowa State College; M.S., University of Wisconsin;
 Ph.D., University of Illinois
- Benedict, Joel A. (1946) *Professor of Education*
 B.A., M.A., Arizona State University; Ed.D., Stanford University
- Benin, David B. (1970) *Assistant Professor of Physics*
 A.B., Cornell University; M.A., Ph.D., University of Rochester
- Bennett, E. Dean (1970) *Associate Professor of Mass Communications*
 B.A., Brigham Young University; M.A., Ph.D., Michigan State University
- Benzinger, Robert P. (1970) *Associate Professor of Industrial Design*
 B.S.M.E., University of Wisconsin; M.A.E., Chrysler Institute of Engineering
- Berch, Michael A. (1969) *Professor of Law*
 B.A., J.D., Columbia University
- Bermann, David R. (1966) *Associate Professor of Political Science*
 B.A., Rockford College; M.A., Ph.D., American University

RESIDENT FACULTY

- Berman, Neil S. (1964) *Professor of Engineering*
B.S., University of Wisconsin, M.S., M.A., Ph.D., University of Texas
- Bertelsen, Wendle R. (1964) *Assistant Professor of Architecture*
B.Arch., University of Michigan
- Bertke, Eldridge M. (1958) *Professor of Zoology*
B.S., M.S., Ph.D., University of Wisconsin
- Bessom, Richard M. (1968) *Associate Professor of Marketing*
A.B., Cornell University; M.B.A., Stanford University,
Ph.D., University of Washington
- Betz, M. Austin (1974) *Assistant Professor of Education*
B.S., Lock Haven State College, M.Ed. Math., Pennsylvania State University
M.A. (Teaching) Brown University
M.A. (Math. Stat.) Ph.D., University of Illinois
- Betz, Mathew J. III (1961) *Professor of Engineering; Associate Dean*
B.S., M.S., Ph.D., Northwestern University *Graduate College*
- Bickford, William B. (1966) *Associate Professor of Engineering*
B.S., M.S., Kansas State University, Ph.D., University of Illinois
- Bidnick, Marilyn L. (1973) *Assistant Professor of Sociology*
B.S., Mt. St. Scholastica College, M.A., Ph.D., University of Texas, Austin
- Bieber, Allan L. (1963) *Associate Professor of Chemistry*
B.S., M.S., North Dakota State University, Ph.D., Oregon State University
- Biekert, Russell G. (1970) *Assistant Professor of Technology*
B.S., M.S., Southern Illinois University, Ed.D., Arizona State University
- Bigpond, Phyllis J. (1972) *Assistant Professor Field Instructor*
B.A., Oklahoma State University, *of Social Work*
M.S.W., George Warren Brown Washington University, St. Louis
- Bininger, Robert J. (1962) *Professor of Spanish; Assistant Dean*
B.A., M.A., Ph.D., Ohio State University *College of Liberal Arts*
- Birge, Edward A. (1972) *Assistant Professor of Microbiology*
B.A., Ph.D., University of Wisconsin, Madison
- Bitk, James P. (1973) *Associate Professor of Chemistry*
B.A., St. John's University, Ph.D., Iowa State University
- Bissett, Judith G. (1974) *Instructor of Spanish*
B.A., University of New Mexico; M.A., University of Wisconsin;
M.L.S., University of Texas
- Bitter, Gary G. (1970) *Associate Professor of Education*
B.S., Kansas State University, M.A., Kansas State Teachers College,
Ph.D., University of Denver
- Blackburn, Jack B. (1972) *Professor of Engineering*
B.S.C.E., Oklahoma University, M.S.C.E., Ph.D., Purdue University; P.E.
- Blackham, Garth J. (1962) *Professor of Education*
B.S., M.S., Utah State University, Ph.D., Cornell University
- Blackledge, Vernon O. (1969) *Associate Professor of Engineering*
B.S.E.F., University of Illinois, M.S.F.F., University of Santa Clara,
Ph.D., Arizona State University
- Blaesser, Willard W. (1968) *Professor of Education*
B.S., M.A., University of Wisconsin, Madison;
Ed.D., George Washington University
- Blinchard, Jack W. (1973) *Associate Professor of Technology*
B.S.R.F., Tr. State College, M.S.F.F., University of Arizona
- Blewett, Laura J. (1964) *Assistant Professor of Nursing*
B.S., University of Minnesota, M.S.N., Case Western Reserve University
- Bloemendaal, Nancy L. (1970) *Instructor in Music*
B.A., Arizona State University, M.F.A., Temple University
- Boetto, Laurel B. (1956) *Assistant Professor of Education*
B.A. in Ed., M.A. in Ed., Arizona State University
- Bogart, Quentin J. (1970) *Associate Professor of Education*
B.A., M.S., Fort Hays State College, Ph.D., University of Texas, Austin
- Boggs, Iohnie J. (1959-65; 1966) *Professor of Administrative Services*
Chairman, Department of Administrative Services
B.S., M.A., Ph.D., Ohio State University
- Bohlman, Herbert M. (1964) *Associate Professor of Administrative*
B.S. in B.A., Drake University, M.B.A., J.D., Indiana University *Services*
- Bond, M. E. (1967) *Associate Professor of Economics,*
Director of Bureau of Business
and Economic Research
B.B.A., M.A., Ph.D., University of Iowa
- Borgo, Philip E. (1967) *Assistant Professor of Engineering*
B.S.C.E., University of Cincinnati; M.S., Ohio State University, P.F.
- Boulton, Laura C. (1972) *Distinguished Professor of Fine Arts, Director*
B.A., D.H.I., Demson University *Boulton Ethnic Music Collection*
- Bowers, Charles O. (1948) *Associate Professor of Music*
B.S. in Ed., Southeast Missouri State College,
M.M., D.M.A., Eastman School of Music
- Bowman, Russell K. (1956) *Professor 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, Mildred (1970) *Assistant Professor Field Instructor*
B.S. in Ed., Texas Technological University, *of Social Work*
M.S.W., Arizona State University
- Boyes, William J. (1974) *Assistant Professor of Economics*
B.S., Idaho State University, Ph.D., Claremont Graduate School
- Boyer, Bernard M. (1969) *Associate Professor of Architecture*
B.Arch., University of Sydney, A.I.T. (I.T.), 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
- Brady, Ward W. (1973) *Assistant Professor of Agriculture*
B.S., M.S., Ph.D., Colorado State University
- Brand, Mark (1968) *Associate Professor of Social Work*
B.A., M.A., University of Arizona; M.S.W., University of California, Berkeley
- Brandt, Elizabeth A. (1974) *Assistant Professor of Anthropology*
B.A., Florida State University; M.A., Ph.D., Southern Methodist University
- Branstetter, Fillamae (1958-64; 1967) *Professor of Nursing*
B.S., St. Louis University; *Assistant Dean, College of Nursing*
M.P.H., University of Minnesota; Ph.D., University of Chicago
- Braun, Joseph J. (1973) *Associate Professor of Psychology*
B.A., University of Oregon; M.A., Ph.D., Ohio State University
- Baver, Sanford L. (1970) *Assistant Professor of Psychology*
B.A., Wayne State University; Ph.D., University of Michigan
- Brazel, Anthony J. (1974) *Assistant Professor of Geography*
B.A., M.A., Rutgers, The State University; Ph.D., University of Michigan
- Breckenridge, Jack D. (1962) *Professor of Art*
B.S., Wisconsin State College; M.F.A., University of Iowa
- Bregar, John F. (1965) *Professor of Engineering*
B.S., Pennsylvania State University; Ph.D., University of Arizona; P.E.
- Bresina, Bertha M. (1960) *Professor of Home Economics*
B.S., M.S., St. Joseph State University; Ph.D., Iowa State University
- Brink, Jeanie R. (1974) *Assistant Professor of English*
B.A., Northwestern University; M.A., Harvard University;
Ph.D., University of Wisconsin, Madison
- Britton, Melvin W. (1957) *Professor of Music*
B.S., M.S., University of Illinois
- Britz, Richard D. (1969) *Assistant Professor of Architecture*
B.Arch., University of Kansas
- Brodley, Hugh T. (1969) *Professor of Art*
A.B., Park College; M.A., Yale University; Ph.D., New York University
- Brock, James L. (1971) *Instructor in Health Physical Education and Recreation*
B.A., M.A., Arizona State University; *Recreation Health Buschall Coach*
- Broekema, Andrew J. (1968) *Professor of Music*
B.M., M.M., University of Michigan; *Chairman, Department of Music*
Ph.D., University of Texas
- Brook, Weston I. (1966) *Associate Professor of Education, Director, Professional Field Experiences*
B.A., M.A., Ed.D., University of Wyoming
- Brose, Marianna F. (1963) *Assistant Professor of English*
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- Brown, Alan R. (1968) *Associate Professor of Criminal Justice*
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- Brown, Brent W. (1972) *Assistant Professor of Public Affairs*
B.A., Bharati Young University; M.A., Arizona State University;
Ph.D., University of Illinois
- Brown, Donald F. (1963) *Professor of Mass Communications*
B.A., M.A., University of Iowa
- Brown, Duane (1950) *Professor of Chemistry*
B.S., Brigham Young University; Ph.D., Cornell University
- Brown, Peter (1967) *Associate Professor of Chemistry*
B.S., Ph.D., University of Southampton (England)
- Brown, Stephen W. (1974) *Associate Professor of Marketing*
B.S., M.B.A., D.B.A., 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 of Industrial Technical Education; Associate Director, Division of Technology*
B.S., Northwest Missouri State University; *Associate Director*
M.Ed., Ed.D., University of Missouri, Columbia
- Bruff, Harold H. (1971) *Assistant Professor of Law*
B.A., Williams College; I.I.B., Harvard University
- Bruinsma, Henry A. (1964) *Professor of Music*
B.M., M.M., Ph.D., University of Michigan; *Dean, College of Fine Arts*
- Bruner, May I. (1961) *Associate Professor of Nursing*
B.S., University of Illinois; M.S., University of Colorado
- Bruns, Gilbert H. (1974) *Associate Professor of Criminal Justice*
B.S., M.Ed., South Dakota State University; Ed.D., Arizona State University
- Bruton, Helen J. (1972) *Assistant Professor of Social Work*
B.A., Michigan State University; M.S.W., University of California, Berkeley
- Bivant, Fred O. (1950) *Associate Professor of Health Physical Education and Recreation*
B.S., Springfield College; M.S., University of Illinois; *Physical Education*
Ed.D., Arizona State University
- Buck, Michael T. (1974) *Assistant Professor of Social Work*
B.S. in Human Relations, Missouri Valley College;
M.S.S.W., University of Wisconsin Milwaukee School of Social Welfare
- Buckingham, Willis J. (1969) *Assistant Professor of English*
A.B., Harvard College; M.S., University of Wisconsin, Madison;
Ph.D., Indiana University
- Buffington, Albert F. (1965) *Professor of German*
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- Buley, Jerry L. (1973) *Assistant Professor of Speech and Theatre*
 B.A., University of Colorado; M.A., Michigan State University;
 Ph.D., Florida State University
- Bullock, Arnold H. (1941) *Professor of Music*
 B.M., Yale University; M.A. in Ed., Arizona State University
- Bunt, Lucas N. H. (1968) *Professor Emeritus of Mathematics*
 B.S., Drexel University of Amsterdam; Ph.D., University of Groningen, Neth.
- Burdette, Walter E. (1956) *Professor of Industrial Technical Education,
 Director, Division of Technology*
 B.S., M.S., Kansas State College of Pittsburg;
 Ed.D., University of Missouri-Columbia
- Burg, B. Richard (1967) *Associate 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 Architecture
 Dean, College of Architecture*
 B.S., University of Idaho; M.S. Arch., Columbia University
- Burgess, Paul L. (1969) *Associate Professor of Economics*
 B.A., Ph.D., University of Colorado
- Burgoyne, Edward F. (1951) *Professor of Chemistry*
 B.S., Utah State University; M.S., Ph.D., University of Wisconsin-Madison
- Burk, Karl W. (1949) *Associate Professor Emeritus of Industrial
 Education*
 B.A. in Ed., M.A. in Ed., Arizona State University; *Technical Education*
 Ed.D., Bradley University
- Burke, Margaret (1973) *Instructor in Nursing*
 B.S.N., Georgetown University; M.S.N., Catholic University, Washington, D.C.
- Burke, William J. (1962) *Professor of Chemistry*
 A.B., Ohio University; Ph.D., Ohio State University
- Burkett, Lee N. (1974) *Assistant Professor of Health
 Education*
 B.A., M.A., San Diego State College; *Physical Education and Recreation*
 Ph.D., Washington State University
- Burkhard, Samuel (1921) *Professor Emeritus of Education*
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- Bursh, Joshua M. III (1971) *Assistant Professor of Administrative
 Services*
 B.A., Grambling College; M.N.S., J.D., Arizona State University
- Burt, Donald M. (1974) *Assistant Professor of Geography*
 A.B., Princeton University; A.M., Ph.D., Harvard University
- Burton, Atleigh R. (1941) *Professor Emeritus of Accounting*
 A.B., M.S., Emporia State Teachers College;
 Ph.D., University of Nebraska-Lincoln; C.P.A., Arizona
- Burton, Foster M. (1969) *Associate Professor of Construction
 Management*
 M.S.C.E., B.S. (Industrial Management), Carnegie Institute of Technology;
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- Buseck, Peter R. (1963) *Professor of Chemistry and Geology*
 B.A., Antioch College; M.A., Ph.D., Columbia University
- Butler, Jay Q. (1972) *Assistant Professor of Finance*
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- Cabrana, William A. (1967) *Associate Professor of Education*
 B.Ed., Gonzaga University; M.Ed., Ph.D., Washington State University
- Caden, James D. (1972) *Assistant Professor of Anthropology*
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- Caraco, Anthony (1974) *Assistant Professor of Architecture*
 B.A., State University of New York; M.A., Arizona State University
- Campbell, Bruce L. (1972) *Assistant Professor of Home Economics*
 B.S., M.S., Brigham Young University; Ph.D., University of Minnesota
- Campbell, Roy H. (1965) *Associate Professor Emeritus of Marketing*
 M.B.A., University of Chicago; Ph.D., Columbia University
- Canby, William C. Jr. (1967) *Professor of Law*
 A.B., Yale University; LL.B., University of Minnesota
- Cannight, James E. (1964) *Professor of Botany*
 B.A., Miami University; A.M., Ph.D., Harvard University
- Carlson, Ingeborg L. (1965) *Professor of German
 Language and Literature*
 Abitur, Hoher Schule, Heidelberg; Volkswirtschaftswissenschaften, University of Heidelberg;
 Cand. phil., University of Heidelberg; Dr. phil., University of Erlangen-Nuremberg
- Carney, James D. (1967) *Professor of Philosophy*
 M.A., Roosevelt University; Ph.D., University of Nebraska-Lincoln
- Carroll, Alice Rose (1955) *Associate Professor Emeritus
 of Mathematics*
 A.B., St. Mary's College; M.A., Ohio University
- Carroll, Christina (1966) *Professor of Music*
- Cartsonis, Sylvia I. (1973) *Assistant Professor Field Instructor*
 B.A., University of Michigan; M.S.S., Bryn Mawr College; *Social Work*
- Carson, M. Lewis (1974) *Assistant Professor of Quantitative Systems
 Management*
 B.S., University of Arizona; B.F.I., Thunderbird Graduate School of Management;
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- 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
- Casaus, Luis E. (1974) *Assistant Professor of Education*
 B.A., New Mexico Highlands University; M.A., University of New Mexico;
 Ed.D., Texas Technological University
- Cass, James L. (1969) *Assistant Professor of Speech and Theatre*
 B.S., Weber State College; M.S., Ph.D., University of Utah
- Castillo, Senon A. (1951) *Instructor in Health, Physical Education
 and Recreation; Health Track Coach*
 B.S., Arizona State University

- Castle, Gordon B (1962) *Professor of Zoology*
B.A. Wabash College, M.A., Ph.D., University of California, Berkeley
- Castle, Peggy (1971) *Associate Professor of Music*
A.R.M.C.M. Royal Manchester College of Music
- Cau, L. Carol (1973) *Instructor in Administrative Services*
A.B., George Washington University; J.D., Arizona State University
- Cavaliere, William A. (1946) *Assistant Professor of Technology*
B.A., M.A. in Ed., Arizona State University
- Cazier, Mont A (1962) *Professor of Zoology*
B.S., Ph.D., University of California, Berkeley
- Chafey, Kathleen H. (1967) *Assistant Professor of Nursing*
B.S.N., Arizona State University; M.S., University of Minnesota
- Chalmers, James A. (1972) *Associate Professor of Economics*
B.A., University of Wyoming; Ph.D., University of Michigan
- Chaquest, Richard R. (1971) *Professor of Agriculture Director*
B.S., D.V.M., Washington State University; *Division of Agriculture*
M.S., Ph.D., Cornell University
- Chambers, Anthony H. (1971) *Assistant Professor of Japanese*
B.A., Pomona College; M.A., Stanford University
- Chartier, George M. (1970) *Assistant Professor of Psychology*
B.S., University of Illinois; M.A., Ph.D., University of Oregon
- Chasey, Eugene F (1965) *Associate Professor of Education*
B.S., Northwestern State College; M.A., Colorado State College,
Ed.D., University of Wyoming
- Chen, Marjory L. (1973) *Assistant Professor of Humanities*
B.M., Averno College; M.M., University of Southern California,
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- Chen, Stanley S (1967) *Associate Professor of Engineering*
Diploma, Taipei Institute of Technology, China; M.S., Ohio University,
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- Childers, Bruce K (1974) *Assistant Professor of Administrative Services*
B.B.A., North Texas State University
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- Christensen, Kent M (1966) *Associate Professor of Education*
B.S., M.S., Brigham Young University, *Director of Student Services*
Ph.D., Michigan State University
- Christine, Ray Ori (1958) *Associate Professor of Education*
A.B., A.M., Colorado State College, F.I.D., Arizona State University
- Chubrich, Robert E (1971) *Assistant Professor of Speech and Theatre*
B.A., Grinnell College; M.A., Indiana University;
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- Church, Kathleen K. (1969) *Associate Professor of Zoology*
B.S., M.A., University of Utah; Ph.D., University of California, Berkeley
- Churchill, William D. (1966) *Associate Professor of Education*
A.B., Colgate University; *Counselor, University Counseling Service*
M.Ed., Alfred University; Ed.D., University of Rochester
- Cialdini, Robert B. (1971) *Assistant Professor of Psychology*
B.S., University of Wisconsin; M.A., Ph.D., University of North Carolina
- Clark, Geoffrey A (1971) *Assistant Professor of Anthropology*
B.A., M.A., University of Arizona; Ph.D., University of Chicago
- Clark, George D. Jr., Major (1973) *Assistant Professor of Military Science*
B.S., Georgia Institute of Technology; M.B.A., Texas University
- Clark, Wilburn O (1967) *Associate Professor of Engineering*
B.S.F.F., M.S.F.E., Ph.D.E.E., University of Kansas
- Clary, Edward W. (1967) *Professor of Law*
A.B., Illinois College; J.D., University of Illinois; J.S.D., Yale University
- Clothier, Ronald R (1955) *Associate Professor of Zoology*
A.B., Fresno State College; M.A., Montana State University,
Ph.D., University of New Mexico
- Cluff, Gordon I (1963) *Associate Professor of Speech and Theatre*
B.A., Arizona State University; M.S., Ph.D., Southern Illinois University
- Clute, James L (1974) *Assistant Professor of Music*
B.M., M.A., University of Iowa
- Cochran, Douglas L (1968) *Associate Professor of Management*
B.S., Ohio State University; M.B.A., Harvard University,
Ph.D., University of Oregon
- Cochran, John A. (1962) *Professor of Economics*
A.B., Drake University; A.M., Ph.D., Harvard University
- Cohen, David (1967) *Associate Professor of Music*
B.S., M.S., Juilliard School of Music; D.M.A., University of Southern California
- Cohodas, Marvin (1974) *Assistant Professor of Art*
B.A., M.A., Ph.D., Columbia 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 of Zoology*
A.B., Middlebury College; M.S., St. Lawrence University,
Ph.D., University of Minnesota
- Comeaux, Malcolm L. (1969) *Assistant Professor of Geography*
B.A., University of Southwestern Louisiana; M.A., Southern Illinois University
Ph.D., Louisiana State University
- Coney, Kenneth A (1973) *Assistant Professor of Marketing*
B.A., M.B.A., Washington State University; Ph.D., University of Oregon
- Conlon, David A. (1948) *Professor Emeritus of English*
A.B., Syracuse University; Ph.D., Yale University
- Cook, Jeffrey M (1961) *Professor of Architecture*
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B.B.A., M.B.A., D.B.A., Texas Technological University
- Cooperrider, Neil K. (1973) *Associate Professor of Engineering*
B.S.M.F., M.S.M.E., Ph.D., Stanford University
- Corder, Bruce W. (1971) *Associate Professor of Health*
B.A., Lynchburg College; *Physical Education*
M.Ed., D.Ed., Temple University *and Recreation*
- Couch, Sanford C. (1962) *Professor of Russian*
B.A., M.A., Ph.D., University of Wisconsin-Madison
- Coudroglou, Aiki (1971) *Associate Professor of Social Work*
B.A., College of St. Benedict; M.S.W., University of Minnesota
- Cowley, John M. (1969) *Gifted Professor of Physics*
B.S., M.S., D.Sc., University of Adelaide (Australia);
Ph.D., Massachusetts Institute of Technology
- Cox, Frank E. (1972) *Associate Professor of Technology*
B.S.M.E., Purdue University; M.S.I.E., Arizona State University
- Cox, Steven R. (1970) *Assistant Professor of Economics*
B.S., University of Wisconsin, Madison; M.A., Ph.D., University of Michigan
- Craft, John E. (1973) *Assistant Professor of Mass Communications*
B.F.A., M.A., Ohio University
- Craig, Samuel F., Jr. (1960) *Professor of Engineering*
B.S., Oregon State University; Ph.D., University of Utah; P.E.
- Cranmer, William H. (1963) *Professor of Social Work*
B.A., University of Akron; M.S., Case Western Reserve University
- Creath, J. Richard (1974) *Assistant Professor of Philosophy*
B.A., Knox College; M.A., University of Pittsburgh
- Creighton, Judith M. (1967) *Instructor in Home Economics*
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- Croft, Lee B. (1973) *Assistant Professor of Russian*
B.S., Arizona State University; M.A., University of Arizona;
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- Cronin, John R. (1966) *Associate Professor of Chemistry*
B.A., College of Wooster; Ph.D., University of Colorado
- Crouch, Beulah (1953) *Assistant Professor of Education*
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- Crowder, Troy F. (1970) *Associate Professor of Mass Communications;*
Assistant to the President Director, University Relations
B.A., University of South Dakota; M.A., University of Iowa
- Cummings, Lawrence T. (1970) *Associate Professor of Education*
B.A., M.A., Arizona State *Director, Student Counseling Service*
University; Ed.D., University of California, Los Angeles
- Cummings, Susan N. (1964) *Associate Professor of Education*
B.S., University of Chicago; M.A. in Ed., Ph.D., Arizona State University
- Curran, Mark J. (1968) *Associate Professor of Spanish*
B.S., Rockhurst College; Ph.D., St. Louis University
- Cuthbert, Alexander R. (1973) *Associate Professor of Architecture*
B.Arch., M.C.P., Edinburgh College of Art
- Daane, Calvin J. (1963) *Professor of Education*
B.S., University of Wisconsin; M.A., Columbia University;
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- Dahl, Richard C. (1966) *Professor of Law Director, Law Library*
B.A., B.I.S., University of California; LL.B., Catholic University
- Daily, R. Austin (1974) *Associate Professor of Accounting*
B.S., University of Notre Dame; M.B.A., Ph.D., University of North Carolina;
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- D'Andrea, Frank L. (1972) *Associate Professor of Music*
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- D'Angelo, Frank J. (1970) *Assistant Professor of English;*
B.A., Loyola University, New Orleans; *Director, Freshman English*
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- Daniel, Norman E. (1970) *Associate Professor of Transportation*
B.S., M.S., University of Tennessee-Knoxville; Ph.D., Indiana University
- Dannenfeldt, Karl H. (1956) *Professor of History;*
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- Darden, Leatha Anne (1972) *Assistant Professor of Home Economics*
B.S., M.S., University of Alabama
- Dauten, Joel J. (1960) *Professor of Finance*
B.S., M.S., Washington University; Ph.D., State University of Iowa
- Davidson, Joseph K. (1973) *Associate Professor of Engineering*
B.M.E., M.Sc., Ph.D., Ohio State University; P.E.
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B.B.A., M.B.A., University of Texas, Ph.D. Ohio State University
- Davis, Robert E. (1959) *Professor of Speech and Theatre*
A.B., A.M., Ph.D. University of Illinois
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A.B., B.S. Central Missouri State College
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B.S., M.S., University of Illinois, Ph.D., University of Michigan
- Dean, Arthur G. (1971) *Associate Professor of Instruction*
B.S., M.S. Texas Technological University, Ph.D., Texas A & M University
- Decker, John P. 1963 *Professor of Engineering*
B.S., University of Idaho; M.A., Ph.D., Duke University
- Decker, Patrick G. (1974) *Assistant Professor of Management*
B.S.I.M., M.B.A., University of Cincinnati
- Deever, R. Merwin (1959) *Professor of Education, Director*
A.B. Southwestern College, *Bureau of Educational Research and Services*
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- Delgado, Richard (1974) *Assistant Professor of Law*
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- De Massa, Thomas A. 1966 *Professor of Engineering*
B.S.E.I., M.S.I.E., M.S., Ph.D., University of Michigan
- DeMittes, Nicholas (1974) *Assistant Professor of Art*
B.A. Long Beach State University, M.S., Illinois Institute of Technology
- Demeke, Howard J. 1962) *Associate Professor of Education*
A.B., San Francisco State College, M.S. Ed.D., University of Southern California
- Dempster, Judith (1974) *Instructor in Nursing*
B.S.N., M.S., Arizona State University
- Dewey, Thomas B. (1971) *Assistant Professor of English*
B.A., Kansas State Teachers College,
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- Dezelsky, Thomas L. (1968) *Associate Professor of Health Physical Education and Recreation*
B.S. Central Michigan University,
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B.S. M.A. East Tennessee State University, Ed.D. University of Georgia
- Ditsworth, Richard I. (1959) *Professor of Engineering*
B.S., M.S., Iowa State College, Ph.D., Michigan State University, P.E.
- Dittert, A. Fred F., Jr. (1967) *Professor of Anthropology*
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- Doebler, Bettie Anne (1971) *Associate Professor of Humanities*
B.A., M.A., Duke University; Ph.D., University of Wisconsin, Madison
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- Donnell, Carol A. 1972) *Assistant Professor of Humanities*
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- Donnelly, Aaron V. (1962) *Professor of Engineering*
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- Downing, George D. Jr. 1964 *Professor of Marketing*
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B.S., University of Arizona; M.S.C.E., Ph.D. Stanford University
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B.A., Arizona State University; M.A., Northwestern University,
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- Doyle, Roy P. (1959) *Professor of Education*
B.A. in Ed. Arizona State University, M.A. Ed.D., Columbia University
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- Dycus, Augustus M. (1959) *Assistant Professor of Biology*
B.S., Akron University, Ph.D. Cornell University
- Falkins, Barbara G. (1974) *Assistant Professor of Speech and Theatre*
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 B.S.Ch.E., Clarkson College of Technology; M.B.A., University of New Mexico;
 Ph.D., Tulane University
- Eckert, Thomas W. (1971) *Instructor of Art*
 B.A., M.F.A., Arizona State University
- Eder, James F., Jr. (1974) *Assistant Professor of Anthropology*
 B.S. Biology, California Institute of Technology,
 M.A., Ph.D., University of California, Santa
- Edmundson, Margaret (1973) *Instructor in Nursing*
 B.S.N., University of Nevada, M.N., Liberty University
- Edney, Julian J. (1973) *Assistant Professor of Psychology*
 B.A., University of California, Riverside, Ph.D., Yale University
- Edwards, Marvin J. (1959) *Assistant Professor of Technology*
 B.S., M.A. in Educational Administration, State University
- Effland, Richard W. (1967) *Professor of Law*
 A.B., I.L.B., University of Wisconsin, L.M., Columbia University
- Ehmsen, Ronald J. (1973) *Assistant Professor of Engineering*
 B.S., New York University; M.S., Portland University
 D.Sc., Washington University
- Ekmundis, Rolf (1963) *Professor of Russian*
 B.A., M.A., University of Wisconsin, Madison, Ph.D., Indiana University
- Fis, Catherine (1967-71, 1974) *Assistant Professor of Nursing*
 B.S.N., Wheaton College, M.S.N., Colorado University
- Fitz, John C. (1957) *Associate Professor of English*
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- Ellis, Robert H. (1962) *Associate Professor of Mass Communications*
 B.A., Arizona State University; *Director, Bureau of Broadcasting*
 M.A., Case Western Reserve University
- Ellner, Anthony Jr. (1960) *Professor of Architecture*
 B.A., Brooklyn College, B.Arch., Yale University, M.A., Columbia University
- Ellsworth, Lola M. (1938) *Professor Emeritus of Home Economics*
 B.S., Brigham Young University, M.A., Columbia University
- Emore, James W. (1949) *Professor of Architecture*
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- Elsea, Janet G. (1977) *Assistant Professor of Speech and Theatre*
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- Emery, Raymond C. (1962) *Associate Professor of English*
 B.A., M.A., University of Wyoming; Ed.D., Stanford University
- Engelhardt, Florence P. (1965) *Associate Professor of Social Work*
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 M.S.S., Fordham University
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 B.A., M.A., Arizona State University; Ph.D., University of Texas, Austin
- English, William S. (1962) *Professor of Music*
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- Fino, Richard B. (1957-62; 1963) *Professor of English*
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- Fiscudero, Mary J. (1948) *Professor of Spanish*
 A.B., San Diego State College, M.A., Calumet College,
 Diplo.me, Institute de Phonétique, University of Paris; Ph.D., Cornell University
- Fryans, Donovan L. (1966) *Associate Professor of Engineering*
 B.S.M.E., University of Cincinnati; Ph.D., Northwestern University
- Evans, John X. (1964) *Professor of English*
 B.A., Holy Cross College; M.A., Ph.D., Yale University
- Fyring, Leroy (1961) *Professor of Chemistry*
 B.S., University of Arizona, Ph.D., University of California, Berkeley
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 B.S., Iowa State College; M.A., Colorado State College,
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 B.A., University of Iowa; J.D., Northeastern University
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 B.A., M.A., Michigan State University
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 B.A., M.A., University of Montana, Ph.D., Ohio State University
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 B.S., M.B.A., Indiana University; Ph.D., Michigan State University
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 B.S., University of Wisconsin, M.A., Ph.D., Washington University
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- Finch, A. Joyce (1965) *Assistant Professor of Nursing*
B.S.N., Augustana College, M.S. University of Colorado
- Fink, Raymond R. (1958) *Professor of Art*
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M.S.A.E., Illinois Institute of Technology
- 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 State University; Ph.D. University of Minnesota
- Fitch, Gregory W. (1974) *Assistant Professor of Philosophy*
B.A., Western Washington State College, M.A. University of Massachusetts
- Fleming, Robert C. (1974) *Assistant Professor of Music*
B.S., Indiana University of Pennsylvania, M.F.A., Carnegie Mellon University,
Ph.D., Southern Illinois University
- Fletcher, Grant (1956) *Professor of Music*
B.M., Illinois Wesleyan University; M.M., University of Michigan,
Ph.D., Eastman School of Music
- Forschuetz, Leon W. (1964) *Professor of Engineering*
B.S., M.S., Ph.D., University of Illinois
- Flynn, James T. (1964) *Associate Professor of Architecture*
B.Arch., Carnegie Institute of Technology; M.Arch., Harvard University
- Footel, Jean A. (1972) *Instructor in Nursing*
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- Foster, David W. (1966) *Professor of Spanish*
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- Foster, James C. (1974) *Assistant Professor of History*
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- Foster, Joyce (1972) *Assistant Professor of Zoology,
Assistant to the Academic Vice President*
B.A., M.A. DePaul University, Ph.D., Arizona State University
- Fouquette, Martin J., Jr. (1965) *Associate Professor of Zoology*
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- Frame, Terry M. (1968) *Associate Professor of Administrative Services
Director, Center for Executive Development*
B.S., Northern Illinois University, M.S., University of Colorado
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- Frasier, James E. (1963) *Professor of Education*
B.A., University of Northern Colorado; M.A., University of Michigan,
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B.M.E., Kansas City Conservatory of Music; M.M., University of Denver
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B.S., M.A., University of South Dakota, Ph.D., University of Iowa
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B.S.E.E., Valparaiso University; M.S.E.E., University of Notre Dame,
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- Gerber, Helmut E. (1971) *Professor of English*
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- Gill, George A. (1967) *Assistant Professor of Education*
B.S., M.A., Arizona State University
- Gillingwater, Dennis (1973) *Instructor of Art*
B.F.A., M.F.A., University of Cincinnati
- Giso, Margaret (1954) *Professor of Health, Physical Education
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B.S., Indiana State Teachers College;
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- Glaunsinger, William S. (1972) *Assistant Professor of Chemistry*
B.S., Miami University; Ph.D., Cornell University
- Glicken, Morley D. (1971) *Assistant Professor of Social Work*
B.Ph., University of North Dakota; M.S.W., University of Washington
- Goheen, Douglas Scott (1965) *Assistant Professor of Speech and Theatre*
A.B., College of William and Mary; M.F.A., Yale University;
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- Goldstein, Elliott S. (1974) *Assistant Professor of Zoology*
B.S., University of Hartford; M.S., Ph.D., University of Minnesota
- Goldstein, Myron (1963) *Associate Professor of Mathematics*
B.S., M.A., Ph.D., University of California, Los Angeles
- Goo, Benjamin (1955) *Professor of Art*
B.F.A., University of Iowa; M.F.A., Cranbrook Academy of Art
- Gooding, Elmer R. (1967) *Associate Professor of Economics,
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- Goodstein, Leonard D. (1974) *Professor of Psychology,
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- Gordon, Leonard (1967) *Associate Professor of Sociology*
B.A., Wayne State University; M.A., University of Michigan
- Gourley, David R. (1967) *Associate Professor of Marketing*
B.S., Miami University; M.B.A., University of Toledo
- Grace, Edward E. (1963) *Professor of Mathematics*
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- Greathouse, Betty M. (1972) *Assistant Professor of Education*
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- Green, James L. (1967) *Associate Professor of English*
B.A., M.A., University of Kansas; Ph.D., University of Nevada
- Green, Mary E. (1967) *Associate Professor of English*
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- Greene, Mildred S. (1966) *Assistant Professor of English*
A.B., Wellesley College; M.A.T., Radcliffe College;
M.A., University of Massachusetts; Ph.D., University of New Mexico
- Greenwood, Michael J. (1973) *Associate Professor of Economics*
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- Greer, George W. (1969) *Professor of Health, Physical Education and
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- Grier, Marvin (1957) *Assistant Professor of Health,
Physical Education and Recreation, Supervisor, Swimming Pool*
B.S., Wisconsin State College, La Crosse; M.A., New York University
- Griffith, LeRoy H. (1958) *Professor of Education*
B.S., in Ed., M.S., in Ed., Drake University; Ph.D., University of Iowa
- Grigsby, J. Eugene (1966) *Professor of Art*
A.B., Morehouse College; M.A., Ohio State University;
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- Grunder, Robert E. (1973) *Professor of Education,
Associate Dean, College of Education*
B.S., University of California; Ed.D., Harvard University
- Gross, Douglas R. (1968) *Associate Professor of Education, Director,
Counselor Training Center*
B.A., M.A., Western Michigan University; Ph.D., University of Wisconsin-Madison
- Grossman, Louis H. (1966) *Professor of Marketing*
A.B., University of Michigan; M.B.A., Ph.D., Michigan State University
- Grobe, Edwin P. (1957) *Professor of French*
A.B., William Jewell College; M.A., Ph.D., Indiana University
- Grover, Janice Z. (1972) *Assistant Professor of English*
A.B., M.A., Ph.D., University of California, Davis
- Gruzinski, Aleksandra (1973) *Assistant Professor of French*
Lycee Français, Barcelona, Spain; B.A., M.A., State University of
New York, Buffalo; Ph.D., Pennsylvania State University
- Gryder, Robert (1959-63; 1964) *Professor of Administrative Services*
B.A., Northwestern State College; M.Ed., Louisiana State University;
Ed.D., University of North Dakota

- Guffey, Connie S. (1974) *Assistant Professor of Military Science*
B.G.E., University of Omaha, M.B.A., Arizona State University
- Gullitt, Elizabeth E. (1964) *Professor Emeritus of Sociology*
B.S., Simmons College, M.A., Ph.D., University of Pennsylvania
- Guinonard, Donald F. (1966) *Professor of Education, Counselor*
B.S., M.S., Montana State College; *University Counselor - Service*
Ed.D., Washington State University
- Gulesertin, Theodore (1971) *Associate Professor of Philosophy*
B.A., University of California, Riverside, Ph.D., Yale University
- Gully, Anthony Lacy (1972) *Assistant Professor of Art*
B.A., University of California, Riverside
M.A., University of California, Berkeley, Ph.D., Stanford University
- Gurnee, Herbert (1947) *Professor Emeritus of Psychology*
A.B., M.A., Wesleyan University, Ph.D., Harvard University
- Gvinner, Robert F. (1970) *Professor of Marketing*
Chairman, Department of Marketing
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- Haberman, Donald C. (1967) *Associate Professor of English*
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- Habelman, Lidia W. (1968) *Instructor in Latin and Italian*
B.A., Bryn Mawr College, M.A., Yale University
- Hadley, Neill F. (1966) *Associate Professor of Zoology*
B.A., Eastern Michigan University, Ph.D., University of Colorado
- Hagan, Alfred J. (1970) *Assistant Professor of Marketing*
B.S., University of Maine, M.B.A., Indiana University,
Ph.D., University of Texas, Austin
- Haggeson, Nelson I. (1961-63, 1964) *Professor of Education*
B.A., Vanderbilt University; M.S., Ed., New Mexico Western College,
Ph.D., Calicut Graduate School
- Hahn, Arthur W. (1962) *Associate Professor of Art*
B.F.A., California School of Fine Arts, M.A., San Francisco State University
- Hakic, John (1966) *Associate Professor of English*
A.B., Centric College, M.A., Ph.D., University of Texas
- Hale, John Douglas (1956) *Professor of Art*
B.F.A., M.F.A., University of Southern California; Ph.D., Ohio State University
- Hall, John S. (1973) *Assistant Professor of Public Affairs*
B.A., M.A., San Diego State University, Ph.D., University of Oregon
- Hamm, George F. (1962) *Professor of Education*,
B.S., South Dakota State College; *Vice President, Student Affairs*
M.A., Ph.D., University of Wyoming
- Hanna, Albert L. (1967) *Associate Professor of Music*
B.M., College of Music of Cincinnati; Ph.D., Indiana University
- Hansen, Theodore C. (1968) *Assistant Professor of Music*
B.M., University of Colorado; M.M., Arizona State University,
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- Hanson, Hugh (1948) *Professor of Zoology*
B.S., Kansas State Teachers College, M.S., Ph.D., University of Illinois
- Hanson, Ronald C. (1966) *Associate Professor of Physics*
B.S., Michigan College of Mining and Technology,
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- Hardert, Ronald A. (1966) *Assistant Professor of Sociology*
A.B., M.A., University of Cincinnati; Ph.D., Indiana University
- Hardt, Annabelle (1968) *Associate Professor of Education*
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Ph.D., University of Texas
- Hatted, Andrew A. (1969) *Associate Professor of Accounting*
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C.P.A., Illinois, North Carolina and Arizona
- Hatting, I. Lloyd (1959) *Professor of Geography*
B.S., Ed., M.S., Kansas State Teachers College, Ph.D., University of Iowa
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- Harris, Bruce (1962) *Professor Emeritus of English*
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B.S., Illinois State University, Ph.D., University of Minnesota
- Harris, Joseph (1963) *Research Professor of Chemistry*
B.S., University of Maryland; M.A., Ph.D., Johns Hopkins University
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B.S., Rocky Mountain College, Billings, M.S.W., University of Denver
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B.S., University of Denver, M.B.A., Ph.D., Ohio State University
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B.A., Ed., Arizona State University, M.F.A., University of Oregon
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B.D., Garrett Biblical Institute, B.A., Northwestern University,
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- Hasbroick, Frank F. (1962) *Associate Professor of Zoology*
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- Heier, William D. (1966) *Professor of Management*
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- Henkel Ray (1966) *Assistant Professor of Geography*
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- Henze, Lura F. (1966) *Assistant Professor of Sociology*
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- Herman, George R. (1956) *Associate Professor of English*
B.S., M.A., University of Kansas
- Hershauer, James C. (1969) *Associate Professor of Quantitative Systems*
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- Hershbeiger, Robert G. (1969) *Associate Professor of Architecture*
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- Hetherington, John J. (1970) *Assistant Professor of Speech and Theatre*
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A.B., University of Illinois, M.A., Whittier College,
Ph.D., University of Southern California
- Howells, Edmund G. (1960) *Assistant Professor of Philosophy*
B.A., University of Utah, M.A. (Ph.). University of Michigan,
M.A. (English), Middlebury College
- Hoyt, Charles D. Jr. (1962) *Professor of Engineering*
B.S., M.S., Ph.D., Purdue University; P.E.
- Hubbard, Paul G. (1950) *Professor of History*
A.B., Wabash College; *Associate Dean, College of Liberal Arts*
M.A., Ph.D., University of Illinois
- Hudson, John W. (1964) *Professor of Sociology*
B.S., M.A., Ph.D., Ohio State University
- Huizingh, William (1959) *Professor of Accounting*
Associate Dean, College of Business Administration
B.S.B.A., M.B.A., University of Denver, Ph.D., University of Michigan,
C.P.A., Arizona and Colorado
- Humphrey, Ted B. (1966) *Assistant Professor of Philosophy*
A.B., M.A., University of California, Riverside
Ph.D., University of California, San Diego
- Hunnicut, Harold B. (1962) *Professor of Education; Associate Dean*
B.S., Ed.M., Ed.D., University of Oklahoma *Graduate College*
- Hunter, Betty A. (1966) *Assistant Professor of Home Economics*
B.S., M.Ed., University of North Carolina, Greensboro
- Huntington, Virginia R. (1962) *Associate Professor of Accounting*
B.A., M.B.A., University of Kansas, Ph.D., University of Texas,
C.P.A., Missouri and Arizona
- Huston, Gerald D. (1962) *Associate Professor of Quantitative Systems*
B.S.C., M.A., Ph.D., University of Iowa
- Indieke, Leroy F. (1968) *Associate Professor of Accounting*
B.S., Valley City State College; M.A., University of North Dakota,
Ph.D., University of Illinois, C.P.A., Illinois
- Innison, Wells F. (1960) *Assistant Professor of Physics*
B.S., United States Coast Guard Academy, M.S., Arizona State University
- Inglis, William H. (1972) *Assistant Professor of Speech and Theatre*
B.S., University of Rochester, M.A., University of Washington
- Inskoop, Gordon C. (1968) *Professor of Management*
B.Ch.E., Ohio State University, Ph.D., Columbia University
- Jacks, Mary L. (1955) *Associate Professor of Administrative Services*
B.A., M.A., Arizona State University, C.P.S., Arizona
- Jackson, Donald W. Jr. (1972) *Assistant Professor of Marketing*
B.A., Albion College, M.B.A., Ph.D., Michigan State University
- Jackson, Marvin R. Jr. (1962) *Associate Professor of Economics*
B.S., M.A., University of Colorado, Ph.D., University of California Berkeley
- Jacob, Richard J. (1963) *Associate Professor of Physics*
B.S., Ph.D., University of Utah
- Jacobowitz, Ronald (1970) *Professor of Mathematics*
B.A., City College of New York, M.S., University of Chicago;
Ph.D., Princeton University
- Jacobson, Arthur (1956) *Professor of Art*
B.S., M.S., University of Wisconsin, Madison
- Jacobson, Dean L. (1974) *Associate Professor of Engineering*
B.S., M.S., University of Notre Dame
Ph.D., University of California, Los Angeles
- Jakob, John H. (1960) *Associate Professor of Architecture*
B.Arch., Ohio State University, M.S. in Arch., Columbia University
- Jankowski, Daniel F. (1964) *Professor of Engineering*
B.S.F., M.S.E., Ph.D., University of Michigan
- Janssen, James G. (1968) *Assistant Professor of English*
B.A., M.A., Marquette University, Ph.D., University of Wisconsin, Madison
- Jaten, Allen C. (1974) *Instructor in Health, Physical Education*
B.S., Arizona State University *and Recreation*
- Jay, Bill (1974) *Assistant Professor of Art*
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- Jelinek, James J. (1953) *Professor of Education*
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 Ed.D. Indiana University
- Jelsma, Lawrence F. (1967) *Professor of Engineering*
 B.S.E.E., Oklahoma State University; M.S., Northwestern University;
 Ph.D. University of Delaware
- Jennings, V. Max (1971) *Assistant Professor of Mass Communications*
 B.A., Texas Technological University; M.A., Arizona State University
- Jo, Yung Hwan (1966) *Professor of Political Science*
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 M.A., University of Tennessee-Knoxville; Ph.D. American University
- Johnson, Alan P. (1967) *Associate Professor of English*
 B.A., Amherst College; M.A., University of Michigan;
 Ph.D. University of Minnesota
- Johnson, David N. (1969) *Professor of Music*
 B.M., Trinity University; M.M., Ph.D., Syracuse University
- Johnson, Douglas A. (1974) *Assistant Professor of Accounting*
 B.B.A., Ph.D., University of Texas; C.P.A., Texas
- Johnson, James C. M. (1972) *Assistant Professor of Sociology*
 B.A., Reed College; M.A., Ph.D., University of Oregon
- Johnson, John M. (1972) *Assistant Professor of Sociology*
 B.A., Indiana University; M.A., San Diego State College;
 C.Phil., Ph.D., University of California, San Diego
- Johnson, Rosemary (1959) *Professor of Nursing*
 B.S., M.P.H. University of Minnesota
- Johnson, Roy M. (1952-53, 1955) *Professor of Microbiology*
 A.B., M.S., University of Chicago; Ph.D. University of New Mexico
- Jones, Darys M. (1963) *Professor Emeritus of Education*
 B.S., M.S., Indiana State University; Ed.D., Indiana University
- Jones, Joseph Stephen L. (1972) *Assistant Professor of English*
 B.A., M.A. University of Utah; Ph.D. University of Texas, Austin
- Jones, Marion K. (1970) *Instructor in Health, Physical Education
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 B.A. Wayne State University
- Judd, B. Ira (1937) *Professor Emeritus of Agriculture*
 B.S., M.S. Utah State University; Ph.D. University of Nebraska, Lincoln
- Justus, Jerry G. (1968) *Associate Professor of Zoology*
 B.A., Franklin College; M.A., Ph.D. Indiana University
- Juvet, Richard S. Jr. (1970) *Professor of Chemistry*
 B.S., Ph.D., University of California, Los Angeles
- Kahn, B. Winston (1966) *Assistant Professor of History*
 B.A. National Taiwan University, China; M.A. University of Minnesota;
 Ph.D., University of Pennsylvania
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 Physical Education and Recreation;
 Junior Varsity Football Coach*
 B.A., M.A., Arizona State University
- Kamins, Martin P. (1970) *Associate Professor of Education*
 B.Ed., University of Miami; M.S., Florida State University;
 Ed.D., Wayne State University
- Kaminsky, Elijah Ben-Zion (1962) *Professor of Political Science*
 A.B., A.M., Ph.D. Harvard University
- Kanneman, Thomas A. (1970) *Associate Professor of Technology*
 B.S.E.E., University of Wisconsin; M.S.F.E., University of New Mexico;
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- Kaplan, Joseph S. (1972) *Assistant Professor of Education*
 B.A., M.A. Trenton State College; Ed.D., University of Oregon
- Karnes, Thomas L. (1968) *Professor of History*
 A.B. Colorado University; A.M., Ph.D., Stanford University
- Kasselman, Mary Jo (1971) *Associate Professor of Nursing*
 B.S.N. University of Kansas; M.A., Columbia University;
 Ph.D., University of Kansas
- Kaufman, Herbert M. (1973) *Assistant 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
- Kaufmann, William B. (1968) *Assistant Professor of Physics*
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 Chairman, Department of Quantitative Systems*
 A.B., M.A. Wayne State University; Ph.D., Ohio State University
- Kearney, James R. III (1968) *Associate Professor of History*
 B.A. Pomona College; M.A. Washington University;
 Ph.D. University of Wisconsin, Madison
- Keating, Patricia B. (1948) *Associate Professor Emeritus of Music*
 B.M., University of Illinois; M.M., Northwestern University
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 B.A., M.A., California State University, Sacramento;
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- Kehl, DeMar G. (1965) *Associate Professor of English*
 B.A., Bob Jones University; M.S., University of Wisconsin, Madison;
 Ph.D. University of Southern California
- Keith, Marlow F. (1946) *Assistant Professor of Industrial
 Technical Education*
 B.A. in Ed., M.A. in Ed., Arizona State University

- Kellerman, Owen I. (1971) *Instructor in Spanish*
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- Kelly, John B. (1963) *Professor of Mathematics*
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- Kelly, Richard W. (1965) *Professor of Engineering*
B.S.E., M.S.E., Ph.D., E.F., University of Iowa
- Kennedy, Thomas D. (1974) *Associate Professor of Criminal Justice*
B.A., Tulane University; M.A., Ph.D., Louisiana State University
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- Kerr, Nancy J. (1968) *Professor of Education*
B.S., University of Illinois; M.A., Ph.D., University of Houston
- Kevane, Clement J. (1956) *Professor of Physics, Chairman Department of Physics*
B.S., Ph.D., Iowa State University
- Keyes, Cornelius M. (1973) *Assistant Professor of Mass Communications*
B.A., Arizona State University
- Kiesow, Milton A. (1957) *Associate Professor of Education*
B.S., University of Wisconsin; M.A., Ph.D., University of Nebraska, Lincoln
- Kigin, Denis J. (1958-65; 1967) *Professor of Industrial Technical Education, Dean, University Extension, Director, Summer Sessions*
B.S., Minkito State College; M.S., Stout State University; Ed.D., University of Missouri, Columbia
- Kilgore, William P. Jr., Captain (1973) *Assistant Professor of Aerospace Studies*
B.A., Ohio State University; M.B.A., University of Texas
- Killeen, Peter R. (1968) *Assistant Professor of Psychology*
B.A., Michigan State University; Ph.D., Huron University
- Kingsbury, Warren I. (1964) *Professor Emeritus of Education*
A.B., Central College, Fayette, Missouri; A.M., University of Missouri; Ed.D., New York University
- Kingston, Jerry L. (1969) *Associate Professor of Economics*
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- Klann, Margaret L. (1945) *Associate Professor of Health Physical Education and Recreation*
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- Kleinfeld, Gerald R. (1962) *Associate Professor of History*
B.A., New York University; M.A., University of Michigan; Ph.D., New York University
- Klingel, David I. (1974) *Assistant Professor of Engineering*
B.S., Iowa State University; M.S., Ph.D., Stanford University
- Klock, John W. (1960) *Professor of Engineering*
B.F., University of Southern California; M.S., Ph.D., University of California, Berkeley; P.E.
- Knamiller, Gary W. (1971) *Assistant Professor of Education*
B.A., Grinnell College; M.P.H., University of California, Los Angeles; Ph.D., University of Illinois
- Knaupp, Jonathan E. (1970) *Associate Professor of Education*
B.S., Oregon State University; M.A., Ph.D., University of Illinois
- 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, Chairman, Department of Economics*
B.S., M.S., Oklahoma State University; Ph.D., University of North Carolina
- Koslow, Lawrence E. (1969) *Assistant Professor of Political Science*
B.A., California State College, Los Angeles; M.A., Ph.D., University of California, Riverside
- Krahenbuhl, Gary S. (1973) *Assistant Professor of Health, Physical Education and Recreation*
B.S., M.S., Northern Illinois University; Ed.D., University of Northern Colorado
- Kronengold, Eric A. (1970) *Assistant Professor of Art*
B.A., S.M.A., San Francisco State University
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B.S. in B.A., University of Wichita; M.A., University of North Dakota; C.P.A., Arizona, Kansas, Missouri, and North Dakota
- Kuester, James L. (1969) *Associate Professor of Engineering*
B.S., University of Texas; M.E., Ph.D., Texas A & M University
- Kuhlmann, H. Gary (1972) *Assistant Professor of Finance*
B.B.A., M.B.A., Ph.D., Ohio State University
- Kuiper, Hendrik J. (1971) *Assistant 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) *Associate Professor of Education*
A.B., M.A., California State College, San Diego; Ph.D., University of Illinois
- Kunz, Kenneth (1974) *Assistant Professor of Art*
B.S. in Arch., University of Cincinnati; M.S. in Arch., University of Washington
- Kurth, Chestine (1974) *Instructor in Nursing*
B.S., University of Kansas; M.S., University of California, San Francisco
- Kurtz, Lynn C. (1967) *Associate Professor of Mathematics*
B.S., South Dakota School of Mines and Technology; M.S., Ph.D., University of Utah
- Kush, Frank J. (1957) *Assistant Professor of Health Physical Education and Recreation, Head Football Coach*
B.A., Michigan State University; M.S., Arizona State University
- Kviala, Al (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)

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 B.S., Ph.D., Iowa State University
- Laietz, Hans G. (1964) *Assistant Professor of German*
 A.B., University of California, Berkeley, A.M., Ph.D., Stanford University
- Lai, Richard T. (1973) *Associate Professor of Architecture*
 A.B. in Arch., M.F.A., Princeton University
- Lake, Robert L. (1958) *Instructor in Mathematics*
 B.S., South Dakota School of Mines and Technology,
 M.A., Arizona State University
- Lamberts, Jacob J. (1960) *Professor of English*
 B.A., Calvin College, M.A., Ph.D., University of Michigan
- Lamm, Robert C. (1959) *Professor of Humanities,*
Director, Center for the Humanities
 B.M., University of Louisville, M.M., University of Arizona; Ph.D., Indiana University
- Lance, Robert F. (1960) *Assistant Professor of Mass Communications*
 B.S., Kent State University; M.S., Northwestern University
- Landerra, Ricardo L. (1962) *Professor of Spanish*
 Bachelor University, University of Santiago (Spain), Maestro Nacional,
 Escuela Normal of Santiago (Spain); Ph.D., University of Colorado
- Landers, E. James (1960) *Professor of Zoology*
 B.A., M.S., University of Wyoming, Ph.D., New York University
- Larmer, John W. (1969) *Associate Professor of Geology*
 B.A., M.S., Ph.D., Lehigh University
- Larson, Arlyn J. (1964) *Associate Professor of Economics*
 Ph.B., M.A., University of North Dakota; Ph.D., University of Illinois
- Larson, George W. (1972) *Assistant Professor in Architecture*
 B.S., Utah State University, M.S.L.A., University of Wisconsin
- LaSota, John A. Jr. (1973) *Professor of Latin; Assistant Dean*
College of Arts
 I.B., University of Arizona
- Laudie, Diew T. (1970) *Assistant Professor of Health*
 B.S., M.S., Brigham Young University; *Physical Education and Recreation*
- Lavik, Rudolph H. (1933) *Professor Emeritus of Health*
Physical Education and Recreation
 B.A., Concordia College, B.P.F., Springfield College, M.A., University of Southern California
- Lawler, Eugene D. (1967) *Assistant Professor of Engineering*
 B.S., Northern State College, South Dakota; *Communications*
 M.A., Arizona State University
- Leathers, Chester R. (1957) *Associate Professor of Microbiology*
 B.S., Eastern Illinois University, M.S., Ph.D., University of Michigan
- Lee, Idelle B. (1962) *Assistant Professor of Education*
 B.A., University of Wisconsin, M.A., Arizona State University
- Lee, Stephen F. (1969) *Professor of Film*
 B.A., I.I.B., University of Minnesota
- Leese, David A. (1974) *Assistant Professor of Administrative Services*
 A.B., Amherst College; J.D., Northwestern University, M.A., Brandeis University
- Lendle, Janet M. (1967) *Assistant Professor of Nursing*
 B.S., St. Scholastica College, M.S., University of Minnesota
- Leonard, Donald J. (1974) *Assistant Professor of Administrative Services*
 B.S., M.B.A., Nichols State University
- Leonard, Philip A. (1968) *Associate 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
- Leslie, Douglas L. (1973) *Associate Professor of Law*
 B.A., State University of Iowa, J.D., University of Michigan
- Lessard, Elizabeth C. (1969) *Assistant Professor of Health*
Physical Education and Recreation
 B.S., Georgia College; M.A., Texas Woman's University
- Levan, Frederick D. (1965) *Associate Professor of Education*
 B.S., M.Ed., Pennsylvania State University, Ed.D., Oklahoma State University
- Levine, Gustav (1967) *Associate Professor of Psychology*
 B.A., M.A., City University of New York, Ph.D., Columbia University
- Levy, Leo B. (1959) *Professor of English*
 A.B., M.A., Ph.D., University of California, Berkeley
- Lewis, Joseph Perley (1972) *Assistant Professor of Administrative Services*
 B.A., University of Arizona, J.D., University of Colorado
- Lewis, Maurice S. (1954) *Professor of Education*
 B.S. in Ed., M.S. in Ed., Drake University, Ed.D., University of Northern Colorado
- Lewis, William F. (1965) *Associate Professor of Engineering*
 B.S.E., Johns Hopkins University, M.S., Ph.D., Northwestern University
- Levya, Rau L. (1970) *Associate Professor of Sociology*
 B.A. Eng., New Mexico Western University, M.S.W., University of Denver
- Lightfoot, Marjorie J. (1964) *Professor of English*
 B.A., Brown University, M.A., Ph.D., Northwestern University
- Lin, Sheng H. (1965) *Professor of Chemistry*
 B.S., M.S., National Taiwan University (China), Ph.D., University of Utah
- Lindemann, Constance (1973) *Assistant Professor of Nursing*
 B.A., California State College at Long Beach,
 M.P.H., D.P.H., University of California
- Linde, Dawy E. (1972) *Professor of Psychology*
 B.A., Macalester College, Ph.D., University of Minnesota
- Linder, Marc A. (1972) *Assistant Professor of Psychology*
 B.A., University of Oregon, M.A., Ph.D., University of Minnesota

- Linderman, Earl W. (1966) *Professor of Art*
B.S. New York State College for Teachers at Buffalo,
M.Ed., D.Fd., Pennsylvania State University
- Lindholm, Ernest (1971) *Assistant Professor of Psychology*
B.A., University of California Berkeley,
M.S., Ph.D., University of Wisconsin, Madison
- Lindstrom, Frederick B. (1953) *Professor of Sociology, Chairman*
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Department of Sociology
- Lindstrom, Naomi E. (1974) *Instructor of Spanish*
B.A., University of Chicago, M.A., Ph.D., Arizona State University
- Liskovec, Richard F. (1958) *Assistant Professor of Mathematics*
B.S., M.A., Kent State University
- Little, Ronald L. (1970) *Assistant Professor of Sociology*
B.A., University of Utah, M.A., Ph.D., University of Oregon
- Littlewood, Mary L. (1965) *Assistant Professor of Health,*
B.S., Miami University, *Physical Education and Recreation*
M.S., University of Colorado
- Littrell, Joseph J. (1958) *Professor of Industrial Technical Education*
A.B., Peru State Teachers College, Nebraska, M.A., University of Minnesota,
Ed.D., University of Missouri, Columbia
- Liu, Chui H. (1965) *Professor of Chemistry*
B.A., Ph.D., University of Illinois
- Livmore, Paul E. (1958) *Assistant Professor of Mathematics*
B.S., M.A., Arizona State University
- Lockhart, Cato (1974) *Instructor in Nursing*
B.S., Case Western Reserve University;
M.S., University of California, San Francisco
- Lockwood, Ralph G. (1972) *Assistant Professor of Music*
B.M., Baldwin Wallace College, M.M., New England Conservatory of Music
- Loewenberg, Robert J. (1972) *Assistant Professor of History*
B.A., Columbia University, Ph.D., Yale University
- Logan, Earl Jr. (1963) *Professor of Engineering*
B.S., M.S., Texas A & M University, Ph.D., Purdue University, P.E.
- Lombardi, Eugene P. (1957) *Professor of Music*
B.Mus.Ed., Westminster College, M.A., Columbia University
- LoPresti, Ronald (1964) *Associate Professor of Music*
B.M., M.M., Eastman School of Music
- Losse, Deborah N. (1973) *Assistant Professor of French*
B.A., Connecticut College, M.A., Ph.D., University of North Carolina
- Lounsbury, John F. (1969) *Professor of Geography;*
B.S., M.S., University of Illinois, *Chairman, Department of Geography*
Ph.D., Northwestern University
- Lovell, Robert E. (1972) *Associate Professor of Engineering*
B.S.E., University of Michigan, M.S., University of Arizona; P.E.
- Lowe, John W. (1956) *Associate Professor of Economics*
B.S., Arizona State University, M.S., University of Wisconsin, Madison,
Ph.D., University of Florida
- Lowe, Robert W. (1966) *Professor Emeritus of Foreign Languages*
M.A., Columbia University, Doctorate, University of Paris
- Lowenstein, Milton D. (1959) *Associate Professor Emeritus*
B.A., M.A., Columbia University *of Architecture*
- Lu, Pao (1964) *Associate Professor of Physics*
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M.S., National Tsing Hua University, China)
- Luchsinger, Wayne W. (1966) *Professor of Chemistry*
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- Luckingham, Bradford F. (1971) *Associate Professor of History*
B.S., Northern Arizona University, M.A., University of Missouri-Columbia,
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- Luenow, Paul F. Jr. (1958) *Associate Professor of Spanish*
B.A., M.A., University of Washington, Ph.D., University of New Mexico
- Lundberg, Horace W. (1962) *Professor of Social Work;*
Dean, Graduate School of Social Service Administration
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*
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B.A., Augustana College, M.S., Ph.D., University of Illinois
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B.A., University of Iowa, M.A., University of South Dakota
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B.S., B.M., University of Illinois, M.S., University of Idaho
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B.S., Idaho State University; M.N., University of Washington
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- McCready, Richard R. (1960) *Professor of Quantitative Systems*
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- McEwen, Douglas R. (1969) *Associate Professor of Music,*
B.S. Bowling Green State University, *Director of Chorus*
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- McFarland, Fla. ne H. (1973) *Associate Professor of Health*
B.A., Marietta College, *Physical Education and Recreation*
M.N., Case Western Reserve University
- McGaughey, Robert W. (1971) *Associate Professor of Zoology*
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Acting Chairman, Department of Political Science
A.B., A.M., Ph.D., Indiana University
- McGrath, G. D. (1950) *Professor of Education*
A.B., Findlay College, M.A., University of Michigan;
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- McKenzie, Patrick Bruce (1970) *Assistant Professor of Accounting*
B.S., M.S., Kansas State University; Ph.D., Michigan State University,
C.P.A., Kansas
- McKlveen, John W. (1974) *Assistant Professor of Engineering*
B.S., United States Naval Academy; M.E.N.E., Ph.D., University of Virginia
- McLeod, Dorothy L. (1957-61, 1962-64; 1970) . . . *Professor of Nursing*
B.S.N., St. Louis University; M.S. Columbia University,
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- McNall, Scott G. (1970) *Associate Professor of Sociology*
B.A., Portland State University, Ph.D., University of Oregon
- McFaggart, W. Donald (1971) *Associate Professor of Geography*
B.A., M.A., University of St. Andrews (Scotland),
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- McWhitter, J. Jeffries (1970) *Associate Professor of Education*
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- MacKinnon, Stephen R. (1971) *Assistant Professor of History*
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- Matrone, Charles F. (1966) *Professor of Education*
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- Mamalis, A. David (1969) *Assistant Professor of Education*
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- Manheim, Henry L. (1958) *Professor of Sociology*
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- Mankin, Lawrence D. (1973) *Instructor of Public Affairs*
B.B.A., City College of New York; M.A. University of Illinois
- Mann, Joseph B. (1972) *Assistant Professor of Social Work*
B.S. Manchester College; M.S.W., Michigan State University
- Mann, William G. (1961) *Instructor in Health, Physical Education*
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- Matheson, Alan A. *Professor of Law,*
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B.A., M.A., Syracuse University; Ph.D., Northern Illinois University
- Martin, John F. Jr. (1966) *Associate Professor of Anthropology*
B.A., Beloit College, M.A., Ph.D., University of Chicago
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- Mason, Bruce B. (1960) *Professor of Political Science*
B.S., North Texas State College, M.A., Texas Christian University,
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- Matthias, Judson S. (1967) *Associate Professor of Engineering*
B.S., U.S. Military Academy, M.S., Oregon State University,
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- Mayer, Albert J. (1968) *Professor of Sociology*
A.B., A.M., Ph.D., University of Chicago

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B.A., M.A., Brigham Young University, Ph.D., University of Utah
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B.S., M.S., University of Arkansas, *Vice President for Administration*
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- Metos, Thomas H. (1965) *Professor of Education*
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- Metzger, Daniel F. (1963) *Professor of Engineering*
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- Meyerson, Lee (1962) *Professor of Psychology*
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 B.S., M.S., Washington University; Ph.D., Northwestern University
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 B.S., M.S., Idaho State University; Ph.D., Syracuse University
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 A.B., University of Notre Dame; B.A., M.A., Oxford University
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- Morris, John P. (1968) *Professor of Law*
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 B.A., University of California Davis,
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B.S., M.A., Ohio State University, Ed.D., Columbia University
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B.A., M.A. University of Minnesota, Ph.D., Florida State University
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B.S., Ph.D. University of Bristol (England)
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B.A., Southern Illinois University, Ph.D., Purdue University
- Oliver, Robert S. (1963) *Associate Professor of Architecture*
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- Olmsted, Cameron B. (1956) *Associate Professor of Education*
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 M.S., Oklahoma State University; D.B.A., Indiana University
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- Owens, Bob R. (1967) *Instructor in Health, Physical*
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 B.S.E.F., University of Arizona; M.S.E., Ph.D., University of Michigan
- Pangrazz, Robert P. (1973) *Assistant Professor of Health, Physical*
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- Pardini, Louis J. (1967) *Associate Professor of Industrial*
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 B.S., Brigham Young University; M.S., University of Utah
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- Parkinson, Stanley R. (1971) *Assistant Professor of Psychology*
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 B.S., Virginia Polytechnic Institute, *Military Science*
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- Peck, George B. (1957) *Assistant Professor of Mathematics*
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- Razzaq, Zia (1974) *Assistant Professor of Engineering*
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- Reader, Mark (1967) *Associate Professor of Physical Science*
A.B., A.M., Ph.D., University of Michigan
- Reeves, Henry C. (1973) *Professor of Microbiology*
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- Reich, John W. (1965) *Associate Professor of Psychology*
B.A., M.S., University of Oklahoma; Ph.D., University of Colorado
- Reif, William I. (1970) *Associate Professor of Mathematics*
B.B.A., M.A., Ph.D., University of Iowa
- Reinl, Robert I. (1961) *Professor of Philosophy*
A.B., A.M., Ph.D., Harvard University
- Reiser, Castle O. (1958) *Professor of Engineering*
B.S., Colorado State University; *Chemical Engineering Faculty*
Pet.E., Colorado School of Mines; Ph.D., University of Wisconsin, Madison, P.E.
- Reuter, Vincent G. (1961) *Associate Professor of Management*
B.S.C., M.A., Ph.D., University of Iowa
- Reynolds, Robert S. (1970) *Associate Professor of Music*
B.M., Texas Christian University; M.M., University of Texas,
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- Reznikoff, Shirely (1973) *Associate Professor of Art*
B.A., University of Southwestern Louisiana,
Certificate, New York School of Interior Design; M.A., Louisiana State University
- Rice, Marilyn (1972) *Assistant Professor of Nursing*
B.S.N., State University of New York at Plattsburgh
M.S., Texas Woman's University
- Rice, Margaret J. (1968) *Assistant Professor Emeritus of Speech and Theatre*
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 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, P.E.
- Richards, Gale L. (1965) *Professor of Speech and Theatre*
B.A., University of Akron; M.A., Ph.D., University of Iowa
- Richardson, Deane E. (1970) *Professor of Health Physical Education and Recreation*
Chairman, Department of Health Physical Education and Recreation
B.S., Bradley University,
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- Richardson, Grant I. (1953) *Professor of Agriculture*
B.S., M.S., University of Arizona; Ph.D., Oregon State University
- Richardson, H. D. (1940) *Professor Emeritus of Counsel in Education*
Ph.B., Ph.M., University of Wisconsin; Ph.D., Northwestern University,
I.I.D., Arizona State University
- Rickel, Harry P. (1948) *Associate Professor of Music*
B.M., M.M., University of Arizona
- Rider, Wendell (1953) *Professor Emeritus of Music*
B.S., Iowa State Teachers College; M.M., Eastman School of Music,
Ph.D., University of Iowa
- Ricke, Flora F. (1968) *Assistant Professor of Nursing*
B.S., University of Colorado; M.S., Boston University
- Ripley, Robert F. (1967) *Associate Professor of Education*
B.A., M.A., Ph.D., University of Minnesota
- Ritpke, Mary (1973) *Instructor in Nursing*
B.S.N., Augustina College; M.S., Arizona State University
- Robbins, Earl R. (1961) *Associate Professor of Engineering*
B.S.E.E., Texas Technological College; M.S.E., Ph.D., Arizona State University
- Roberts, Russell C. Jr., Colonel (1974) *Professor of Aerospace Studies*
Chairman, Department of Aerospace Studies
B.S., Florida State University; M.S., George Washington University
- Roberts, Thomas G. (1970) *Associate Professor of Education*
B.A., Wake Forest University; M.A., Ph.D., University of North Carolina
- Robinson, Don R. (1968) *Instructor in Health Physical Education and Recreation; Gymnastics Coach*
B.A., University of Northern Colorado; *and Recreation; Gymnastics Coach*
M.S., Eastern New Mexico University
- Robinson, Daniel O. (1950) *Professor of Agriculture*
A.B., Brigham Young University; M.S., University of Arizona,
Ph.D., Ohio State University
- Robinson, Helen M. (1967) *Associate Professor of Music*
B.A., University of Oregon; M.M., Northwestern University

- Robison, Ray C (1967) *Instructor in Health Physical Education and Recreation, Head Trainer*
 B.S., Morningside College,
 M.S., Indiana University
- Rod, Bruce (1974) *Instructor in Art*
 B.A., Moorhead State College, M.F.A. University of Wisconsin, Madison
- Rollier, Dwayne A (1971) *Associate Professor of Engineering*
 B.S., M.S., Oklahoma State University; Ph.D., Florida State University
- Roman, Roger V. (1973) *Assistant Professor of Mathematics*
 B.A. Washington and Jefferson College; M.S., Florida State University;
 Ph.D. Purdue University
- Rook, Fern H. (1969) *Assistant Professor of Technology*
 B.A., University of Colorado, M.A., Arizona State University
- Roper, Devon J. (1966) *Assistant Professor of Technology*
 B.S. Utah State University, M.S. Arizona State University
- Rose, Jonathan (1968) *Professor of Law*
 B.A., University of Pennsylvania; J.I.B. University of Minnesota
- Rose, Marion H (1971) *Professor of Nursing*
 B.S., University of Kansas, A.M. Ph.D., University of Chicago
- Rosenzweig, Kenneth 1974 *Assistant Professor of Accounting*
 B.A., University of Texas; M.B.A., University of Houston
- Rosner, John C. (1969) *Associate Professor of Engineering*
 B.S. Purdue University; M.S. Lehigh University, Ph.D., Purdue University; P.E.
- Rossi, Patrick J. (1967) *Associate Professor of Psychology*
 B.S. St. Marys College, M.S. San Fernando Valley State College,
 Ph.D. University of California, Riverside
- Rosman, Mark (1974) *Associate Professor of Education*
 B.A., New York University, M.S., University of Bridgeport
 Ed.D. University of Massachusetts
- Rover, R. Craig (1952) *Professor of Education*
 B.A. Upsala College; M.A., St. Lawrence University; Ph.D., Cornell University
- Rowe, Kenneth L. 1962 *Associate Professor of Marketing*
 B.A., M.A., Northern Iowa University; Ph.D., Michigan State University
- Rowley, C. Stevenson (1970) *Associate Professor of Accounting*
 B.A., Trinity College, M.B.A., University of Chicago,
 Ph.D., University of Wisconsin, Madison, C.P.A., Arizona, Illinois
- Roy, Radha R. 1963 *Professor of Physics*
 B.Sc., M.Sc. Presidency College, University of Calicut,
 Ph.D. University of London
- Rucolo, James S. (1974) *Associate Professor of Music*
 B.M., Eastman School of Music, M.M. Arizona State University,
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- Ruch, William A. (1968) *Associate Professor of Management*
 B.S., M.B.A., D.B.A., Indiana University
- Rue, Joseph (1972) *Assistant Professor of Quantitative Systems*
 M.S., D.B.A., University of Southern California
- Ruff, Paul F. (1958) *Professor of Engineering*
 B.S.C.E., M.S.C.E., Case Institute of Technology; P.E.
- Ruppé, Reynold J. (1960) *Professor of Anthropology*
 B.A., University of New Mexico, Ph.D., Harvard University
- Russell, Paul E. (1967) *Professor of Engineering*
 B.S.E.E., B.S.M.E., New Mexico A & M University,
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- Russell, Stanley J. (1969) *Assistant Professor of Engineering*
 B.S., University of Illinois; M.S. Ph.D., University of Wisconsin, Madison
- Sacks, Benjamin (1963) *Professor Emeritus of History*
 B.A., University of New Mexico, M.A., McGill University,
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- Sadalla, Edward K. 1974) *Assistant Professor of Psychology*
 B.A., University of California Berkeley, Ph.D., Stanford University
- Salerno, Nicholas A. (1961) *Professor of English*
 B.A. in Ed. M.A., Arizona State University, Ph.D., Stanford University
- Sanders, Bevie T. (1957) *Associate Professor of Accounting*
 B.B.A., North Texas State University, M.S., Texas A & M University,
 Ph.D., University of Texas, C.P.A., Arizona and Texas
- Sanderson, R. Thomas (1963) *Professor of Chemistry*
 B.S., Yale University; Ph.D., University of Chicago
- Sandler, Todd M. (1971) *Assistant Professor of Economics*
 B.A. M.A., Ph.D., State University of New York Binghamton
- Sandling, Rosemarie C. (1971) *Instructor in Nursing*
 B.S.N., Arizona State University, M.N., University of California Los Angeles
- Sansone, Fried J. (1965) *Associate Professor of Mathematics*
 B.S.E., M.S.E., University of Michigan,
 M.S., Ph.D., Rutgers, The State University
- Santora, Dolores (1972) *Assistant Professor of Nursing*
 B.S., M.S. Wayne State University
- Sargent, Charles S. Jr. (1971) *Assistant Professor of Geography*
 B.A., University of Wyoming; M.A., Ph.D., University of California Berkeley
- Sater, Vernon F. (1962) *Professor of Engineering*
 B.S.Ch.E., M.S.Ch.E., Ph.D., Illinois Institute of Technology
- Satterthwaite, Lester I., J. (1968) *Professor of Education*
 B.S., M.S., Ed.D., Indiana University
- Sattler, Howard (1968) *Associate Professor of Education*
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- Schabacker, Joseph C. (1963) *Professor of Management*
B.S., Temple University; M.B.A., Ph.D., University of California, Los Angeles
- Schade, Thomas V. (1974) *Assistant Professor of Criminal Justice*
B.A., Hope College; M.A., Ph.D., Western Michigan University
- Schal, Merrill H. (1960-66, 1967) *Associate Professor of Education*
B.A., Albion College; M.A., Ed.D., Arizona State University
- Schaumburg, Donald R. (1953) *Professor of Art*
B.A. in Art Ed., College of Arts and Crafts; M.F.A., Claremont Graduate College
- Schilling, Dorothy C. (1932) *Professor Emeritus of English*
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- Schlacter, John L. (1969) *Associate Professor of Marketing*
B.B.A., Western Reserve University; M.B.A., Ph.D., Ohio State University
- Schmidt, Alfred H. (1960) *Professor of Marketing*
B.S., University of Oklahoma; M.B.A., D.B.A., Indiana University
- Schmidt, Jean M. (1966) *Associate Professor of Microbiology*
B.A., M.S., University of Iowa; Ph.D., University of California, Berkeley
- Schmidt, Randal B. (1968) *Assistant Professor of Art*
B.A., Hamline University; M.A., University of New Mexico
- Schoen, Robert A. (1966) *Assistant Professor of Technology*
B.S., M.S., Arizona State University
- Schoenwetter, James (1967) *Associate Professor of Anthropology*
A.B., University of Chicago; M.S., University of Arizona;
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- Schon, Isabel (1974) *Assistant Professor of Education*
B.S., Mankato State College; M.A., Michigan State University
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- Schroeder, Milton R. (1969) *Professor of Law*
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B.A., M.A., Arizona State University
- Scott, Walter T. (1961) *Professor of Mathematics*
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- Scouler, David B. (1952) *Professor Emeritus of Music*
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- Searfoss, D. Gerald (1972) *Assistant Professor of Accounting*
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- Searfoss, Lyndon W. (1973) *Assistant Professor of Education*
B.S., West Chester State College; M.A., Ph.D., Syracuse University
- Sebald, Hans (1963) *Associate Professor of Sociology*
B.A., Manchester College; M.S., Ph.D., Ohio State University
- Segall, Burton A. (1971) *Assistant Professor of Engineering*
B.S.C.E., Polytechnic Institute of Brooklyn;
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- Segall, Mary F. (1971) *Associate Professor of Nursing*
B.S., Skidmore College; M.S., University of North Carolina;
Ph.D., New York University
- Sehsted, Colene R. (1967) *Assistant Professor of Nursing*
B.S., University of Arkansas; M.S., University of Maryland
- Seipp, Kenneth F. (1963) *Professor of Music*
B.S., Hartwick College; M.M., Conservatory of Music, University of Kansas City;
Mus.F.D., Indiana University
- Senner, Wayne M. (1973) *Associate Professor of German*
B.A., Portland State University; M.A., University of Washington;
Ph.D., University of Illinois
- Serapiglia, Theresa (1973) *Assistant Professor of Education*
B.S., Millersville State College, Pennsylvania; M.E.D., University of Pittsburgh;
Ph.D., Pennsylvania State University
- Shafer, Robert E. (1966) *Professor of English*
B.S., M.S., University of Wisconsin, Madison; Ed.D., Columbia University
- Shafer, Susanne M. (1966) *Professor of Education*
A.B., Smith College; M.A., Syracuse University; Ph.D., University of Michigan
- Shapiro, David L. (1969) *Associate Professor of Economics*
M.A., Wayne State University; J.D., Detroit College of Law;
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- Shea, Elizabeth A. (1972) *Instructor in Nursing*
B.S.N., University of New Mexico; M.S., Arizona State University
- Shelton, Leon G. (1967) *Associate Professor of Education*;
B.A., University of Colorado, *Dean of Students*
A.M., Ed.D., University of Northern Colorado
- Shelton, Robert B. (1970) *Assistant Professor of Economics*
B.A., Texas Christian University; M.A., University of California, Berkeley;
Ph.D., Southern Illinois University
- Sheppard, Douglas C. (1971) *Professor of Spanish*
B.A., Montana State University; M.A., Ph.D., University of Wisconsin, Madison
- Sheridan, Felecia (1973) *Assistant Professor of Nursing*
B.S.N., M.S.N., Wayne State University
- Sheridan, Michael F. (1966) *Associate Professor of Geology*
B.A., Albright 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
- Shigetani, Shigetani N. (1973) *Assistant Professor of Humanities*
B.A., Ryukoku University (Japan), M.A., Ph.D., Northwestern University
- Shipp, Vernon E. (1966) *Assistant Professor of Art*
B.S., Grand Canyon College, M.A., Arizona State University
- Shrock, David I. (1974) *Assistant Professor of Transportation*
B.F.F., General Motors Institute, M.B.A., D.B.A., Indiana University
- Shuman, Gayle (1974) *Assistant Professor of Criminal Justice*
Director, Center of Criminal Justice
B.S., M.A. in Ed., Ed.D., Arizona State University
- Silver, Benjamin (1971) *Assistant Professor of Mass Communications*
B.A., M.A., University of Iowa
- Silver, Burr A. (1972) *Assistant Professor of Geography*
B.A., M.S., Baylor University, Ph.D., University of Washington
- Simmons, Douglas J. (1963) *Assistant Professor of French*
A.B., Wabash College, M.A.T., Harvard University
Certificat de français usuel, degré universitaire,
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- Simon, Sheldon W. (1975) *Professor of Political Science*
Chairman, Department of Political Science
B.A., University of Minnesota, M.A., Princeton University,
Ph.D., University of Minnesota
- Sinkov, Abraham (1964) *Professor of Mathematics*
B.S., College of City of New York, M.A., 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
- Smith, Arthur B. (1967) *Associate Professor of Administrative Services*
Services Research Associate, Bureau of Business and Economic Research
B.S., Harvard Simmons University,
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- Smith, Charles B. (1964) *Professor of Administrative Services*
B.S., Drake University, M.S., New Mexico Highlands University,
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- Smith, Charles H. (1974) *Professor of Accounting*
B.Com., University of Cape Town (South Africa),
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- Smith, L. Christian (1971) *Assistant Professor of History*
B.A., Union College, M.A., Ph.D., University of Illinois
- Smith, Clyde B. (1957) *Professor of Health Physical Education*
B.A., Geneva College, M.S., Indiana University, *Editorial, Recreation*
- Smith, L. Ch. (1959) *Professor of Mathematics*
B.S., M.A. in Ed., Arizona State University, Ed.D., Stanford University
- Smith, Margo M. (1963) *Associate Professor of Music*
B.M., Grinnell College; M.A. in Ed., Arizona State University
- Smith, Marion W. (1952) *Associate Professor of Music*
B.S. in Mus. Ed., Capital University, M.M., American Conservatory of Music
- Smith, Richard L. (1967) *Professor of Engineering*
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; *Assistant Director, Office of Liberal Arts*
Ph.D., University of Southern California
- Smith, Rose Marie (1967) *Assistant Professor of Speech and Theatre*
B.A., Oklahoma College for Women; M.A., University of Michigan
- Smith, Brunet, Kenneth (1974) *Assistant Professor of Art*
B.S., M.A., Arts University *Curator of Collections*
- Snider, Donald L. (1967) *Associate Professor of Engineering*
B.S.E.L., California State Polytechnic College,
M.S.F.E., University of Pennsylvania, Ph.D., Case Institute of Technology
- Snow, Robert P. (1971) *Assistant Professor of Sociology*
B.S., M.A., Ph.D., University of Minnesota
- Snyder, Ernest F. J. (1958) *Professor of Science Education*
A.B., M.A., Colorado State University, Ed.D., New York University
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B.S., Bonanza State College, M.Ed., Montclair State College,
Ph.D., University of Georgia
- Snyder, Lester M. (1967) *Associate Professor of Education*
B.S., Millersville State College, M.Ed., Western Maryland College
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- Sommerfeld, Milton R. (1968) *Associate Professor of Botany*
B.S., Southwest Texas State College, Ph.D., Washington University
- Spicer, Myrna (1974) *Assistant Professor of Nursing*
B.S.N., Arizona State University, M.S.N., University of California, San Francisco
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- Spradling, Quentin M. (1971) *Assistant Professor of Technology*
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- Stadler, Jack F. (1963) *Associate Professor of Engineering*
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B.S., University of Utah, *College of Engineering and Applied Sciences*
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B.S., M.S., University of Texas, P.E.
- Stahnke, Herbert L. (1941) *Professor Emeritus of Zoology*
S.B. University of Chicago, M.A., University of Arizona,
Ph.D. Iowa State University
- Staley, Frederick A. (1970) *Associate Professor of Education*
B.A., M.A. Western Michigan University, Ph.D., Michigan State University
- Stazer, Frank S. (1955) *Associate Professor of Music*
B.M.Ed., University of Kansas, M.M., Eastman School of Music
- Stange, Jean B. (1970) *Assistant Professor of Health Education*
B.S., Iowa State University, M.S., University of Minnesota
- Stanley, James T. (1968) *Associate Professor of Entomology*
B.S., M.S., Ph.D., University of Illinois
- Stark, Barbara L. (1972) *Assistant Professor of Anthropology*
B.A. Rice University, M.Ph.T., Ph.D., Yale University
- Starrfield, Sumner G. (1972) *Assistant Professor of Physics*
B.A., University of California, Berkeley,
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- Steadman, Lyle B. (1971) *Assistant Professor of Anthropology*
B.A., Occidental College, M.A., University of California, Los Angeles,
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- Steece, Bert M. (1974) *Assistant Professor of Quantitative Statistics*
A.B., A.M., Ph.D., University of Southern California
- Steere, Cary J. (1960) *Assistant Professor of Education*
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- Steffl, Bernita M. (1961) *Associate Professor of Nursing*
B.S. in P.H.N., M.P.H., University of Minnesota
- Stein, Peter K. (1959) *Professor of Engineering*
S.B. Bus. Adm., S.B.M.E., M.S., Massachusetts Institute of Technology, P.E.
- Steinmann, Wilbur L. (1959) *Associate Professor of Education*
B.S.E.F., University of Minnesota, M.S., University of Iowa
- Stellhorn, Edythe (1961-63, 1973) *Assistant Professor of Nursing*
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- Stewart, Donald G. (1964) *Associate Professor of Mathematics*
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- Stewart, Kenneth M. (1947) *Professor of Anthropology*
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- Stiles, Philip G. (1969) *Professor of Agriculture*
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- Stites, William H. (1954) *Professor of Speech and Theatre*
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- Stone, William J. (1967) *Associate Professor of Health*
B.S., Boston University, M.S., *Physical Educator and Recreation*
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- Stoner, Richard G. (1963) *Professor of Physics*
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- Stout, M'naid W. (1968) *Professor of Education*
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- Stowe, Noel J. (1967) *Associate Professor of History*
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- Strange, Richard F. (1974) *Professor of Music, Director of Bands*
B.M.E., Wichita State University, M.M.E., University of Colorado,
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B.Arch., University of Southern California
- Streufert, Hildegarde (1961) *Associate Professor of Home Economics*
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- Strojnik, Ales (1969) *Professor of Physics*
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- Strom, Robert D. (1969) *Professor of Education*
B.S., Middlesex College, M.A., University of Minnesota,
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- Strong, Robert E., Jr. (1969) *Associate Professor of Law*
B.A., Stanford University, B.S., Harvard University
- Sturtevant, John H. (1963) *Associate Professor of Art*
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- Surbeck, Elaine (1974) *Assistant Professor of Home Economics;*
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- Susel, Rudolph M. (1970) *Assistant Professor of History*
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- Swanson, Roger M. (1968) *Assistant Professor of English; Dean of
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- Taylor, Jack J. (1960) *Professor of Art*
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- Taylor, Jacqueline (1967-68; 1973) *Professor of Nursing*
B.S.N., University of Washington, M.S., University of North Carolina,
Ph.D., University of Arizona
- Taylor, Louis (1949) *Assistant Professor Emeritus of English*
B.S. in Ed., M.A., Ohio State University
- Taysom, Elvin D. (1953) *Professor of Agriculture*
B.S., University of Idaho; M.S., Utah State University;
Ph.D., Washington State University
- Teague, Dutton O. (1974) *Associate Professor of Social Work;*
Assistant Dean, Graduate School of Social Service Administration
B.A., M.S.W., University of Washington
- Templer, Margherita De Bonfils (1974) *Assistant Professor of
Italian*
Licenza Liceale, Liceo S. Ippolito, Ph.D., Indiana University
- Tenney, Lester I. (1969) *Associate Professor of Insurance*
B.A., University of Miami, M.A., San Diego State College
D.B.A., University of Southern California
- Tetting, Daniel (1973) *Instructor in Nursing*
B.S.N., DePaul University, M.S.N., University of Illinois
- Theobald, Clarabelle (1962) *Associate Professor of Nursing*
B.S., Arizona State University, M.S., University of California, Los Angeles
- Thiele, Joan E. (1973) *Assistant Professor of Nursing*
B.S., Texas Woman's University, M.S.N., Case Western Reserve University,
Ph.D., Arizona State University
- Thomas, Charles S. (1968) *Associate Professor of Education*
B.S., M.S., Ohio University, Ed.D., University of Pennsylvania
- Thomason, Leslie L. (1969) *Professor of Technology*
A.B., M.A., Ed.D., University of Oklahoma
- Thompson, Jerry W. (1967) *Instructor in Health,
Physical Education and Recreation, Assistant Football Coach*
B.S., University of Oklahoma
- Thompson, Lee P. (1955) *Professor of Engineering;*
Dean, College of Engineering and Applied Sciences;
Director, School of Engineering, Director, Engineering Research Center
B.A., Indiana University; M.S., Ph.D., Texas A & M University, P.E.
- Thompson, Truet B. (1959) *Professor of Engineering*
B.S., B.S.E.E., Louisiana Polytechnic Institute; M.S., Oklahoma State University;
Ph.D., Northwestern University, P.E.
- Thompson, Wilma M. (1959) *Instructor in Mathematics*
A.B., New Mexico Highlands University; M.S., University of Wyoming
- Thomson, Ronald G. (1947) *Professor of Health, Physical Education
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B.S., Springfield College, M.A., Arizona State University
Ed.D., University of Southern California
- Thomson, Tom R. (1961) *Professor of Chemistry*
B.A., University of California, Berkeley, M.S., Ph.D., Kansas State University

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- Fice, Thomas E. (1967) *Professor of Engineering, Chairman, Electrical*
B.S.E.F., M.S.E.E. Ph.D., Ohio State University *Engineering Faculty*
- Tidwell, Victor H. (1971) *Associate Professor of Accounting*
B.S. Illinois College, M.B.A. D.B.A., Indiana University, C.P.A., Iowa
- Tilden, Arnold (1937) *Professor Emeritus of History*
B.A., M.A. DePaul University, Ph.D., University of Southern California
- Tillery, Bill W. (1973) *Associate Professor of Science Education*
B.S. Northeastern State College, M.A., Ed.D. University of Northern Colorado
- Tingey, Sherman (1966) *Professor of Management*
B.S., Utah State University, M.B.A., Golden Gate University;
Ph.D., University of Washington
- 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, Teachers College
- Toohy, Jack V. (1966) *Professor of Health, Physical Education*
B.A., Arizona State University; M.S.E., University of Illinois, *and Recreation*
M.S., Northern Arizona University, Ed.D., Arizona State University
- Tootle, John C. (1967) *Associate Professor of Administrative Services*
B.S., Georgia Southern College; M.A., George Peabody College;
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- Tower, William E., Major (1973) *Assistant Professor of Military Science*
B.A.S., University of Nebraska, M.S., Arizona State University
- Trelease, Richard N. (1971) *Assistant Professor of Biology*
B.S., M.S., University of Nevada, Ph.D., University of Texas
- Trennert, Robert A. (1974) *Assistant Professor of History*
B.A., Occidental College, M.A., Los Angeles State College,
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- Tu, Eugenia Y. (1973) *Instructor of Chinese*
B.Ed. Taiwan Normal University, B.A., Bay of Women's College,
M.S. University of Arizona
- Turk, Rudy H. (1967) *Associate Professor of Art*
B.S., University of Wisconsin, *Director, University Art Collections*
M.A. University of Tennessee, Knoxville
- Turnbow, James W. (1959) *Professor of Engineering*
B.S.M.E. Texas Technological College,
M.S.G.M., Ph.D., University of Texas, P.E.
- Turner, Christy G. II (1966) *Professor of Anthropology*
B.A., M.A. University of Arizona, *Assistant Dean, Graduate College*
Ph.D. University of Wisconsin-Madison
- Turner, Katharine C. (1946) *Professor of English*
B.Ed., Illinois State Normal University, M.A. Ph.D., University of Michigan
- Valdivieso, L. Teresa (1970) *Instructor in Spanish*
B.A., M.A. Education) M.A. Liberal Arts), Arizona State University
- Vander Linden, Marjorie (1974) *Instructor in Nursing*
B.S.N., Arizona State University, M.S.N., Texas Woman's University
- Van Petten, Donald R. (1942) *Professor Emeritus of Political Science*
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- Vin Scoy, Herbert A. (1963) *Professor of Spanish*
B.A., M.A., University of Alabama, Ph.D., University of Wisconsin, Madison
- Van Wagenen, R. Keith (1963) *Professor of Education*
Chairman, Department of Educational Psychology
B.A., Pacific Union College, M.A. in Ed., Arizona State University,
Ph.D., University of Utah
- VarnBuhler, Ray (1973) *Assistant Professor of Art*
B.F.A., Wayne State University, M.A., Art Institute of Chicago
- Veatch, Jeannette (1968) *Professor of Education*
A.B., Western Michigan University, M.A., Ph.D., New York University
- Venable, Gilbert T. (1970) *Assistant Professor of Law*
B.A., Cornell University; J.D., University of Pittsburgh
- Vergis, John P. (1954) *Professor of Education*
B.S., M.A., New York University, Ed.D., University of Southern California
- Vestre, Norris P. (1972) *Professor of Psychology*
B.A., Ph.D., University of Minnesota
- Vichules, Leo D. (1961) *Assistant Professor of Political Science*
A.B. M.A., University of Michigan
- Virgilio, Carmelo (1965) *Associate Professor of Romance Languages*
A.B., State University of New York; A.M., Ph.D., Indiana University
- Von der Heydt, Alfred (1950) *Professor Emeritus of German*
Diploma, University of Frankfurt on the Main, Germany; M.A., Yale University,
Ph.D., Cornell University
- Von Dreele, Robert B. (1971) *Assistant Professor of Chemistry*
B.S., Ph.D., Cornell University
- Voss, Howard G. (1964) *Assistant Professor of Physics*
A.B. Hope College, M.N.S., Arizona State University, M.S., Purdue University
- Votichenko, T. Alexander (1956) *Assistant Professor of Philosophy*
A.B., Princeton University, M.A., Columbia University
- Wagner, Ronald F. (1962) *Professor of Art*
B.S., University of Wisconsin, M.F.A., University of Iowa
- Wagstaff, H. Reid (1969) *Associate Professor of Geography*
A.B. A.M., Ph.D., University of Michigan

- Walker, Bruce J. (1974) *Associate Professor of Marketing*
B.A. Seattle University; M.B.A., D.B.A., University of Colorado
- Walker, Charles Thomas (1971) *Professor of Physics*
A.B. M.S. University of Louisville; Ph.D. Brown University
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B.S., Western Reserve University, M.S., Catholic University of America
- Walker, John E. (1970) *Assistant Professor of Education*
B.A., Albion College; M.A., Michigan State University; Ed.D., Utah State University
- Walker, Stephen G. (1969) *Assistant Professor of Political Science*
A.B., Creighton University; M.A., Ph.D. University of Florida
- Wallace, Charles E. (1958) *Professor of Engineering*
B.S. Lewis and Clark College, *Chairman, Engineering Science Faculty*
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- Wallen, Carl J. (1973) *Professor of Education;*
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B.A. University of California, Santa Barbara; M.A., San Francisco State College; Ed.D., Stanford University
- Wamacks, Naomi W. (1968) *Associate Professor of Secondary Education*
B.A., M.A., Ed.D., Arizona State University
- Wing, Alan P. (1970) *Professor of Mathematics*
B.S., Washington State University, M.S. University of Southern California; Ph.D. University of California, Los Angeles
- Wang, Cecilia (1973) *Assistant Professor of Mathematics*
B.S., Immaculate Heart College; M.A., Ph.D., University of California, Los Angeles
- Ward, Jack W. (1964) *Associate Professor of Construction*
B.S. in C.F. University of Idaho, P.E.
- Warnicke, Retha M. (1973) *Assistant Professor of History*
A.B. Indiana University, M.A., Ph.D., Harvard University
- Warren, Morrison F. (1968) *Professor of Education; Director, I.D. Paine Laboratory*
B.A., M.A., Ed.D., Arizona State University
- Wasser, Paula K. (1927) *Professor Emeritus of Art*
B.S. in Ed. University of North Dakota; M.A. Stanford University
- Watkins, Thomas B. (1972) *Assistant Professor of Industrial Technological Education*
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- Watson, Clyde W. (1971) *Associate Professor of Art; Chairman, Department of Art*
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- Watson, George L. (1969) *Assistant Professor of Political Science*
B.A. Phillips University, M.A., Ph.D. Duke University
- Weaver, Gene A. Colone (1973) *Professor of Military Science*
B.S., East Texas State College; *Chairman, Department of Military Science*
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- Weber, Delbert D. (1962-66, 1969) *Professor of Education; Dean, College of Education*
B.A., Midland College; M.Ed., Ed.D. University of Nebraska, Lincoln
- Wegner, Arttoll L. (1957) *Professor of Health, Physical Education and Recreation*
B.S., Wisconsin State College; M.S., University of Wisconsin; P.F.D. Indiana University
- Weinrich, Heinz (1973) *Assistant Professor of Management*
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- Weiner, Gordon M. (1968) *Assistant Professor of History*
A.B., Ph.D., University of Pennsylvania
- Weinstein, Sharon R. (1972) *Assistant Professor of Humanities*
B.A., M.A., Michigan State University; Ph.D., University of Utah
- Weis, Dennis G. (1971) *Assistant Professor of Mathematics*
B.S. Illinois Institute of Technology, Ph.D., Brown University
- Weiss, Neil A. (1970) *Assistant Professor of Mathematics*
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- Welch, H. William (1967) *Professor of Engineering, Assistant Dean*
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M.S., Ph.D., University of Michigan, P.E.
- Wentz, Richard E. (1972) *Associate Professor of Humanities*
A.B. Ursinus College; B.D. Lancaster Theological Seminary; M.Phil. Ph.D., George Washington University
- Werther, William, Jr. (1971) *Assistant Professor of Management*
B.S., B.A., M.A., Ph.D. University of Florida
- Weston, Robert (1973) *Assistant Professor of Art*
B.A., University of Minnesota; M.A., Pennsylvania State University
- Wexler, Charles (1973) *Professor of Mathematics*
S.B., A.M., Ph.D., Harvard University
- Whiffen, Marcus (1960) *Professor of Architecture*
B.A., M.A., University of Cambridge
- Whitam, Frederick L. (1966) *Associate Professor of Sociology*
B.A., Millsaps College; A.M., Ph.D., Indiana University
- White, Harold C. (1966) *Professor of Management*
B.S., M.S., University of Oregon, Ph.D., University of Florida
- White, Michael J. (1974) *Assistant Professor of Philosophy*
B.A., Arizona State University, M.A., Ph.D., University of California, San Diego
- White, Robert C., Jr. (1973) *Assistant Professor of Education*
B.S.E., Pacific University, M.S., Ph.D. University of Arizona
- Whitchist, Harry B. (1958) *Professor of Chemistry*
B.A., M.A., Ph.D. Rice University
- Whysong, Gary I. (1974) *Assistant Professor of Agriculture*
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- Wilcox, Sidney W. (1955) *Professor of Intercom Communications*
 B.A., Bethany Penn. College; M.A., University of Oklahoma
- Wilkinson, Joseph W. (1964) *Associate Professor of Education*
 B.S., Carnegie Institute of Technology; M.B.A., Stanford University;
 D.B.A., University of Denver; CPA, Calif.
- Williams, Scott H. (1974) *Assistant Professor of Education*
 B.S., Missouri College of Education
- Wilson, Forrest L. (1947) *Assistant Professor of Activities of Sport*
 B.A., University of South Dakota; M.A., Northwest University; Ph.D., Utah
- Wilson, Gloria N. (1966) *Associate Professor of Administrative Services*
 B.A., Montana State College; M.A., Ed.D., California University
- Wisor, Leola A. (1968) *Professor of French*
 B.Ed., University of Saskatchewan; M.A., Arizona State University
- Wison, Lynn D. (1966) *Professor of Economics*
 B.S., M.S., Ph.D., Middlebury University
- Witt, Clark A. Jr. (1963) *Associate Professor of Education*
 A.B., Occidental College; M.B.A., Middlebury University;
 Ph.D., University of Michigan; C.I.A.
- Winkelman, Richard D. (1965) *Associate Professor of Education*
 A.B., Southern Illinois University; A.M., Ph.D., University of Illinois
- Witz, Dorothy (1959) *Professor of Education of Education*
 B.A., State University of Iowa; M.A., Ph.D., University of Denver
- Witt-Dine, (1966) *Associate Professor of Social Treatise*
 B.F.A., University of Chicago; M.A., Ph.D., University of Iowa
- Wochner, Raymond E. (1952) *Professor of Education*
 B.S., York College; M.A., University of Nebraska; Ph.D., University of Washington
- Wolf, Donald F. (1969) *Associate Professor of Physical Science*
 B.A., M.A., Cozumi University; S.T.M., University of Santa Clara;
 Ph.D., Georgetown University
- Wolan, Owen A. (1964) *Assistant Professor of Education*
 B.A., M.A., Merrimack State University; Ph.D., University of Washington
- Wong, Timothy C. (1974) *Assistant Professor of Chinese*
 B.A., State Teachers College; M.A., University of Hawaii;
 Ph.D., State University
- Wood, Byrd D. (1971) *Associate Professor of Engineering*
 A.A., Bessemer College; B.S.M.E., M.S.M.E., Utah State University;
 Ph.D., University of Minnesota; P.E.
- Wood, Harry (1954) *Professor of Art*
 B.A., M.A., University of Wisconsin-Madison;
 B.A., Ph.D., Ohio State University
- Woodf, Marvin C. (1966) *Professor of Engineering*
 B.S., M.S., Ph.D., Iowa State University
- Wooding, Robert R. (1971) *Associate Professor of Chemistry*
 B.S., U.S. Naval Academy;
 B.C.F., M.C.F., Renaissance Polytechnic Institute, P.E.
- Woodard, Natalie J. (1969) *Associate Professor of Social Work*
 B.A., Washington Square College of New York University;
 M.S.S., South College School for Social Work
- Woodward, Roosevelt Jr. (1965) *Associate Professor of Art*
 B.S., M.A., Indiana State University
- Woody, Robert W. (1968) *Professor of Chemistry*
 B.S., Ohio State University; Ph.D., University of California, Berkeley
- Wooldidge, Charles B. (1959) *Associate Professor of Engineering*
 A.B., B.S., University of Kentucky; M.S., Ph.D., Princeton University; P.L.
- Wooldidge, Marjorie C. (1959) *Associate Professor of Home Economics*
 B.S., M.S., University of Kentucky; Ph.D., Princeton University
- Woolf, Charles M. (1966-63, 1964) *Professor of Zoology*
 B.S., M.S., University of Utah; Dean, College of Liberal Arts;
 Ph.D., University of California, Berkeley
- Wootten, William W. (1959) *Associate Professor of History*
 B.A., University of Chicago; M.A., University of Iowa;
 Ph.D., University of Minnesota
- Wootton, Richard (1964) *Professor of Education*
 B.S., M.S., Ed.D., University of Utah; Director, State Projects
- Work, Richard N. (1965) *Professor of Philosophy*
 A.B., M.S., Ph.D., Cornell University
- Wenn, C. Gilbert (1965) *Professor Emeritus of Civic Education*
 A.B., Willamette University; M.A., Ph.D., Stanford University;
 D., Willamette University
- Wright, Marvin E. (1933) *Assistant Professor of Speech and Theatre*
 B.A., M.A., Ph.D., University of Minnesota
- Wright, Robert G. (1967) *Associate Professor of Management*
 B.S., California State College, Pomona;
 M.B.A., D.B.A., University of Southern California
- Walk, Ned W. (1957) *Assistant Professor of Health*
Physical Education and Recreation; Health Basketball Coach
 B.S., Wisconsin State University; M.Ed., Xavier University
- Wunsch, Alan P. (1973) *Assistant Professor of Administrative Services*
 B.Ed., M.S.I., University of Wisconsin, Whitewater;
 Ed.D., University of California, San Anselmo
- Wurster, Stanley R. (1971) *Assistant Professor of Education*
 B.S., Lock Haven State College; M.S., Eastern College;
 Ed.D., New Mexico State University
- Wize, Carl A. (1965) *Assistant Professor of Nursing*
 B.S., Ohio State College; M.S., University of Maryland

Wyndelts, Robert (1974) *Assistant Professor of Accounting*
 B.B.A., M.P.A., Georgia State University, Ph.D. University of Georgia,
 C.P.A., Georgia

Yale, Francis G (1952) *Associate Professor of Science Education*
 A.B. M.A. University of Northern Colorado, Ed.D. Columbia University

Yamamoto, Kaoru (1972) *Professor of Education*
 B.S., University of Tokyo; M.A., Ph.D., University of Minnesota

Yeater, James W (1958) *Professor of Speech and Theatre*
 B.A. Baker University, M.A., University of Washington;
 Ph.D., University of Illinois

Yoseloff, Mark L. (1971) *Assistant Professor of Mathematics*
 B.A., M.A. University of Pennsylvania, Ph.D., Princeton University

Yoshitomi, Cynthia L. (1973) *Instructor in Health Physical Education
 and Recreation*
 B.A. M.A., Arizona State University

Young, Hewitt H. (1967) *Professor of Engineering; Chairman,
 Industrial Engineering Faculty*
 B.S.M.E., M.S.I.E., Case Institute of Technology; Ph.D. Arizona State University, P.E.

Young, Otis E. Jr (1963) *Professor of History*
 A.B., A.M., Ph.D. Indiana University

Young, Troy L. (1971) *Instructor in Health Physical Education
 and Recreation; Assistant Trainer*
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Youngblood, Robert L (1972) *Assistant 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 of Advertising*
 B.S. in B.A., M.S.B.A., University of Alabama

Zaslow, Bertram (1956) *Professor of Chemistry*
 B.A., Cornell University, M.S., University of Minnesota,
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Zesbaugh, Joseph P. (1969) *Instructor in Mass Communications;
 Assistant Director Bureau of Broadcasting*
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 B.S.E.E., Cornell University, M.S.E.E., Ph.D., Syracuse University

Zimmerman, J. E. (1946) *Professor Emeritus of English*
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Zimmerman, Muriel Ann (1968) *Assistant Professor of Art*
 B.A., Queens College; M.A., M.F.A., Ph.D., Arizona State University

Zornow, Ruth A. (1970) *Assistant Professor of Nursing*
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Atheide, David I. (1973) *Visiting Assistant Professor of Sociology*
 B.A. Central Washington State College, M.A., University of Washington,
 Ph.D., University of California San Diego

Anderson, Virginia (1974) *Visiting Assistant Professor of Social Work*
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Belk, Denton (1974) *Visiting Assistant Professor of Zoology*
 B.S.Ed., M.A. University of Texas, Austin; Ph.D. Arizona State University

Braver, Michael B. (1974) *Visiting Assistant Professor of Sociology*
 A.B., M.A. C.Phil., University of California, Los Angeles

Denecke, Arno H. (1974) *Visiting Professor of Law*
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 B.A. Humboldt State College, Ph.D., Arizona State University

Fimmons, Chester W (1974) *Visiting Professor of Botany
 and Microbiology*
 B.S., Pennsylvania College of Iowa, M.S., University of Iowa, Ph.D., Columbia University

Heinandez, Armand P. (1973) *Visiting Associate Professor of Criminal
 Justice*
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Iockhart, William B. (1974) *Visiting Professor of Law*
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Pallas, Thomas E (1974) *Visiting Professor of Political Science*
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Pedrick, Jo Ann Glatfelly (1973) *Visiting Associate Professor
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Shoecraft, Paul (1973) *Visiting Assistant Professor of Mathematics*
 B.A. Arizona State University, M.S. Northern Arizona University,
 Ph.D., University of Michigan

Stock, William A. (1973) *Visiting Assistant Professor of Education*
 B.A., Blackburn College, M.S., Ph.D. Iowa State University

VISITING PROFESSORS AND LECTURERS

- Tebow, Hilda P. (1974) *Visiting Professor of Social Work*
 B.A., Oklahoma State University, M.S.W. Vanderbilt University
- Wulff, Keith M. (1974) *Visiting Assistant Professor of Sociology*
 B.S.Ec., University of Wisconsin, B.D., Wartburg Theological Seminary,
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LECTURERS

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- Bounds, Gene *Lecturer in Architecture*
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- Cain, Marvin F. *Lecturer in Humanities*
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 B.Arch., Illinois Institute of Technology
- Clark, Julian H. *Lecturer in Architecture*
 B.S., B.Arch., Georgia Institute of Technology
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- De Groot, Alfred T. *Lecturer in Humanities*
 B.A., B.D., M.A., Butler University, Ph.D., University of Chicago
- Desjardin, Margaret E. *Accompanist; Lecturer in Health,
 Physical Education and Recreation*
- Douglas, Bobby E. *Lecturer in Health, Physical Education
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 B.Arch. Arizona State University
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- Hawkey, Nancy J. *Lecturer in Nursing*
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Asian Studies, Center for	<i>Yung Hwan Jo, Director</i>
Audiovisual Service	<i>Warren Fry, Director</i>
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Campus Systems and Programming	<i>Gordon E. Crosswell, Director</i>
Career Education, Center for	<i>G. D. McGrath, Director</i>
Career Services	<i>Robert F. Menke, Director</i>
Community Services Program	<i>Donald R. Campbell, Coordinator</i>
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Educational Research and Services, Bureau of	<i>R. Merwin Dwyer, Director</i>
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Executive Development, Center for	<i>Terry M. Frame, Director</i>
Family Life Studies, Center for	<i>Director</i>
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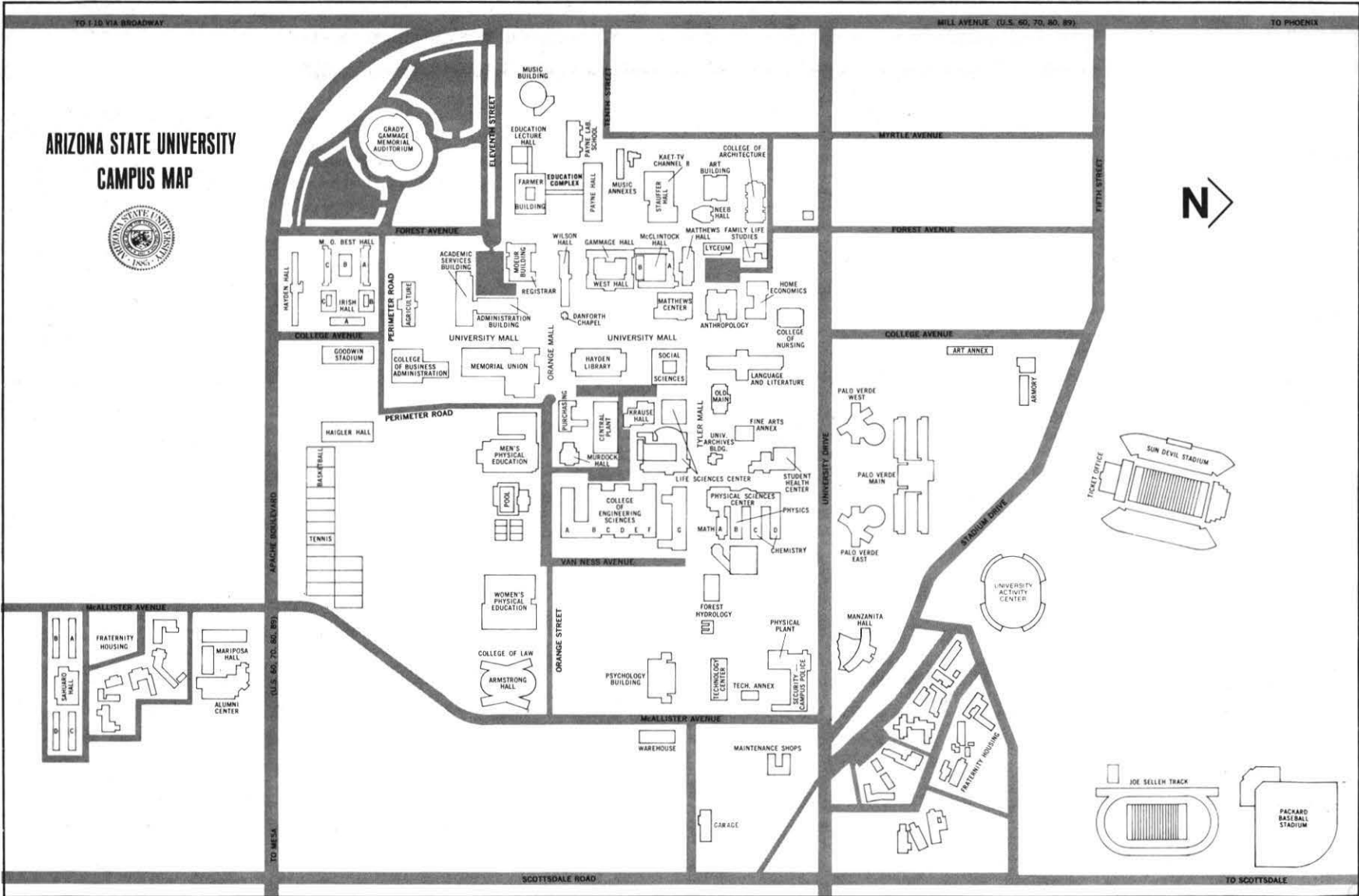
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ARIZONA STATE UNIVERSITY CAMPUS MAP



TO T.L.D. VIA BROADWAY

MILL AVENUE (U.S. 60, 70, 80, 89)

TO PHOENIX

ELEVENTH STREET

MYRTLE AVENUE

FOREST AVENUE

COLLEGE AVENUE

FOREST AVENUE

COLLEGE AVENUE

PERIMETER ROAD

VAN NESS AVENUE

ORANGE STREET

MUALISTER AVENUE

SCOTTSDALE ROAD

FIFTH STREET



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(U.S. 80, 70, 80, 89)

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COLLEGE OF LAW
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PALO VERDE EAST

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SUN DEVIL STADIUM

UNIVERSITY ACTIVITY CENTER

MANZANITA HALL

PHYSICAL PLANT

TECH. ANNEX

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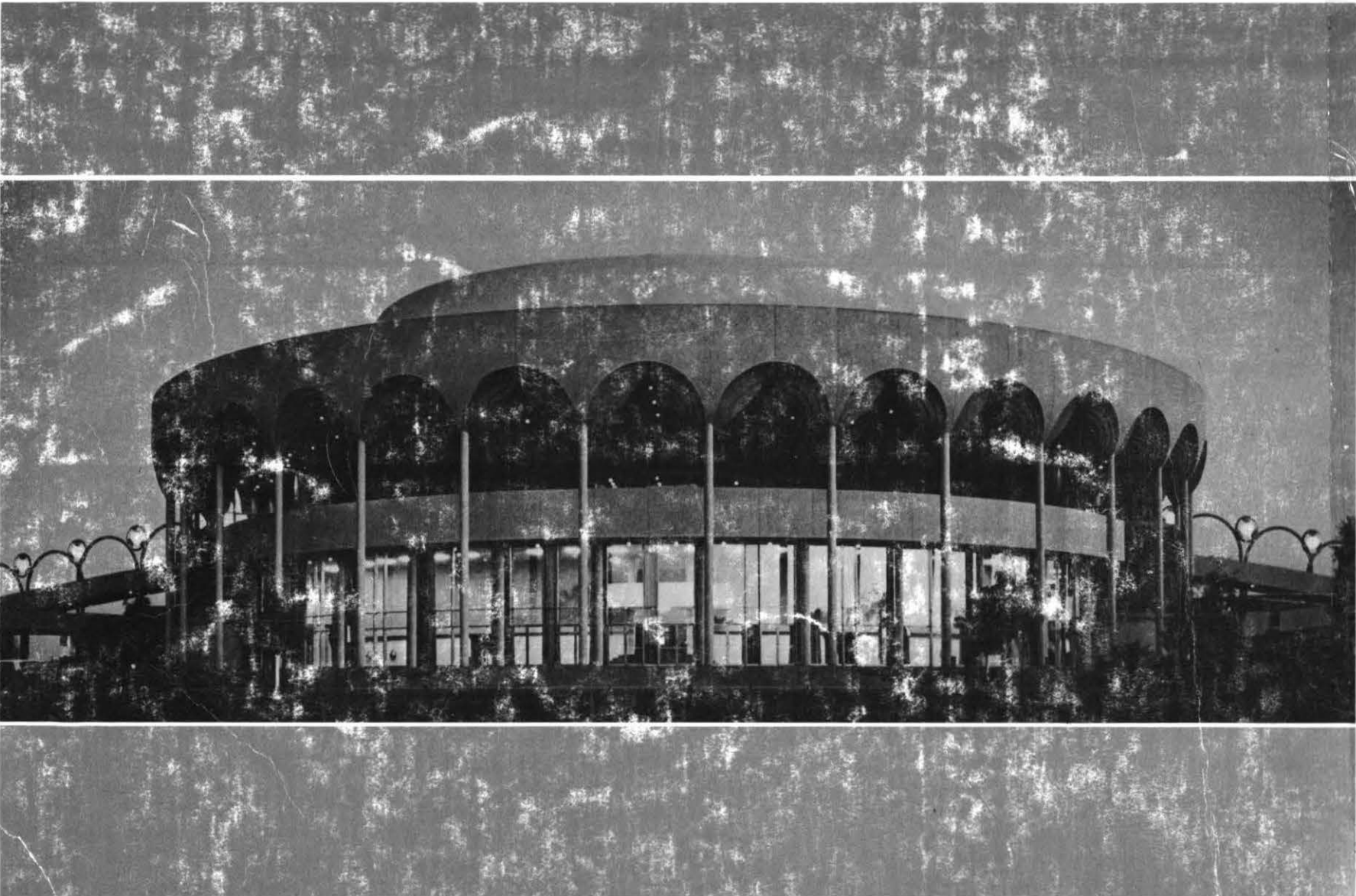
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