

Special Education Program Area

SPECIAL EDUCATION

SPE 311 Orientation to Education of Exceptional Children. (3) F, S, SS

Includes gifted, mildly handicapped, severely handicapped and the bilingual/multicultural exceptional child. *General studies: SB*

312 Mental Retardation. (3) F, S, SS

Characteristics and assessment specific to mental retardation. Termology, development, educational programming, and therapeutic procedures will be emphasized. Prerequisite: SPE 311

314 Introduction to Bilingual Multicultural Special Education. (3) F, S, SS

Theoretical background and practical application of general issues regarding the education of bilingual/multicultural handicapped children. Prerequisite: SPE 311

336 Behavioral and Emotional Problems in Children. (3) F, S, SS

Characteristics and assessment specific to emotional and behavioral disturbed children. Termology, development, and educational programming emphasized. Prerequisite: SPE 311.

361 Introduction to Learning Disabilities. (3) F, S, SS

Characteristics and assessment specific to learning disabilities. Termology, development, and educational programming emphasized. Prerequisite: SPE 311

411 Parent Involvement and Regulatory Issues. (3) F, S

Emphasis on parent and school relations through effective communication and state and federal regulations impacting services for the handicapped. Prerequisites: SPE 311 majors only

412 Evaluating Exceptional Children. (3) F, S

Normative and criterion referenced diagnostic techniques, including formative evaluation. Emphasis upon application. Daily practicum required. Prerequisites: EDP 301, 302, EED 404; SPE 311. Corequisites: ECD 402, RDG 401, 402, SPE 413, 496

413 Methods in Language, Reading, and Arithmetic for Exceptional Children. (3) F, S

Methods, techniques, and materials for use in prescriptive teaching. Daily practicum required. Corequisites: SPE 412, 496

414 Methods and Strategies in Behavior Management. (3) F, S

The organization and delivery of instruction including formative evaluation techniques. Techniques of behavior management. Daily practicum required. Prerequisites: RDG 401, 402, SPE 412, 413. Corequisites: SPE 415, 496.

415 Social Behavior Problems of Exceptional Children. (3) F, S

Analysis and intervention into social behavior problems of exceptional populations. Daily practicum required. Prerequisites: RDG 401, 402, SPE 412, 413. Corequisites: SPE 414, 496

455 Early Childhood and the Handicapped. (3) F

Early childhood education as it applies to the handicapped child.

478 Student Teaching in Special Education. (3-15) F, S

"Y" grade only. Prerequisites: approval of special education program coordinator; completion of specified prerequisites in special education.

496 Field Experience. (0) F, S

Application of course content in a special education setting. Emphasis on observation, pupil management, planning and delivering instruction, and assessment. Corequisites: SPE 411 or 413, 412, 414, 415

511 The Exceptional Child. (3) F, S, SS

Educational needs of exceptional children and adults. Not recommended for students who have completed SPE 311

512 Individuals with Mental Retardation. (3) F, S, SS

Etymology, diagnosis and management of individuals with mental retardation. Current trends in prevention, programming, and teacher preparation. Not recommended for students who have completed SPE 312

513 Teaching Students with Mental Retardation. (3) N

Specific methods, materials and curriculum for students with mild or moderate retardation. Prerequisite: SPE 312 or 512.

514 Bilingual Multicultural Aspects of Special Education. (3) S

Theories and issues related to the education of bilingual and culturally diverse exceptional children

515 Methods for the Remediation of Learning Problems of Exceptional Children. (3) S, SS

Methods and materials for remediating the basic academic problems of exceptional children. Prerequisites: SPE 511; a methods course in the teaching of reading and mathematics.

522 Academic Assessment of Exceptional Children. (3) F

Normative and criterion referenced assessment of learning problems in exceptional children. Formative evaluation included. Practicum required. Lecture, practicum. Prerequisites: SPE 311 or 511 elementary methods courses; program approval

523 Prescriptive Teaching with Exceptional Children. (3) F

Language, reading, and arithmetic methods, techniques, and materials used in individualized instruction. Practicum required. Lecture, practicum. Prerequisites: elementary methods courses: SPE 311 (or 511), 522 (or concurrent and program approval)

524 Effective Classroom Behavior Management. (3) S

Organization and delivery of instruction including formative evaluation and techniques of academic behavior management for exceptional children. Practicum required. Lecture, practicum. Prerequisites: SPE 311 (or 511), 522, 523 and program approval.

531 Behavior Management Approaches with Exceptional Children. (3) F, SS

Behavior management approaches for classroom behavior of exceptional children. Prerequisite: SPE 511 or equivalent.

536 Characteristics of Children with Behavioral Disorders. (3) F, SS

Variables contributing to behavior patterns of behaviorally disordered children.

538 Methods of Teaching Students with Behavioral Disorders. (3) N

Development of methods for managing the academic and social behavior of behaviorally disordered children and youth in educational settings. Prerequisite: SPE 336 or 536.

551 Teaching Young Children with Special Needs. (3) S

Methods, materials and curriculum for preschool and primary aged children with special needs. Prerequisites: SPE 455 and 511 or equivalent

552 Management of Individuals with Severe Handicaps. (3) S

Instruction and management of school aged and adult individuals with severe, physical, or multiple handicaps. Prerequisites: SPE 511 or equivalent; instructor approval

553 Developmental Functional Assessment. (3) F

Teacher focused developmental functional assessment of preschool and severely physically and multiply handicapped individuals. Field experience required. Prerequisites: SPE 511 and 512 and 574 or equivalent

554 The Parent/School Partnership. (3) S

Includes knowledge and procedures for involvement and training of parents and caregivers of preschool and severely handicapped individuals. Field experience required. Prerequisites: SPE 455 and 511 or equivalent

561 Characteristics Diagnosis of Learning Disabilities. (3) F, SS

Theories related to learning disabilities, including identification and characteristics

562 Methods of Teaching Students with Learning Disabilities. (3) N

Various methods and intervention strategies for remedial learning disabilities of children and youth. Prerequisite: SPE 361 or 561.

574 Educational Evaluation of Exceptional Children. (3) F, SS

Design and statistical considerations of normative and criterion referenced tests. Collection, recording and analysis of data from formative evaluation. Prerequisites: SPE 511 or equivalent a methods course in the teaching of reading and mathematics.

575 Current Issues in the Education of Exceptional Children. (3) F, SS

Mainstreaming, noncategorical, financing, legal, diagnostic, labeling, segregation, and other critical and controversial issues related to the education of exceptional children.

577 Mainstreaming Methods. (3) S

Successful mainstreaming methods, practical problem solving sessions related to teacher's classroom needs, and individual contracts focusing on mainstreaming issues are addressed. General educators encouraged.

578 Student Teaching in Special Education. (9-15) F, S

"Y" grade only. Prerequisite: completion of specified courses approved by the special education program coordinator

579 Supported Employment for Individuals with Severe Handicaps. (3) F

Emphasis on transition from school to integrated community and work settings for the severely and profoundly handicapped. Practicum required. Lecture, practicum. Prerequisites: SPE 552 and courses on severely handicapped.

582 Classroom Research with Exceptional Children. (3) S

Introduction to interpreting research. Specific research techniques with primary emphasis on classroom research, including applied behavior analysis.

585 Creativity: Research and Development. (3) S

Nature of creativity explored in terms of philosophical underpinnings, empirical evidence, human development, self-actualization, and the ecology surrounding the creative event.

586 Advising the Gifted Child. (3) A

Focus on educational planning and guidance, social and emotional development, and family problem solving regarding needs of gifted children.

587 Controversies in Educating the Gifted. (3) F

In-depth analysis of major controversies in educating the gifted, including nature/nurture, the role of mental tests, and sex differences.

588 The Gifted Child. (3) F, SS

Gifted children's characteristics, identification, needs, school and home environments, definitions, and misunderstandings. Research by Pressey, Stanley, Terman, and others.

589 Methods in Teaching the Gifted. (3) S, SS

Methods in teaching elementary and secondary school gifted children, including individualized and computer-assisted instruction, team teaching. Prerequisite: SPE 588.

774 Characteristics and Causation of Exceptionality. (3) F

In-depth analysis of literature pertaining to causes of exceptionality and learning, educational, personal-social, and cognitive characteristics. Lecture, discussion.

775 Evaluation and Intervention in Special Education. (3) S

In-depth analysis of research and literature on evaluation procedures and intervention approaches for exceptional individuals at all age levels. Lecture, discussion.

781 Research and Evaluation in Special Education. (3) S

Issues and problems in conducting research and/or evaluation programs involving exceptional children.

Omnibus Courses: See page 40 for omnibus courses that may be offered.

Division of Educational Leadership and Policy Studies

Nicholas R. Appleton

Director

(ED 108) 602/965-6248

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SHAFER, M. STOUT, WARREN,
WOCHNER, WOOTON

Program Areas

Educational Administration and
Supervision
Education Policy Studies
Higher Education

Degrees: M.A., M.Ed., Ed.S.*, Ed.D.,
Ph.D.

Programs of the Division of Educational Leadership and Policy Studies are designed to develop leaders, researchers, and policy analysts for careers in schools, colleges, and private and government agencies. Graduates are able to examine educational institutions, theories, and practices within broad economic, historical, political, and social contexts in this country and abroad.

Three basic emphases exist within the division's programs. One strand focuses on the administration and policies of educational institutions and practices from preschool through secondary education. The second strand focuses on the administration and policies of postsecondary education. The third strand emphasizes inquiry into the processes by which educational policy is formulated and evaluation of policy decisions. Each strand brings together

the methods and perspectives of the social sciences and the social and philosophical foundations of education.

Faculty within the division are involved in both empirical and theoretical research. Qualitative and quantitative methods are employed. Students have the opportunity to work on research projects in the College of Education and in school districts and educational agencies throughout the country.

The division is a member of the University Council for Educational Administration.

EDUCATIONAL ADMINISTRATION AND SUPERVISION

EDA 501 Competency/Performance in Educational Administration. (6) F, SS

The nature of educational administration and the concept of competency as it applies to educational administration.

507 Computers in Educational Administration. (3) F, S

Survey of computer use and applications in educational administration. Lecture, lab. Cross-listed as EMC 507.

510 Introduction to Organization and Administration of American Public Schools. (3) F, S

Organizational structure and administration of public education are explored through the application of legal and ethical concepts and relevant information of the social sciences. Cross-listed as SPF 510.

511 School Law. (3) F, S, SS

Constitutional, statutory, and case law that relates to all school personnel, pupils, the school district, and other governmental units. Contracts, dismissals, tenure, retirement, pupil injuries, liability of personnel and district, school district boundary changes, and bonding.

521 Evaluation of Teaching Performance. (3) F

In-depth analysis of legal basis of teacher appraisal, teacher competency, measurement of teacher performance, and application of performance appraisal systems.

524 Theory and Application of Educational Administration. (3) F, SS

History and development of public school administration in the United States; current organizational patterns for public education at local, intermediate, state, and national levels; current theoretical positions in educational administration.

525 Human Relations and Societal Factors in Education. (3) N

Interrelations between problems of educational administration and interdisciplinary social sciences. Communications skills, morale, authority, and perception. Concepts from political science, economics, and social-psychology useful to the administrator.

526 Instructional Supervision. (3) F, S, SS

Administering curriculum improvement, in-service education, evaluating, and improving teaching competence; administrative instructional responsibilities.

* Applications are not being accepted for the Educational Specialist program.

527 Managerial Functions in School Administration. (3) N
Relates to the work of the central district office staff and the school principal. Use of human resources, educational planning, and organization and management of time.

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

544 Public School Finance. (3) F
Measures of ability, efforts, and educational need; capital outlay, funding, tax revenues; federal, state, and local financing alternatives; major issues and trends in the financing of public education.

548 Community Relations in Education. (3) N
Administrative factors of primary importance in developing community involvement in public schools. Emphasis on theory and skill of school system and individual communication.

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

571 School Business Management. (3) F, S, SS
Purchasing, budgeting, accounting, payroll management, auditing financial report, insurance, and administration of non-teaching personnel and services.

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

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

634 Instructional Leadership. (3) N
Curricular practices and processes used by instructional leaders who plan, organize, and coordinate the professional activities of elementary and secondary schools. Prerequisite: EDA 526.

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

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

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

711 Administrative Leadership. (3) F
Emphasis on research in leadership application of research findings to administrative and supervisory functions in educational endeavor.

ors. Prerequisites: 30 semester hours in educational administration; admission to doctoral program.

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

733 Administrative Management. (3) S
Recent research relating to school management. School finance, law, budgets, transportation, food services, and supply management. Prerequisites: 30 semester hours in educational administration; admission to doctoral program.

Omnibus Courses: See page 40 for omnibus courses that may be offered.

EDUCATIONAL POLICY STUDIES

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

301 Culture and Schooling. (2) F, S
For the professional teacher preparation program: an overview of the cultural, social, and political elements in which formal schooling takes place in the United States. For education majors only.

401 Theory and Practice in Education. (1) 2 F, S
For the professional teacher preparation program: The analysis and interpretation of classroom behavior from perspectives derived from philosophy, social science, and law. For education majors only.

457 Third-World Women. (3) F
Economic, social, and demographic context for understanding the roles of third world women in health, family, work, education, and community. Cross-listed as FAS 494 NUR 457/WST 457. Prerequisite: 6 hours of social science credit or instructor approval. *Genera studies SB, G*

510 Introduction to Organization and Administration of American Public Schools. (3) F, S
Organizational structure and administration of public education are explored through the application of legal and ethical concepts and relevant information of the social sciences. Cross-listed as EDA 510.

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

515 Education of Women. (3) A
Analysis of roles and status of women, educational practices, and alternatives.

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

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

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

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

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

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

711 Social and Historical Foundations of Education. (3) S, SS
Problems of American education and the historical context.

Omnibus Courses: See page 40 for omnibus courses that may be offered.

HIGHER EDUCATION

HED 510 Introduction to Higher Education. (3) F, S
An overview of American higher education including philosophical, political, and social aspects.

516 Management Concepts in Higher Education. (1) N
Introduction to concepts of management theory and practice.

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

611 Curriculum and Instruction. (3) S
Curriculum development, instructional organization, and improvement of instruction in higher education. Prerequisite: HED 510.

644 Higher Education Finance and Budgeting. (3) S
Financial planning and budgeting in higher education institutions. Issues related to financing public and private colleges and universities. Prerequisite: HED 510.

649 Law of Higher Education. (3) F
Analysis of legal issues related to higher education examination of key court decisions. Prerequisite: HED 510.

689 Administration. (3) F
Theory and practice of administration in higher education institutions. Prerequisite: HED 510.

Omnibus Courses: See page 40 for omnibus courses that may be offered.

Division of Psychology in Education

Andres Barona
Interim Director
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REGENTS' PROFESSOR KULHAVY

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STAFFORD, VERGES, WRENN

Program Areas

Counseling Psychology
Counselor Education
Learning and Instructional Technology
Lifespan Development Psychology
Measurement, Statistics and
Methodological Studies
School Psychology

Degrees: M.A., M.C., M.Ed., Ed.D.,
Ph.D.

The faculty in the Division of Psychology in Education offer graduate degrees in a number of program majors. Master's degrees are offered in Counseling, Counselor Education, Educational Psychology, and Learning and Instructional Technology. Doctoral degrees are offered in the program majors of Counselor Education (applications for the doctorate in Counselor Education are no longer being accepted), Counseling Psychology (a program accredited by the American Psychological Association), Educational Psychology, and Learning and Instruc-

tional Technology. In the Ph.D. program in Educational Psychology, the following concentrations are available: school psychology (a program accredited by the American Psychological Association), measurement, statistics, and methodological studies; and lifespan developmental psychology.

Students applying to the graduate programs in Counseling Psychology or Educational Psychology are required to submit scores on the Graduate Record Examination (GRE). The Miller Analogies Test may be substituted for the GRE in the concentrations of counselor education and educational technology. All degree programs require the successful completion of comprehensive examinations.

Additional information on graduate programs may be obtained directly from the division office. Persons requesting information should specify the program of interest.

COUNSELING PSYCHOLOGY

CPY 613 Child Counseling. 3 N

Applications of counseling theory in working with children in clinics and elementary schools. Integrated practicum available with permission of instructor. Prerequisite: CED 577 or equivalent.

622 Group Counseling. 3 F, S

Theories and methodologies used in group counseling. Prerequisites: CED 567 and 577 or equivalents.

634 Organizational Development and Planned Change. 3 N

Organizational and individual dynamics including theory, analysis, techniques, and consultative intervention strategies used in organizational development. Field consultation projects. Prerequisites: CED 567 and 577 or equivalents.

644 Psychology of Careers. 3 S

Advanced career counseling including theory, research, and practice. Prerequisite: CED 577 or equivalent.

645 Professional Issues and Ethics. 3 F, S

Ethical, legal, and professional issues of concern to practitioners and researchers functioning in a variety of settings. Prerequisites: CED 512 and 523 or equivalents.

666 Comparative Theories of Personality. 3 F

Comparative analysis of personality theories in relation to counseling practices. Prerequisite: CED 577 or equivalent.

667 Patterns of Behavior Disorders. 3 A

Etiology and treatment of a variety of psychological problems, particularly those represented in DSM-IV. Prerequisite: CED 577 or equivalent.

670 Behavioral Counseling. 3 N

Theory, procedures, and applications of behavior modification and therapy in working with children, parents, and adults in schools, clinics, and institutional settings. Didactic instruction and analysis of individual and group problems and directed experiences. Prerequisite: CED 577 or equivalent.

671 Multicultural Counseling. 3 N

Provides awareness of the influence of socio-cultural variables on human development and explores implications for counseling minority populations. Prerequisite: CED 577 or equivalent.

672 Human Diversity: Social Psychological Perspectives. 3 A

Implications for psychological practice of social, psychological, and biological factors in the development of behavioral differences.

674 Counseling Women. 3 F

Explores women's development and its implications for counseling. Sexism, mental health, sex differences, and diagnosis and psychopathology and women's particular treatment needs.

675 Counseling Interventions in Stress Management. 3 N

Theory, procedures, and application of stress management techniques, including biofeedback, meditation, relaxation, autogenic therapy, visualization, and imagery. Prerequisites: CED 577 or equivalent, instructor approval.

677 Advanced Counseling. 3 N

Advanced topics in counseling theory, research, and practice. Prerequisite: CED 577 or equivalent.

679 History and Systems of Psychology. 3 A

Examination of the development and differentiation of the discipline of psychology from its origins in philosophy to the present.

701 Science and Practice of Counseling Psychology. 3 F

Directed experiences involving the integration of theory, research, and practice in counseling psychology. Prerequisite: instructor approval.

702 Research Methods in Counseling Psychology. 3 A

The application of experimental and/or quasi-experimental methods to theory construction and treatment evaluation in counseling psychology. Prerequisite: COE 502 or equivalent.

Omnibus Courses: See page 40 for omnibus courses that may be offered.

COUNSELOR EDUCATION

CED 512 Introduction to the Helping Relationship. 3 F, S, SS

Introduction to the skills used in the helping professions and an examination of the settings in which they occur.

522 Personality Development. 3 F, S, SS

Interaction of affective and cognitive factors in personality development at different ages. Various personality theories examined.

523 Psychological Tests. 3 F, S, SS

Standardized tests in the study of the individual with emphasis on test score interpretation in counseling.

534 Occupations and Careers. 3 F, S, SS

The world of work: career development, education, and training for occupational entry and mobility.

545 Analysis of the Individual. 3 F, S, SS

Theory and methods commonly used in studying the individual. Observational methods, diagnostic interviews, structured, and semi-structured methods for assessing personality. Prerequisite: CED 523.

567 Group Procedures. (3) F, S, SS

Social psychological factors determining interaction, effectiveness, and morale in small groups. Techniques of observation, assessment, and leadership.

577 Counseling. (3) F, S, SS

Principles and application of counseling with particular emphasis on counseling theories. Prerequisites: CED 512, 534, 545; admission to M.C. or school counselor certification program.

655 Student Development Programs in Higher Education. (3) A

Emerging conceptual models of student development. Overview of student personnel and student affairs programs in community colleges, four-year colleges, and universities. Observation on campuses.

656 The American College Student. (3) A

Selected theories of human development with application to academic/sociopsychological learning tasks of postsecondary environmental influences, including faculty expectations and campus subcultures.

672 Marriage and Family Counseling I. (3) F

Introduction to marriage and family counseling theories. Emphasis is on a systems-communication model utilizing co-counseling.

673 Marriage and Family Counseling II. (3) S

Advanced analysis and application of systems communication counseling. Focus on marital and sexual counseling. Practicum recommended.

681 Supervised Practice. (3) F, S

Supervised experiences in schools or community agencies. Prerequisite: instructor approval.

Omnibus Courses: See page 40 for omnibus courses that may be offered.

EDUCATIONAL PSYCHOLOGY**EDP 301 Learning and Motivation in Education.** (2) F, S

Using a case format, learning and motivation principles are applied to education contexts. Education majors only.

302 Assessment and Evaluation in Education. (1) F, S

Using a case format, assessment and evaluation principles are applied to education contexts. Education majors only.

303 Human Development. (3) F, S

Selected aspects of child and adolescent development. Emphasis on possibilities for influence by teachers and parents. For majors only. Prerequisite: CDE 232 or equivalent. *General Studies: L2.*

310 Educational Psychology. (1–6) F, S, SS

Human behavior in educational situations presented through instructional modules. Students may re-enroll for credit to a total of 6 hours. *General studies: SB.*

313 Childhood and Adolescence. (3) F, S, SS

Principles underlying total development of pre- and early-adolescent children. Emphasis on physical, intellectual, social, and emotional development with practical implications for teachers grades 5–9. Prerequisite: EDP 303 or admission to College of Education postbaccalaureate program.

454 Introduction to Statistical Data Analysis in Education. (3) F, S, SS

The role of statistics in research. Tabular and graphic data presentation. Frequency distributions, descriptive indexes, and introduction to statistical inference. Prerequisite: MAT 117. *General studies: N2.*

502 Introduction to Quantitative Methods. (3) F, S, SS

Topics in statistical analysis, measurement, and research design. Exploratory data analysis, estimation theory, and statistical inference. Use of computers for data analysis. Cross-listed as COE 502.

503 Introduction to Qualitative Research. (3) F, S, SS

Terminology, historical development, approaches (including ethnography, ethnomethodology, critical theory, grounded theory, and hermeneutics), and qualitative versus quantitative social sciences; methods of inquiry. Cross-listed as COE 503.

504 Learning and Instruction. (3) F, S, SS

Introduction to psychology of learning and instruction. Includes the foundations of learning theories and their application to educational practice. Cross-listed as COE 504.

510 Essentials of Classroom Learning. (3) F, S, SS

Theoretical and empirical foundations of learning in the classroom milieu. Critical exposure to research and method in instructional psychology. Cross-listed as LNT 510.

513 Child Development. (3) F, S, SS

Examination of problems and achievements experienced by children growing up in a technological society. Emphasis on discovering the child's perspective.

514 Psychology of the Adolescent. (3) F, S, SS

Cognitive, physical, and social development of adolescents in contemporary society. Impact of family, school, and work place on adolescent development. Prerequisite: EDP 310 or PGS 100 or equivalent.

530 Theoretical Issues and Research in Human Development. (3) F

Psychological theories, research, and methods relevant to human development, emphasizing the relations between early development and later performance.

532 Psychology of Exceptionality. (3) S

General psychological theory and experimental research relevant to exceptionality, emphasizing implications for educational programs that recognize unique learner characteristics. Field work.

534 Principles of Behavior Modification. (3) F

Principles of conditioning as applied to behavior modification; current research on the experimental analysis of behavior in educational psychology.

540 Theoretical Views of Learning. (3) F, S

Classical and cognitive theories of learning, plus recent orientations. Illustrative experimental and rational foundations; implications for educational practice. Cross-listed as LNT 540.

542 The Psychology of Learning and Instruction. (3) S

Critical review and evaluation of research on learning variables relevant to acquisition and retention of instructional materials. Lab. Cross-listed as LNT 542.

543 Psychological Research on Life-Span Development. (3) S

Critical review and evaluation of contemporary research on cognitive and affective development across the life span. Prerequisite: EDP 530 or equivalent.

544 Psychology of Reading. (3) N

Alternate analyses of the reading process; designs and procedures for investigating instructional and noninstructional variables related to reading achievement.

550 Introduction to Measurement in Education. (3) F, S

Nature and types of educational measures. Critiquing and selecting appropriate measuring devices. Constructing measuring devices. Social controversies about tests.

551 Expository Writing and Research Heuristics. (3) F

Weekly writing practice making use of heuristic concepts and expository principles. The construction of rationales for research problems. Logic and coherence in rhetoric. Writing style appropriate to exposition.

552 Basic Statistical Analysis in Education. (3) F, S, SS

Nature of educational data and statistical analysis. Frequency distributions and descriptive indexes. Introduction to hypothesis testing, ANOVA and regression.

554 Intermediate Statistical Data Analysis in Education. (3) F, S, SS

Multiple regression, ANOVA by multiple regression, repeated measures and other designs, covariance analysis, and introduction to MANOVA. Prerequisite: COE 502 or EDP 552 or passing grade on a qualifying exam.

556 Data Processing Techniques in Measurement and Research. (3) S

Advancement of statistical design and measurement skills through development of data-processing techniques and usage of special programs and data-processing programs. Prerequisite: EDP 554.

560 Individual Intellectual Assessment. (1–6) F, S

Experience in administering and interpreting individual tests. Theoretical basis for ability testing, ethical considerations, and diagnostic use of test results. Initial enrollment, 3-hour minimum. Lab experience. Prerequisites: EDP 454 and admission to a program in professional psychology or instructor approval.

562 School Psychology: Theory and Practice. (3) F

Development and present status of school psychology, including an overview of assessment and intervention strategies and professional issues.

563 Interventions in School Psychology. (3) F

Examination of case-based consultation and consultation research relevant to school psychology practice. Field experience. Prerequisite: school psychology program or instructor approval.

566 Diagnosis of Learning Difficulties. (3) S

Clinical diagnosis of learning difficulties, emphasizing specific academic problems. Use and interpretation of diagnostic instruments in practical school situations. Prerequisites: EDP 560 and 562 or equivalents; instructor approval.

567 School Psychological Services to Minority Students. (3) S
Historical perspectives and major issues in psychological and academic assessment and interventions with minority school children.

568 Organizational Development: School Psychological Perspectives. (3) F
Applications of organization development strategies and techniques in facilitating the positive impact of schools on students' learning and social functioning.

651 Methods and Practices of Qualitative Research. (3) S
Advanced course for students familiar with theory and extant work. Topics include data collection, analysis, reporting, and an extensive fieldwork project. Prerequisite: COE 503.

652 Multivariate Procedures in Data Analysis I. (3) F
Multivariate analysis of variance and covariance, multivariate multiple comparison procedures, power analysis and effect size, discriminant analysis, and repeated measures analysis. Prerequisite: EDP 554 or passing score on qualifying exam.

654 Multivariate Procedures in Data Analysis II. (3) S
Multivariate multiple regression, canonical correlation, factor analysis, categorical data analysis, log linear models, and structural equation models. Prerequisite: EDP 554 or passing score on qualifying exam.

Omnibus Courses: See page 40 for omnibus courses that may be offered.

LEARNING AND INSTRUCTIONAL TECHNOLOGY

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

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

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

504 Educational Evaluation. (3) S
Evaluation procedures in instruction and training.

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

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

542 The Psychology of Learning and Instruction. (3) S
Critical review and evaluation of research on learning variables relevant to acquisition and retention of instructional materials. Lab. Cross-listed as EDP 542.

545 Cognition and Instruction. (3) F
Current developments in research relating cognitive models to the instructional process. Seminar. Prerequisites: EDP 552; LNT 540.

584 Educational Technology Internship. (1-6) F, S, SS
Prerequisites: LNT 501, 502; instructor approval. Pre- or corequisite: EMC 521.

780 Advanced Instructional Development. (1-3) S
Conducting and documenting selected instructional development activities. Prerequisites: LNT 502; instructor approval.

792 Advanced Instructional Research. (3) F
Design and execution of instructional research on selected topics. Prerequisites: LNT 503; instructor approval.

Omnibus Courses: See page 40 for omnibus courses that may be offered.



College of Engineering and Applied Sciences

Charles E. Backus, Ph.D.
Interim Dean

PURPOSE

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

ORGANIZATION

The College of Engineering and Applied Sciences comprises the following units:

School of Agribusiness and Environmental Resources

School of Construction and Technology

Department of Aeronautical Technology
Department of Construction
Department of Electronics and Computer Technology
Department of Manufacturing and Industrial Technology

School of Engineering

Department of Chemical, Bio and Materials Engineering
Department of Civil Engineering
Department of Computer Science and Engineering
Department of Electrical Engineering
Department of Industrial and Management Systems Engineering
Department of Mechanical and Aerospace Engineering

The Office of the Dean administers programs in engineering special and interdisciplinary studies.

Research Centers. The college is committed to becoming one of national prominence in research. In addition, it is the policy of the college to encourage exceptional upper-division undergraduate students and graduate students to participate with faculty in research activity. Most faculty are conducting re-

search on government or industry-sponsored programs. Research activities include aerodynamics, agribusiness, arid land agriculture, bioengineering, biomedical, biotechnology, CAD/CAM, computer design, computer science and applications, computer-integrated manufacturing, environmental, materials science, microelectronics manufacturing, natural resource management, nuclear radiation, power systems, rotor dynamics, semiconductor materials and devices, signal processing, solar energy, solid-state electronic devices, structural dynamics, structures, telecommunications, thermosciences, transportation systems, and turbine design. These activities are carried out under the academic divisions or departments listed in the following catalog material and also through the interdisciplinary research centers listed below:

Aerospace Research Center
Center for Advanced Research in Transportation
Center for Agribusiness Policy Studies
Center for Energy Systems Research
Center for Solid State Electronics Research
Computer-Integrated Manufacturing Systems Research Center
Systems Science and Engineering Research Center
Telecommunications Research Center

Center for Professional Development. The Center for Professional Development in the College of Engineering and Applied Sciences establishes a cooperative focus with the college's academic departments and research centers to provide a wide variety of technical conferences, institutes, seminars, short courses, research briefings, and televised and satellite-transmitted programs to enable engineers, scientists, and technical managers locally, nationally, and internationally to continue their lifelong learning in a constantly changing technical world.

Programs may be conducted on campus in the center's conference room, at various off-campus locations, or at company sites upon request.

For more information, contact the Center for Professional Development, located in ECG 148, at 602/965-1740.

ADMISSION

Students who wish to be admitted to freshman standing in the College of

Engineering and Applied Sciences should present certain secondary units that are specified in the requirements of each of the three schools. Students who have omissions or deficiencies in secondary school subject matter preparation may be required to complete additional university course work that may not be applied toward their degrees.

Students who are not admissible to programs in this college and who enroll in another college at ASU may not register for any 300 or 400 level courses in this college unless such courses are required in their degree programs and the students have the proper course prerequisites.

Entrance requirements of this college may differ from those of other ASU academic units. Students may be admitted under one of two different classifications, the professional and preprofessional programs.

Professional Program. For admission to a *professional program*, Arizona residents must meet one of the requirements as listed in the "Professional Program Requirements for Residents" table.

For admission to a professional program, a nonresident must meet one of the requirements as listed in the "Pro-

fessional Program Requirements for Nonresidents" table.

Students admitted to the university by the General Education Development (GED) are required to take either the ACT or the SAT in order to be admitted to a professional program.

Preprofessional Program. A student not admissible to a professional program within the college but otherwise admissible to ASU may be admitted as a *preprofessional* student to any one of the departments or schools of the college. International students whose TOEFL scores do not meet the above minimum scores also may be admitted to the preprofessional program. A student admitted into this classification follows the freshman-sophomore sequence of courses as required by the chosen major. Courses are selected with the assistance of an academic advisor. After completing a minimum of 30 semester hours of required or approved elective courses *with a cumulative GPA equivalent to that required of transfer students and corresponding to the chosen major*, students may apply for admission to the professional program. *International students must also submit a TOEFL score equivalent to that required for admission to the professional programs*. Students ad-

mitted as preprofessional students are not permitted to register for 300 and 400 level courses in the College of Engineering and Applied Sciences until their status is changed to the professional classification.

Readmission. Students applying for readmission to professional status for any program in this college must have a cumulative GPA for all college course work equal to that of the transfer admission requirements shown below. A student who does not meet these requirements may request admission to the preprofessional program, subject to the restrictions shown above.

Transfer into and within the College. Students transferring into or between schools or departments within the college or from other colleges within the university must meet both the cumulative GPA requirement and the catalog requirements of the new school or department in effect at the time of transfer. Students who are transferring from an Arizona community college and have been in continuous residence may continue under the catalog in effect at the time of entering the community college.

Transfer Students. A student who contemplates transferring into this college from another institution, whether a community college or four year institution, should study carefully the pertinent sections under this college pertaining to the particular program and, if possible, consult an advisor in this college before enrolling in the other institution. These steps assure a smooth transition at the time of transfer. Transfer students may request admission to either preprofessional or professional status in any of the programs offered by this college. The restrictions with regard to preprofessional status are shown in the "Professional Program Requirements for Transfer Students" table. The departments and schools may impose additional admission and graduation requirements to those minimums specified by the college.

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

The minimum requirements for admission of resident and nonresident transfer students to the professional program are listed in the "Professional Program Requirements for Transfer Students" table.

Professional Program Requirements for Residents

Program	High School Rank	Minimum Scores	
		ACT	SAT
Agribusiness and Environmental Resources	Upper 50%	22	930
Construction	Upper 50%	23	1050
Engineering	Upper 25%	23	1050
Technology	Upper 50%	22	930

Professional Program Requirements for Nonresidents

Program	High School Rank	Minimum Scores		
		ACT	SAT	TOEFL*
Agribusiness and Environmental Resources	Upper 25%	24	1010	500
Construction	Upper 25%	24	1050	550
Engineering	Upper 25%	24	1050	550
Technology	Upper 25%	24	1010	500

* For international students, see pages 32 and 33.

Professional Program Requirements for Transfer Students

Program	Transfer GPA		TOEFL ²
	Resident	Nonresident	
Agribusiness and Environmental Resources	2.00	2.50	500
Construction	2.25	2.50	550
Engineering	2.50	2.50	550
Technology	2.25	2.50	500

¹ The cumulative GPA is calculated using all credits from ASU and from other colleges and universities

² For international students (see pages 32 and 33)

Credit is granted for transferred courses deemed equivalent to corresponding courses in the selected program of study, subject to grade and senior residence requirements. Credits transferred from a community college or two year institution are applied only as lower division credits. Prospective Arizona community college transfer students should consult their advisors and refer to the annual *Arizona Higher Education Course Equivalency Guide* for a listing of the acceptable courses transferable to the various college degree programs.

It should be noted that some courses taken in other colleges of this university or other universities may be acceptable for general university credit but may not be acceptable toward the degree requirements of this college. Determination of those particular courses acceptable to a specific degree program is made within the appropriate department or school with the approval of the dean.

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

A student in the college is eligible to apply upon completion of 45 or more hours of classes in the selected major. Certain positions may require completion of specific courses of study. Transfer students are required to complete at least one semester at ASU before beginning work.

All student applicants must have a GPA of at least 2.50 and the approval of an advisor.

To maintain continuous student status in the university, each co op student must be enrolled in ASE 399 Cooperative Work Experience for one semester hour during each work session. For more information, contact the director of Student Academic Services at 602/965 5150 (ECG 115) or the Career Services office at 602/965 2350 (SSV C359).

ADVISEMENT

For assistance and counseling in planning a program of study, each student in this college is assigned a faculty advisor who is familiar with the chosen field of specialization and who must be consulted before registering each semester. The student should inform the advisor of any outside work or activity so that course loads may be adjusted accordingly.

Most students attending college find it necessary to obtain part-time employment. A recommended formula often used for relating school and work load is as follows:

$$\frac{\text{Credit hours of enrollment}}{48} = \frac{\text{number of hours employed each week}}{3}$$

Students enrolled in this college may register for a maximum of 19 semester hours. Any student wanting to register for more than the maximum must petition the CEAS Standards Committee and must have an approval on file before registering for the overload.

The associate director of Student Academic Services is also available to all students for counseling and advising.

Minority Engineering Program. The Minority Engineering Program director and the academic advisor are available to assist prospective, newly admitted, and continuing students with academic advisement and a variety of support services. Advisement is also provided in the procurement of financial aid, scholarships, and professional development.

DEGREES

Majors. Programs leading to the B.S. and B.S.E. degrees are offered by the College of Engineering and Applied Sciences, with majors in the subjects shown in the "College of Engineering and Applied Sciences Degrees and Majors" table, pages 210-211. Each major is administered by the academic unit indicated.

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

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

Graduate Degrees

Deficiencies for admission to the graduate degree programs are specified at the time of admission. The Graduate Record Examination (GRE)—the verbal, quantitative, and analytical components—is recommended but not required unless specified by the respective academic unit. TOEFL scores must be submitted by foreign student applicants before admission is considered. The minimum required score is determined by each academic unit.

College of Engineering and Applied Sciences Degrees and Majors

Major	Degree	Administered by
Baccalaureate Degrees		
School of Agribusiness and Environmental Resources		
Agribusiness Concentrations: agribusiness, computer analysis, pre veterinary medicine	B.S.	School of Agribusiness and Environmental Resources
Environmental Resources in Agriculture Concentration: natural resource management	B.S.	School of Agribusiness and Environmental Resources
School of Construction and Technology		
Aeronautical Engineering Technology Option: aeronautical technology	B.S.	Department of Aeronautical Technology
Aeronautical Management Technology Options: aircraft flight management, airway science management	B.S.	Department of Aeronautical Technology
Construction Options: general building construction, general development, heavy construction, military construction, specialty construction	B.S.	Department of Construction
Electronics Engineering Technology Options: computer systems, electronic systems, microelectronics, telecommunications	B.S.	Department of Electronics and Computer Technology
Industrial Technology Options: graphic communications, industrial management, interactive computer graphics	B.S.	Department of Manufacturing and Industrial Technology
Manufacturing Engineering Technology Options: computer integrated manufacturing engineering technology, manufacturing engineering technology, mechanical engineering technology, robotic and automation engineering technology, welding engineering technology	B.S.	Department of Manufacturing and Industrial Technology
School of Engineering		
Aerospace Engineering Emphases: aerodynamics, aerospace materials, aerospace structures, computer methods, design, mechanical, propulsion, system dynamics and control	B.S.E.	Department of Mechanical and Aerospace Engineering
Bioengineering Emphases: biochemical engineering, bioelectrical engineering, biomechanical engineering, bionuclear engineering, biosystems engineering, pre medical engineering	B.S.E.	Department of Chemical, Bio and Materials Engineering
Chemical Engineering Emphases: biochemical, biomedical, environmental materials, pre medical, process engineering, semiconductor processing	B.S.E.	Department of Chemical, Bio and Materials Engineering
Civil Engineering Emphases: construction engineering, environmental engineering, geotechnical engineering, structural engineering, transportation engineering, water resources engineering	B.S.E.	Department of Civil Engineering
Computer Science	B.S.	Department of Computer Science and Engineering
Computer Systems Engineering	B.S.E.	Department of Computer Science and Engineering
Electrical Engineering	B.S.E.	Department of Electrical Engineering

* This program is administered by the Graduate College. See the "Graduate College" section of this catalog.

Major	Degree	Administered by
Engineering Interdisciplinary Studies Option: geological engineering	B.S.	School of Engineering
Engineering Special Studies Options: engineering mechanics, manufacturing engineering, microelectronics manufacturing engineering, nuclear engineering science, pre medical engineering, systems engineering	B.S.E.	School of Engineering
Industrial Engineering	B.S.E.	Department of Industrial and Management Systems Engineering
Materials Science and Engineering Emphases: chemical processing and energy systems, electronic materials, manufacturing and materials processing, mechanical metallurgy, physical metallurgy, polymers and composites	B.S.E.	Department of Chemical, Bio and Materials Engineering
Mechanical Engineering Emphases: aerospace; biomechanical; computer methods; control and dynamic systems; design; energy systems; engineering mechanics; manufacturing; stress analysis, failure prevention, and materials; thermosciences	B.S.E.	Department of Mechanical and Aerospace Engineering
Graduate Degrees		
School of Agribusiness and Environmental Resources		
Agribusiness Concentrations: agribusiness management and marketing, food quality assurance	M.S.	School of Agribusiness and Environmental Resources
Environmental Resources in Agriculture	M.S.	School of Agribusiness and Environmental Resources
School of Construction and Technology		
Construction Concentrations: construction science, facilities, management	M.S.	Department of Construction
Technology Concentrations: aeronautical engineering technology, aeronautical management technology	M.Tech.	Department of Aeronautical Technology
Technology Concentration: electronics engineering technology	M.Tech.	Department of Electronics and Computer Technology
Technology Concentrations: graphic communications technology, industrial management and supervision, manufacturing engineering technology, mechanical engineering technology, welding engineering technology	M.Tech.	Department of Manufacturing and Industrial Technology
School of Engineering		
Aerospace Engineering	M.S., M.S.E., Ph.D.	Department of Mechanical and Aerospace Engineering
Bioengineering	M.S., Ph.D.	Department of Chemical, Bio, and Materials Engineering
Chemical Engineering Concentrations: biomedical and clinical engineering, chemical process engineering, chemical reactor engineering, energy and materials conversion, environmental control, solid state processing, transport phenomena	M.S., M.S.E., Ph.D.	Department of Chemical, Bio, and Materials Engineering

* This program is administered by the Graduate College. See the "Graduate College" section of this catalog.

Major	Degree	Administered by
Civil Engineering Concentrations environmental sanitary, geotechnical/soil mechanics, structures, transportation, water resources/hydraulics	M.S., M.S.E., Ph.D.	Department of Civil Engineering
Computer Science	M.C.S., M.S., Ph.D.	Department of Computer Science and Engineering
Electrical Engineering	M.S., M.S.E., Ph.D.	Department of Electrical Engineering
Engineering Science	M.S., M.S.E., Ph.D.	School of Engineering
Industrial Engineering Concentrations computer-aided processes, computer integrated manufacturing, human factors, information systems, operations research, organization control, quality control reliability	M.S., M.S.E., Ph.D.	Department of Industrial and Management Systems Engineering
Mechanical Engineering	M.S., M.S.E., Ph.D.	Department of Mechanical and Aerospace Engineering
Science and Engineering of Materials	Ph.D.*	Committee on Science and Engineering of Materials

* This program is administered by the Graduate College. See the "Graduate College" section of this catalog.

Master of Computer Science Degree (M.C.S.)

The M.C.S. program provides a professionally oriented, graduate level education in computer science and engineering. All of the Graduate College entrance requirements and departmental academic performance and preparation requirements must be satisfied for admission. The applicant must have a baccalaureate degree in computer science, computer engineering, or a closely related field. The M.C.S. program requires a minimum of 30 semester hours of approved graduate level course work. At the end of the program of study, the student must pass a final comprehensive examination over the graduate course work taken for the degree and over the appropriate undergraduate prerequisites. Details of the content and format of the examination are available from the department.

Master of Science Degree (M.S.)

Agribusiness and Environmental Resources. This program provides competent students with opportunities to complete advanced studies with emphasis on research. Areas of study in Agribusiness may be management, marketing, finance, international agriculture, and food industry. Areas of study in Environmental Resources in Agriculture may be natural resource management and range ecology. Admission requires completion of 18 se

mester hours in agribusiness and environmental resources or closely related course work. Scores from the GRE or Miller Analogies Test (MAT) are required. The Graduate Management Admission Test (GMAT) is accepted for agribusiness students only. A minimum of 30 semester hours of approved graduate course work is required, including a thesis. An oral examination in defense of the thesis is required.

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

Construction. This graduate program provides opportunities for qualified students holding a baccalaureate degree in construction, engineering, architecture, or a related discipline to complete advanced studies with emphasis on management and research. The construction science concentration allows candidates whose primary interest is field engineering or supervision of heavy and industrial construction projects to pursue a more technically oriented course of study. The construction management concentration allows candi

dates pursuing upper level management positions in various sectors of the construction industry to improve their competency in project, program, and company management areas. The facilities management concentration supports the needs of the student whose aim is to pursue careers in the maintenance, operation, renovation, or decommissioning of existing facilities.

Engineering Science. These research oriented graduate degree programs provide opportunities to highly competent students to major in aerospace, chemical, civil, electrical, industrial, or mechanical engineering, bioengineering, or engineering science. Options in aerospace engineering, biotechnology, engineering mechanics, engineering science, materials science and engineering, nuclear engineering sciences, and system science and engineering are available under the Engineering Science major. M.S.E. and Ph.D. degree programs are also available in these options.

The M.S. degree program (including all options) is administered through the office of the college associate dean for graduate studies. Admission normally requires an appropriate undergraduate engineering degree and satisfaction of all Graduate College admission requirements and special department requirements. A minimum of 30 semester

hours of approved graduate course work is required, which must include a thesis and an oral examination at the completion of the program. Students writing a thesis must enroll in a combination of both 592 Research and 599 Thesis, totaling six semester hours

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

These professionally oriented graduate degree programs are intended as a preparation for a career in professional practice. Two options are available: the thesis (engineering report or research paper) option and the no thesis, no report option. Both require a minimum of 30 semester hours of approved graduate level course work. For entry the student must satisfy all Graduate College admission requirements and special department requirements and must have a baccalaureate degree in engineering or another closely related degree program.

Two options are available within the Master of Science in Engineering degree programs. Option 1 is designed primarily for full time students. A thesis is required of students following this option. Option 2 is designed primarily for students who hold full time jobs and must attend university classes on a part time basis or for full time students who do not have an approved thesis topic.

Master of Technology Degree (M.Tech.)

This degree program is designed for flexibility, permitting the student to select a combination of courses in technology and supporting areas to meet individual career goals. Selected areas of concentration are designed to provide graduates with technical and professional skills for use in preparation for and advancement in leadership positions found in industry and education. The Master of Technology is offered by the Departments of Aeronautical Technology, Electronics and Computer Technology, and Manufacturing and Industrial Technology. Admission requires an appropriate baccalaureate degree with a minimum of 30 semester hours in technology or equivalent. A minimum of 32 semester hours of approved course work is required, including a practicum or applied project. An oral examination in defense of the practicum or applied project is required.

Doctor of Philosophy Degree

The Ph.D. degree is awarded in engineering or Computer Science upon the satisfactory completion of an approved program of graduate study, research, and dissertation. For specific reference to this degree, see the "Graduate College" section of this catalog or the *Graduate Catalog*.

DEGREE REQUIREMENTS

For detailed information on the degree requirements of a major in the College of Engineering and Applied Sciences, refer to that department's or school's individual description on the ensuing pages.

English Proficiency Requirement.

English proficiency is required. As a minimum each student must complete both ENG 101 and 102 or ENG 105, but any student whose written or spoken English in any course is unsatisfactory may be required by the appropriate director or department chair to take additional course work. See "First Year Composition Requirement," page 66.

Pass/Fail Grades. Students enrolled in the College of Engineering and Applied Sciences do not receive degree credit for pass/fail courses taken at this institution. In addition, no course in this college is offered for pass/fail credit. Students requesting credit for pass/fail courses taken at another institution must file a Petition for Adjustment to Curriculum Requirements. Each request is judged on its particular merits.

Entry into Upper-Division Courses.

Before enrolling in courses at the 300 level and above, a student in good academic standing must secure the approval of his or her advisor. A student who is not in good academic standing must secure the approval of his or her advisor and director or department chair. Students whose grades in 300-level courses are unsatisfactory may be required to retake one or more courses for which credit has previously been granted.

The departments and schools have certain additional requirements that must be met in addition to the above college requirements and students should consult them for details.

Course Work Currency. Courses taken more than five years before admission to degree programs in this col-

lege are not normally accepted for transfer credit at the option of the department in which the applicant wishes to enroll. Courses completed within the five years preceding admission are judged as to their applicability to the student's curriculum.

GENERAL STUDIES REQUIREMENTS

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

Specific attention should be directed to the university general studies requirements shown on pages 45-48. Additional requirements and recommended course selections are shown in appropriate catalog sections for the schools and departments of this college.

School of Engineering majors have some restrictions on the selections of course work used to fulfill the general studies requirements in humanities and fine arts (HU), social and behavioral sciences (SB) and lower division literacy and critical inquiry (LI). Please refer to page 240 for details.

General studies courses are regularly reviewed. To determine whether a course meets one or more general studies course credit requirements, see the listing of courses by core and awareness area, pages 49-65. General studies courses are also identified following course descriptions according to the "Key to General Studies Credit Abbreviations," page 48.

GRADUATION REQUIREMENTS

Graduation requirements in this college are listed under the description of each school or major.

ACADEMIC STANDARDS

Retention. A student is expected to make satisfactory progress toward completion of degree requirements in order to continue enrollment in the College of Engineering and Applied Sciences. Any one of the following conditions is considered unsatisfactory progress and results in the student being placed on probationary status:

1. a deficiency of five or more grade points;
2. a semester or summer session with a GPA less than or equal to 1.50;
3. two successive semesters with GPAs less than 2.00; or
4. grades of "E," "W," or "I" in half the semester hours appearing on the official enrollment record for any semester.

Students not meeting department standards are placed on probation at the department's discretion.

Students on probation are subject to disqualification if

1. they do not attain a semester GPA of 2.25 and their cumulative GPA is below 2.00 at the end of the probationary semester (items 1, 2, and 3 above);
2. they are placed on probation for two consecutive semesters; or
3. they receive an "I," "E," or "W" during the probationary semester (for item 4 above).

Courses completed during the summer sessions may not be used to re-evaluate a student's fall semester probationary status.

Probationary students may not register for the next semester without a special permit from Student Academic Services. Special permits are not given until grades are recorded by the registrar for the current semester.

Disqualification. During a semester on probationary status, a student who fails to meet the retention standards specified above is disqualified. Students may request a review of their disqualification status by contacting the associate director of Student Academic Services in ECG 115. Any disqualified student who is accepted by another college at ASU may not register for courses in this college unless the courses are required for the new major. Disqualified students who do register for courses in this college may be with-

drawn from these courses any time during that semester. Furthermore, students at the university who have been disqualified academically by this college are not eligible to enroll in summer session courses in this college until the disqualification period has expired and they have been reinstated.

Reinstatement. The College of Engineering and Applied Sciences does not accept an application for reinstatement until the disqualified student has remained out of this college for at least a 12 month period. Merely having remained in a disqualified status for the above period of time does not, in itself, constitute a basis for reinstatement. Proof of ability to do satisfactory college work in the chosen discipline is required, for example, completing pertinent courses in the discipline at a community college with better than average grades.

STUDENT RESPONSIBILITIES

Course Prerequisites. It is expected that students consult the *Schedule of Classes* and the catalog with regard to course prerequisites. Students who register for courses without the designated prerequisites may be withdrawn without the student's consent at any time before the final examination. Such withdrawal may be effected by the instructor, the chair of the department offering the course, the director of Student Academic Services, or the dean of the college. In such cases, there is no monetary reimbursement to the student. However, such withdrawal is considered to be unrestricted as described on page 42 and does not count against the number of restricted withdrawals allowed.

SPECIAL PROGRAMS

Student Academic Services. The dean's office of the College of Engineering and Applied Sciences maintains a special office staffed to assist students in various matters. This office coordinates the work of the College Admissions and Standards Committee and administers the probation, disqualification, and readmission processes for students who are academically deficient.

Academic Honors. Students completing baccalaureate degree requirements receive the appropriate honors designations on their diplomas consistent with

the requirements specified by the university.

Students in the College of Engineering and Applied Sciences are encouraged to seek information concerning entry into those honor societies for which they may qualify. Membership in such organizations enhances the student's professional stature. The following honor societies are active within the college:

1. Alpha Pi Mu Industrial Engineering Honor Society;
2. Alpha Zeta Agriculture Honor Society;
3. Chi Epsilon—Civil Engineering Honor Society;
4. Eta Kappa Nu Electrical Engineering Honor Society;
5. Pi Tau Sigma Mechanical Engineering Honor Society;
6. Sigma Lambda Chi—Construction Honor Society;
7. Tau Alpha Pi National Honor Society, Engineering Technologies;
8. Tau Beta Pi National Engineering Honor Society; and
9. Upsilon Pi Epsilon National Computer Science Honor Society.

Information on any of these organizations may be obtained from the respective department or school offices or Student Academic Services.

University Honors College. The College of Engineering and Applied Sciences participates with the University Honors College, which affords superior undergraduates opportunities for enhanced educational experiences. Participating students can major in any academic program. A description of the requirements and the opportunities offered by the University Honors College can be found on pages 73-75 of this catalog.

Scholarships. Academic scholarships for continuing students in this college may be applied for by contacting the Student Academic Services Office or the various department or school offices. Other scholarships may be available through the university Student Financial Assistance Office.

ASU 3+2 Programs. Students desiring to earn a baccalaureate degree from Grand Canyon University (Phoenix, Arizona) in Mathematics, Chemistry, or Physics, or from Southwestern Univer-

sity (Georgetown, Texas) in Physical Science and a baccalaureate degree in one of the engineering majors or Construction from ASU can take advantage of a 3+2 program approved by these institutions. Students from Grand Canyon University may also select a degree program in Construction. Such students complete the first three years of study at their respective college or university and the last two years of study at ASU. At the end of the fourth or fifth year, assuming all degree requirements have been met, the baccalaureate degree is awarded by the student's respective college or university and the appropriate engineering or construction baccalaureate degree is awarded by ASU. More information can be obtained by writing to one of the following offices:

Office of the Administrative Vice President

Grand Canyon University
3300 W. Camelback Rd.
Phoenix, Arizona 85017-1097

Provost and Dean of the Brown College of Arts and Sciences
Southwestern University
Georgetown, Texas 78626

Office of the Dean
College of Engineering and Applied Sciences
Arizona State University
Tempe, Arizona 85287-5506



The Department of Construction also has 2+2 agreements with several selected out-of-state colleges and universities. For a listing and additional information, contact the department chair: Department of Construction, Arizona State University, Tempe, Arizona 85287-0204, 602/965-3615.

ROTC Students. Students pursuing a commission through either the Air Force or Army ROTC programs are required to take from 12 to 20 hours in the Department of Aerospace Studies or Department of Military Science. To preclude excessive overloads, these students should plan on at least one additional semester to complete degree requirements. Because of accreditation requirements, aerospace studies (AES) courses are not acceptable for engineering or engineering technology degree credit as a social or behavioral science under general studies. ROTC students must also meet all other degree requirements of this college.

A military construction option is available in the Department of Construction.

GENERAL INFORMATION

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

Program of Study. This broad term describes the complete array of courses included in the study leading to a degree. Examples: agribusiness and environmental resources, construction, engineering, and technology.

Major. This term describes a specialized group of courses contained within the program of study. Example: program of study—engineering; major—Civil Engineering. Example: program of study—technology; major—Industrial Technology.

Area of Emphasis (Technical Electives), Option, or Concentration. Each of these terms describes a selection of courses within a major or among one or more majors. The number of technical electives varies from curriculum to curriculum. In a number of the majors, the technical electives must be chosen from preselected groups. For this reason the choice of specific technical electives for an area of emphasis should be done with the advice and counsel of an advisor. Example: major—Mechanical Engineering; area of emphasis—thermosciences.

School of Agribusiness and Environmental Resources

Eric P. Thor
Director
(AG 281) 602/965-3585

PROFESSORS

BRADY, BROCK, CHALQUEST,
EDWARDS, GORDON, KAGAN,
STILES, THOR

ASSOCIATE PROFESSORS

CONKLIN, W. MILLER, RACCACH,
SEPERICH, WHYSONG

ASSISTANT PROFESSOR

GREEN

PROFESSORS EMERITI

BARRETT, LYTLE, MADDY,
V. MILLER, MOODY, RASMUSSEN,
RICHARDSON, ROBINSON, TAYSOM

PURPOSE

The School of Agribusiness and Environmental Resources provides academic programs directed toward agribusiness and the environmental aspects of agriculture. Agribusiness is a dynamic industry that provides employment to about 23% of the U.S. labor force. Environmental resources emphasizes both the conservation of wildland resources for the needs of future generations and their use to meet present-day needs. Courses in the School of Agribusiness and Environmental Resources are designed to prepare students for the wide range of job opportunities that exist in the agricultural industries and governmental agencies. The academic programs are especially designed to meet the needs of the urban student who has had little or no previous agriculture experience. An interest in plants, animals, or foods can be the starting point for career development in agricultural industries or natural resource management. The undergraduate programs also provide the necessary training for students preparing to enter graduate degree programs.

ORGANIZATION

The academic programs are organized into two separate majors: (1) Agribusiness and (2) Environmental Resources in Agriculture. Options for specialization within these majors are

**Agribusiness and Environmental Resources in Agriculture
Concentrations and Options**

Major	Concentration	Option
Agribusiness	Agribusiness	Food industry General agribusiness International agribusiness
	Computer analysis Pre veterinary medicine	
Environmental Resources in Agriculture	Natural resource management	Range ecology Wildlife habitat management

shown in the "Agribusiness and Environmental Resources in Agriculture Concentrations and Options" table.

Center for Agribusiness Policy Studies

The Center for Agribusiness Policy Studies carries out research and development relating to agribusiness, rural development, multiple use of scarce resources, and public policy. The center addresses regional, national, and international development in the context of global and competitive markets for agricultural products and inputs. Of particular interest is the development of private sector strategies and public policy alternatives that go beyond traditional government subsidy programs to find innovative, market-oriented ways to enhance competitiveness in international markets, increase rural incomes and create new jobs. A related center concern is the development of "win win" strategies for environmental management and the multiple use of scarce natural resources by competing interest groups. The goal of such policy development is to resolve or manage conflict regionally, nationally, or globally and to promote long-term, sustainable agriculture in terms of regional economic growth. Of particular interest to the center are innovative rural credit programs for developing nations, strategic marketing to identify profitable "niche" markets and further processing to create jobs and add value to agricultural products. For more information, contact the director of the Center for Agribusiness Policy Studies at 602/965 3585 (AG 281).

DEGREES

Bachelor of Science (B.S.). The School of Agribusiness and Environmental Resources offers the Bachelor

of Science degree in Agribusiness and in Environmental Resources in Agriculture

Master of Science (M.S.). The School of Agribusiness and Environmental Resources offers the Master of Science degree in Agribusiness and in Environmental Resources in Agriculture. The program includes research and the preparation of a thesis. A minimum of 30 semester hours of graduate level course work is required for the degree. Additional details for this degree are given in the *Graduate Catalog*.

ADMISSION

See pages 27 32, 43-45, 207 209, and 213 214 for information regarding requirements for admission, transfer, retention, disqualification, and reinstatement.

In addition, students who are beginning their initial college work in the School of Agribusiness and Environmental Resources should present secondary school units in accordance with the minimum university requirements. There are no secondary school agricultural course requirements.

GRADUATION REQUIREMENTS

The completion of a minimum of 126 semester hours including university general studies, the school and major cores, and option courses leads to the B.S. degree. An overall GPA of 2.00 is required. Of the semester hours required for graduation, 40% (a minimum of 50 semester hours) must be upper division. Also see special graduation requirements under the pre veterinary medicine concentration described on page 218.

MAJORS

The Agribusiness major is an applied, industry oriented curriculum. The study of animals, plants, and their utilization in the food and fiber system forms the base of the program. Students learn to analyze firms involved in input supply activities, commodity processing, food manufacturing, and food distribution. Students also study government agricultural programs and national policy activities that affect agribusiness. Because of the U.S. role in supplying commodity and food products to the world markets, international aspects of agribusiness development and trade are emphasized.

The natural resource management concentration within the Environmental Resources in Agriculture major emphasizes the study of wildland ecosystem management. Application of the systems approach in a wide variety of resource management situations is emphasized. Students pursue an ecological emphasis in the range ecology option or the wildlife habitat management option. In both cases, students are trained to apply ecological principles to management of wildlands. Students with particular interest in vegetation, water, and soil resources should pursue the range ecology option. Students with a particular interest in animal resources should pursue the wildlife habitat option.

The baccalaureate degree requirements in Agribusiness and Environmental Resources in Agriculture include the general studies, the School of Agribusiness and Environmental Resources core, a proficiency core, the major core, and the option courses and elective courses to complete the graduation requirement of 126 semester hours. Before entering the junior year, each student, with the aid of an advisor, is expected to select a concentration and an option.

DEGREE REQUIREMENTS

All students pursuing a B.S. degree in the School of Agribusiness and Environmental Resources must satisfy English proficiency and general studies requirements as follows:

English Proficiency	Semester Hours
ENG 101, 102 First Year Composition ¹ or ENG 105 Advanced First Year Composition (3)	6

General Studies

*Literacy and Critical Inquiry*²

One L1 course¹ 3
 One L2 course³ 3

Numeracy

Numeracy courses 6

*Humanities and Fine Arts and Social and Behavioral Sciences*²
 (15 semester hours minimum)

At least one course must be upper division, two courses must be from the same department, and two departments or more must be represented in the total selection.

Humanities and fine arts 6-9

Social and behavioral sciences 6-9

*Natural Sciences*¹

Natural sciences courses 8

Total general studies 35

NOTE Six semester hours taken in two of the three awareness areas² are required in the final list of courses offered in the student's graduation program of study. If desired, these courses can be included in the humanities and fine arts and social and behavioral sciences course selections.

¹ See the school academic advisor for approved courses.

² See pages 49-65 for the acceptable courses in these categories.

³ See pages 45-65 for a description and list of L1 and L2 courses.

Agribusiness and Environmental Resources in Agriculture Core

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

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

The following proficiency core courses are required of all students except those in the computer analysis and pre veterinary medicine concentrations:

	<i>Semester Hours</i>
BIO 181, 182 General Biology or AGB 150 Animal Science (3) and ERA 130 Environmental Resources Science and Humans 4)	8

CHM 101 Introductory Chemistry or CHM 113 General Chemistry (4) and CHM 115 General Chemistry with Qualitative Analysis (5)	4
ECN 111 Macroeconomic Principles	3
ERA 350 Applied Quantitative Methods ¹	3
MAT 117 College Algebra ¹ or MAT 210 Brief Calculus 3)	3
Computer course ²	3
Total	23

These courses are a part of the general studies requirements

² A list of acceptable courses is available in School of Agribusiness and Environmental Resources Office

AGRIBUSINESS

The Agribusiness major offers several concentrations and options. It combines business and technical agriculture as they relate to the management, marketing, and financial objectives of agribusiness firms. Topics of interest include the supplying of input resources and services to agricultural producers, the management of crop and livestock enterprises, the processing of raw agricultural products and the management and quality assurance of food manufacturing. Food distribution is examined from the points of view of food wholesalers and retailers as well as food service firms, which include restaurants and specialized food firms. The study of agribusiness also includes analysis of the critical roles of government in regulating certain aspects of agribusiness and promoting international trade in agribusiness products.

Agribusiness. The agribusiness concentration contains the general agribusiness, international agribusiness, and food industry options

General agribusiness integrates the knowledge and skills needed to manage people, products, and services in agribusiness enterprises. Agribusiness management combines the agricultural sciences, behavioral science, and common sense. Functional, institutional, and behavioral aspects of marketing are examined while studying the flows of products and services through the various market channels for agricultural inputs, commodities, and food. Emphasis is placed on up to date management/marketing methods that allow graduates to meet challenges in the

food and fiber industries. Graduates are qualified to make significant contributions in a broad range of career opportunities that exist in agribusiness. Many start career paths that lead to upper level agribusiness management marketing positions.

International agribusiness relates worldwide agricultural resources to the requirements and potentials of the various nations. Particular emphasis is given to economic development and to the international trade of food and fiber products. Special courses are offered to form a unique curriculum that is designed to train either the U.S. or foreign student to work in the enhancement of agricultural programs of foreign countries. Provided is a basic knowledge of U.S. agricultural techniques that is extended to the global aspects of agriculture. Graduates in this area are particularly qualified to aid in the development of the world's agricultural potential to provide food to meet the expanding populations. Jobs exist in commercial industries and in government agencies national, international, and foreign. A language capability in addition to English is recommended.

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

Students selecting the agribusiness concentration are required to take the following courses:

	<i>Semester Hours</i>
ACC 230 Introductory Accounting I or AGB 390 Agribusiness Accounting 3)	3
AGB 312 Agribusiness Marketing	3
AGB 332 Agribusiness Finance	3
AGB 342 Agribusiness Management I	4
AGB 364 Agribusiness Technology	3
AGB 412 Agricultural Commodities	3
AGB 443 Agribusiness Management II	3
AGB 444 Agribusiness Analysis	3
AGB 455 Agricultural Marketing Channels	3
AGB 458 International Agribusiness	3
AGB 474 Agribusiness Policy and Government Regulations	3
AGB 490 Recent Advances in Agribusiness	1
ECN 112 Macroeconomic Principles	3
Total	38

Typical Curriculum for the Agribusiness Concentration

First Year

	<i>Semester Hours</i>
AGB 150 Animal Science	3
CHM 101 Introductory Chemistry	4
ENG 101, 102 First Year Composition	6
ERA 130 Environmental Resources Science and Humans	4
MAT 117 College Algebra	3
General elective courses	5
Social and behavioral sciences courses*	6
Total	31

Second Year

ACC 230 Introductory Accounting I	3
or AGB 390 Agribusiness Accounting 3	
AGB 302 Introduction to Agribusiness	3
ECN 111 Macroeconomic Principles	3
ECN 12 Microeconomic Principles	3
Agribusiness electives courses	9
General elective courses	6
Humanities and fine arts courses*	6
Total	33

Third Year

AGB 300 Livestock Management	3
AGB 310 Crop Management	3
AGB 312 Agribusiness Marketing	3
AGB 332 Agribusiness Finance	3
AGB 342 Agribusiness Management I	4
AGB 364 Agribusiness Technology	3
ERA 346 Natural Resource Conservation	3
ERA 350 Applied Quantitative Methods	3
Option courses	6
Total	31

Fourth Year

AGB 412 Agricultural Commodities	3
AGB 443 Agribusiness Management II	3
AGB 444 Agribusiness Analysis	3
AGB 455 Agricultural Marketing Channels	3
AGB 458 International Agribusiness	3
AGB 474 Agribusiness Policy and Government Regulations	3
AGB 490 Recent Advances in Agribusiness	1
General elective courses	3
Option courses	9
Total	31

* See pages 45–65 for the requirements and the approved list

Computer Analysis. This concentration gives students the necessary background to move into a wide variety of

career opportunities involving the use of computers in the agribusiness industries. A basic core of agricultural science courses is combined with a proficiency core of agribusiness marketing, management, finance, and critical computer science courses. A graduate of this program is prepared to handle the problems agribusiness firms and organizations face in applying the latest computer technology to operations.

Students choosing the computer analysis concentration are required to take the following proficiency core courses:

	<i>Semester Hours</i>
AGB 312 Agribusiness Marketing	3
AGB 332 Agribusiness Finance	3
AGB 342 Agribusiness Management I	4
BIO 181, 182 General Biology	8
CSE 100 Introduction to Computer Science I	3
CSE 10 Introduction to Computer Science II	3
CSE 120 Digital Design Fundamentals	3
CSE 201 Application Languages Programming Laboratory	1
CSE 310 Data Structures	3
CSE 340 Structure of Programming Languages	3
ERA 350 Applied Quantitative Methods	3
MAT 243 Discrete Mathematical Structures	3
MAT 271 Calculus with Analytic Geometry II	4
or MAT 290 Calculus I (5)	
MAT 272 Calculus with Analytic Geometry III	4
or MAT 29 Calculus II (5)	
MAT 342 Linear Algebra	3
Total	51/53

Typical Curriculum for the Computer Analysis Concentration

First Year

	<i>Semester Hours</i>
CSE 100 Introduction to Computer Science I	3
CSE 101 Introduction to Computer Science II	3
ENG 101, 102 First Year Composition	6
MAT 243 Discrete Mathematical Structures	3
MAT 270 Calculus with Analytic Geometry I	4
MAT 271 Calculus with Analytic Geometry II	4
Humanities and Fine arts courses*	6
Social and behavioral sciences courses*	3
Total	32

Second Year

AGB 312 Introduction to Agribusiness	3
BIO 181, 182 General Biology	8
CSE 120 Digital Design Fundamentals	3
CSE 201 Application Languages Programming Laboratory	1
CSE 310 Data Structures	3
MAT 22 Calculus with Analytic Geometry III	4
General elective courses	9
Total	31

Third Year

AGB 300 Livestock Management	3
AGB 310 Crop Management	3
AGB 312 Agribusiness Marketing	3
AGB 332 Agribusiness Finance	3
AGB 342 Agribusiness Management I	4
CSE 340 Structure of Programming Languages	3
ERA 350 Applied Quantitative Methods	3
MAT 342 Linear Algebra	3
Social and behavioral sciences courses*	6
Total	31

Fourth Year

ERA 346 Natural Resource Conservation	3
General elective courses	13
Supporting courses	16
Total	32

* See pages 45–65 for the requirements and the approved list.

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

hours at ASU and by completing the Agribusiness and Environmental Resources in 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 is eligible to receive the B.S. degree after the Office of the Registrar 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 GPA of 2.00 or better.

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

Students selecting the pre veterinary medicine concentration are required to take the following proficiency core courses:

	<i>Semester Hours</i>
BIO 181, 182 General Biology ...	.8
CHM 113 General Chemistry ..	.4
CHM 115 General Chemistry with Qualitative Analysis ..	.5
CHM 231 Elementary Organic Chemistry ..	.4
or CHM 331 General Organic Chemistry, 335 General Or ganic Chemistry Laboratory, 332 General Organic Chemis try, and 336 General Organic Chemistry Laboratory (8)	
ERA 350 Applied Quantitative Methods ..	.3
MAT 117 College Algebra ..	.3
or MAT 210 Brief Calculus (3)	
MIC 206 Microbiology Laboratory ..	.1
MIC 220 Biology of Microorganisms ..	.3
Total .....	.31 35

**Typical Curriculum for the
Pre-Veterinary Medicine
Concentration**

First Year

	<i>Semester Hours</i>
CHM 113 General Chemistry .....	.4
CHM 115 General Chemistry with Qualitative Analysis .....	.5
ENG 101, 102 First Year Composition ..	.6
MAT 117 College Algebra ..	.3
or MAT 210 Brief Calculus (3)	
Humanities and fine arts courses ¹ ..	.6

Social and behavioral sciences courses ¹	6
Total	30

Second Year

AGB 300 Livestock Management .....	.3
AGB 353 Wildlife and Domestic Animal Nutrition .....	.3
BIO 181, 182 General Biology ..	.8
CHM 231 Elementary Organic Chemistry .....	.4
or CHM 331 General Organic Chemistry, 335 General Or ganic Chemistry Laboratory, 332 General Organic Chem istry, and 336 General Or ganic Chemistry Laboratory (8)	
General elective courses ..	.9
Humanities and fine arts courses	.3
Total	30-34

Third Year

AGB 439 Veterinary Practices .....	.3
BIO 340 General Genetics ...	.4
CHM 361 Principles of Biochemistry .....	.3
CHM 367 Elementary Biochemistry Laboratory ..	.1
ERA 346 Natural Resource Conservation ..	.3
ERA 350 Applied Quantitative Methods ..	.3
MIC 206 Microbiology Laboratory ...	.1
MIC 220 Biology of Microorganisms	.3
PHY 111 General Physics ..	.3
PHY 113 General Physics Laboratory ..	.1
PHY 112 General Physics .....	.3
PHY 114 General Physics Laboratory ..	.1
General elective courses .....	.4
Total	33

Fourth Year²

General elective courses ..	.6
Supporting courses ..	.15
Upper-division courses .....	.12
Total	33

¹ See pages 45-65 for the requirements and the approved list.

² Assuming the student has applied and has been accepted to a veterinary college during the beginning of the third year, the courses from the first year of the veterinary program are substituted for the classes of the fourth year for the B.S. degree.

**ENVIRONMENTAL RESOURCES
IN AGRICULTURE**

The primary emphasis of the Environmental Resources in Agriculture major is natural resource management and conservation. Particular attention

is given to the study of ecosystem characteristics as they relate to man's use of renewable resources. Applications of ecological principles to resource management are considered using examples drawn from Arizona's forest, range, and agricultural ecosystems. Employment opportunities in environmental resource management, range ecology, land reclamation, soil conservation, and agribusiness exist with both private firms and government resource management agencies.

Natural Resource Management. This concentration includes the range ecology and wildlife habitat management options.

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

Wildlife habitat management emphasizes the interaction of renewable resources with the wildlife populations that inhabit them. Primary training is in the areas of ecology, plant, and soil science, with strong supporting courses in wildlife. Students completing this option may choose careers as professional wildlife habitat managers for federal and state agencies or in the private sector.

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

	<i>Semester Hours</i>
BIO 320 Fundamentals of Ecology .....	.3
BOT 370 The Flora of Arizona ...	.4
ENG 301 Writing for the Professions ..	.3
ERA 325 Soils .....	.3
ERA 326 Soils Laboratory .....	.1
ERA 333 Water Resources Management .....	.3
ERA 360 Range Ecosystem Management ..	.4
ERA 402 Range Habitat Inventory .....	.4
ERA 407 Range Plants and Habitats .....	.4
ERA 420 Range Habitat Improvements .....	.3
ERA 475 Wildlife and Range Animal Management .....	.3

ERA 490	Recent Advances in Environmental Resources	1
Total	.....	36

Typical Curriculum for Environmental Resources in Agriculture
First Year

	<i>Semester Hours</i>	
BIO 181, 182	General Biology	8
CHM 101	Introductory Chemistry	4
ENG 101, 102	First Year Composition	6
MAT 117	College Algebra	3
	Computer course ¹	3
	General elective courses	7
Total	.....	31

Second Year

BOT 370	The Flora of Arizona	4
ERA 325	Soils	3
ERA 326	Soils Laboratory	1
	Humanities and fine arts courses ²	8
	Option requirements ³	7
	Social and behavioral sciences courses ²	8
Total	.....	31

Third Year

AGB 300	Livestock Management	3
AGB 302	Introduction to Agribusiness	3
AGB 310	Crop Management	3
ERA 346	Natural Resource Conservation	3
ERA 350	Applied Quantitative Methods	3
ERA 360	Range Ecosystem Management	4
	Option requirements ³	14
Total	.....	33

Fourth Year

ERA 490	Recent Advances in Environmental Resources	1
	General elective courses	4
	Option requirements ³	26
Total	.....	31

A list of acceptable courses is available in School of Agribusiness and Environmental Resources Office

² See pages 45–65 for the requirements and the approved list.

³ Option requirements as listed for individual programs.

AGRIBUSINESS

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

150 Animal Science. (3) F
Comparative growth, development and propagation of farm animals. Lecture, lab

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

300 Livestock Management. 3 F
Methods of managing livestock enterprises, economics, loss prevention, and marketing. Prerequisites: BIO 181, 182.

302 Introduction to Agribusiness. (3) F
Impact of national policy and world agriculture on the cost, quantity, and quality of the U.S. food resources.

310 Crop Management. (3) S
Crop production, management principles, and their application to crop growth and development. Prerequisites: BIO 181, 182

312 Agribusiness Marketing. (3) F
Marketing arrangements for agricultural products. Prerequisite: AGB 342

332 Agribusiness Finance. (3) S
Agribusiness investment management and financial institutions that serve agriculture. Prerequisites: AGB 342, ECN 111

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

342 Agribusiness Management I. (4) S
Principles of management, including planning, organizing, integrating, measuring, and developing people in agribusiness organizations. Lecture, computer lab

353 Wildlife and Domestic Animal Nutrition. (3) S
Feedstuffs, feeding standards, and their application in meeting nutritional needs of animals producing food and fiber

364 Agribusiness Technology. (3) S
Biotechnology and other technologies of the three sectors of agribusiness including input production, and commodity food processing and distribution. Prerequisites: BIO 181 and 182 or instructor approval

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

369 Food Analysis. (3) F
Processing control and scientific instrumentation used in food quality assurance laboratories. Lecture, lab. Prerequisites: CHM 225, 226

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

390 Agribusiness Accounting. (3) N
Introduction to managerial accounting for agribusiness using computerized accounting systems for the development of financial data required for management decisions on making. Prerequisite: computer literacy

402 Agricultural Cooperatives. 3 N
Organization, operation, and management of agricultural cooperatives

404 Sales and Merchandising in Agribusiness. 3 N
The principles and techniques of selling and commodity merchandising in the agricultural industries. Lecture, lab.

412 Agricultural Commodities. 3 F
Trading on futures markets. Emphasis on the hedging practices with grains and meats. Prerequisite: AGB 312 or 1 marketing or finance course

413 Financial Commodities. 3 S
Trading on futures markets. Emphasis on the hedging practices with financial and currency instruments. Prerequisite: AGB 332 or FIN 300

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

423 Food and Industrial Microbiology. 4 F
Food and industry related microorganisms, deterioration and preservation of industrial commodities. Lecture, lab. Prerequisite: MIC 205 or 206 or instructor approval

424 Food and Industrial Fermentations. 4 S
Management, manipulation, and metabolic activities of industrial microorganisms and their processes. Lecture, lab. Prerequisite: AGB 423 or instructor approval

425 Food Safety. (3) S
Control, prevention, and prediction of microbial and chemical foodborne diseases. Prerequisite: AGB 423 or instructor approval

426 Food Chemistry. (4) S
The biochemical and chemical interactions that occur in raw and processed foods. Lecture, lab. Prerequisites: CHM 115, 231

428 Comparative Nutrition. 3 N
Effects of nutrition on animal systems and metabolic functions. Prerequisite: CHM 231.

433 Diseases of Domestic Animals. (3) N
Control and prevention of infectious and non-infectious diseases of domestic animals. Prerequisite: MIC 206 or 220

435 Animal Physiology I. 4 F
Control and function of the nervous, muscular, cardiovascular, respiratory, and renal systems of domestic animals. Lecture, lab. Cross-listed as BME 435. Prerequisites: BIO 181, CHM 113.

439 Veterinary Practices. (3) F, S
Observation of and participation in veterinary medicine and surgery supervised by local veterinarians. Prerequisite: advanced pre-veterinary student

440 Food Marketing. 3 S
Food processing, packaging, distribution, market research, new food research and development, and social implications. Prerequisite: AGB 312

443 Agribusiness Management II. (3) F
Principles of human resource management, with emphasis on the special problems of agribusiness systems. Prerequisite: AGB 342

444 Agribusiness Analysis. 3 S
Analysis of agribusiness firm decisions in the ecological, economic, social, and political environments. Special emphasis on ethical issues surrounding food production and consumption. Prerequisites: AGB 312 and 332 or equivalents. *General studies L2*

450 International Agricultural Development. (3 F)

Transition of developing countries from subsistence to modern agriculture. Technology transfer and food improvement programs are emphasized. Prerequisite: AGB 312

452 World Food Dynamics. (3 N)

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

453 World Agricultural Resources. (3 S)

World production and consumption of agricultural products, international relations, and agencies concerned with world agricultural development problems. Prerequisite: AGB 302 *General studies: G*

454 International Agricultural Trade. (3 N)

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

455 Agricultural Marketing Channels. (3 S)

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

458 International Agribusiness. (3 N)

Identification and analysis of methods, problems, and future of international agribusiness operations. Emphasis on special problems associated with international agribusiness systems. Prerequisite: AGB 312.

460 Agribusiness Management Systems.

(4) S
The development and use of decisions on support systems for agribusiness management and marketing. Lecture, lab. Prerequisite: AGB 332, 342, ERA 350.

474 Agribusiness Policy and Government Regulations. (3 F)

The development and implementation of government food, drug, pesticide, and farm policies and regulations that affect the management of agribusiness. Prerequisites: AGB 312, 342, 412.

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

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

505 Commodity Analysis. (3 N)

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

508 Advanced Agribusiness Marketing. (3 F)

Theory and analysis of marketing farm commodities, risks, and the effect of future trading on cash prices.

509 Advanced Agribusiness Marketing Channels. (3 S)

Analysis of agribusiness marketing systems. Formulation of marketing strategies.

510 Advanced Agribusiness Management I. (3 F)

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

511 Advanced Agribusiness Management II. (3 S)

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

512 Food Industry Management. (3 S)

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

516 International Agricultural Techniques. (3 N)

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

518 World Agricultural Development. (3 N)

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

520 Advanced Agribusiness Analysis I. (4 S)

Vertical integration and differentiation in food and agricultural industries. Lecture, recitation. Prerequisites: AGB 508 and 510 and 532 or equivalent.

521 Agribusiness Coordination. (4 N)

Organizational alternatives for agribusiness with emphasis on cooperatives and trading companies. Lecture, recitation. Prerequisites: AGB 508 and 510 and 532 or equivalent.

525 Advanced Agribusiness Management Systems. (3 N)

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

527 Agribusiness Research Methods. (3 N)

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

530 Advanced Agribusiness Policy. (3 N)

Policy-making history, structure and process. Prerequisite: AGB 508.

532 Advanced Agribusiness Finance. (3 F)

Financial management of agribusiness firms, agribusiness financial analysis, investment analysis, agricultural risk management and introduction to agricultural financial intermediaries. Prerequisites: computer literacy and one finance course or instructor approval.

535 Advanced Food Science. (3 N)

Chemical and physical nature of processed foods. Emphasis on food product development. Prerequisite: AGB 364

Omnibus Courses: See page 40 for omnibus courses that may be offered

ENVIRONMENTAL RESOURCES IN AGRICULTURE

ERA 130 Environmental Resources Science and Humans. (4 F, S)

Physical and biological laws underlying the production of natural resources, including air, water, soil, plants, and animals as influenced by humans. Lecture, lab.

325 Soils. (3 F)

Fundamental properties of soils and their relation to plant growth and the nutrition of man and animals. Relation of soils to environmental quality. Prerequisite: CHM 101 or 113 or equivalent.

326 Soils Laboratory. (1 F)

Selected exercises to broaden the background and understanding of basic soil principles. Lab. Corequisite: ERA 325

332 Agricultural Chemicals. (3 N)

Composition, properties, and use of agricultural commercial fertilizers and pesticides and their effects on soil, air, and water quality.

333 Water Resources Management. (3 S)

Sources, the development and conservation of, and regulations for agricultural, natural resources, and urban uses. Prerequisite: CHM 101 or 113.

346 Natural Resource Conservation. (3 S)

A global perspective on the conservation of wild and agricultural resources. Development/resource conservation relationships. *General studies: G*

350 Applied Quantitative Methods. (3 F)

Statistical methods with applications in natural resource management and the agricultural sciences. Use of digital computer. Prerequisite: MAT 117 or equivalent. *General studies: N2*

360 Range Ecosystem Management. (4 F)

Relationships between vegetation, soils, and grazing animals. Evaluation of grazing animal impact, livestock and wildlife. Multiple use of range and resources. Lecture, recitation. Prerequisites: BIO 320 and ERA 346 or equivalent.

365 Watershed Management. (3 N)

Hydrologic, physical, biological, and ecological principles applied to watershed management. Impact of ecosystem manipulation on water yield and quality. 1 weekend field trip. Prerequisites: ERA 325, 346

370 Forest Ecosystem Management. (3 N)

Silvicultural principles underlying the practice of forestry. Forest site evaluations, manipulation of stands to direct successional forest measurements and multiple use of forests. Lecture, lab. Prerequisites: BIO 320; ERA 346, 350

402 Range Habitat Inventory. (4 S)

Vegetation sampling and inventory as related to animal habitat relations. Lecture, lab. 1 weekend field trip. Prerequisites: ERA 350, 360

407 Range Plants and Habitats. (4 F)

The distribution, ecology, characteristics, identification of key plants, and values of habitats on western rangelands. Laboratory emphasis on grass identification. Lecture, lab. Prerequisite: BOT 370 or equivalent.

410 Wildlife Habitat Relations. (3 N)

Interactions among animal populations and their habitat. Systems simulation of population dynamics as influenced by competition and management strategies. Lecture, lab. 1 weekend field trip. Prerequisite: ERA 360

420 Range Habitat Improvements. (3 S)

Current practices in brush and weed control, revegetation, burning, water developments, fencing and grazing as tools for range improvement. Lecture, 1 weekend field trip. Prerequisite: ERA 360

425 Soil Classification and Management.

(3) N
Principles of soil genesis, morphology and classification. Management and conservation practices will be presented. Prerequisite: ERA 325

446 Soil Fertility. (3 S)

Availability of soils to retain and supply plant nutrients. Reactions of fertilizers in soils. Prerequisites: ERA 325, 326

448 Soil Ecology. (3 N)

Soil viewed in an ecosystem context, soil plant relationships, nutrient budgets, and abiotic factors that influence soil processes. Prerequisites: BIO 320 and ERA 325 and 326 or instructor approval.

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

460 Applied Systems Ecology. (3) N
The systems approach applied to analysis and management of natural resource ecosystems Use of simulation models Prerequisites: ERA 350 or equivalent, 1 course in ecology

470 Land Reclamation. (3) N
Problems of reestablishing vegetation on disturbed sites. Specific revegetation techniques, surface modification, and government regulations. 1 weekend field trip. Prerequisites: ERA 407 and 420 and 446 and 448 or instructor approval

475 Wildlife and Range Animal Management. (3) N
Principles and techniques for management of domestic and nondomestic animals using rangeland ecosystems. Emphasis on practical applications of management. Weekend field trips. Prerequisite: instructor approval.

480 Natural Resource Planning. (3) S
Planning for management and conservation of wildland ecosystems. Ecological, economic, and social constraints on long-term sustainable resource development. Computer tools for resource planning. Lecture, 1 weekend field trip. Prerequisites: ERA 402 or equivalent, senior standing

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

540 Plant Responses to Environmental Stresses. (3) N
Reaction of plants to environmental stresses, herbivores, fire, pesticides, mechanical treatments, air pollutants, and soil amendments. 1 weekend field trip. Prerequisites: BOT 360 and ERA 420 or instructor approval.

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

550 Vegetation Dynamics. (3) N
Succession concept and its use in site evaluation. Habitat type concept. Herbivores as an ecological process. Prerequisite: BOT 420 or instructor approval

560 Systems Ecology. (3) N
Quantitative description and mathematical modeling of ecosystem structure and function. Techniques for model construction and simulation. Lecture/lab. Prerequisites: ERA 350 or equivalent computer programming; 6 hours in ecology studies

Omnibus Courses: See page 40 for omnibus courses that may be offered.

School of Construction and Technology

Richard W. Kelly
Director
(TC 201A) 602 965-3874

PURPOSE

The primary purpose of the school is to provide students the opportunity to obtain a quality education in construction and technology and to qualify them directly for positions of leadership and responsibility in industrial, commercial, educational, and government activity.

The construction program and its options provide a well integrated program that gives the student proficiency for a professional construction career. In addition to technical skills, it develops the ideals, judgment, character, and breadth of view important to success in the industry.

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

DEGREES

Bachelor of Science degree programs and options within each major are offered in the four departments as shown on pages 210–211. Each curriculum includes some elective courses that are reserved for the student's use to add a unique emphasis or dimension. These credits are traditionally referred to as technical electives and are normally restricted to upper division courses in technology, construction, engineering, and computer science. In each case, the choice of technical electives must be approved by the student's faculty

advisor and department chair. Requirements for each of the majors offered are described on the following pages.

In addition to the undergraduate degrees offered in the School of Construction and Technology, the Master of Technology degree (M.Tech.) is offered by each of the three departments in technology in accordance with the details given on page 213, and the Master of Science degree (M.S.) is offered by the Department of Construction. See the *Graduate Catalog* for complete details.

ADMISSION

See pages 27–32, 43–45, 207–209, and 213–214 for information regarding requirements for admission, transfer, retention, disqualification, and reinstatement.

A preprofessional category is available for applicants deficient in regular admission requirements.

The Department of Construction requires secondary school units totaling three and a half units in mathematics, including geometry, advanced algebra, and trigonometry. Students having omissions or deficiencies in subject matter preparation are required to complete additional university credit work that is not applied toward a Construction major. These may include MAT 118 Precalculus Algebra and Trigonometry and PHY 101 Introduction to Physics. Vocational and craft-oriented courses taught at community colleges are not accepted for credit toward a bachelor's degree in Construction.

Entry into a program in one of the departments of technology as a freshman student assumes three years of high school math (algebra I and II and geometry). High school chemistry and physics are recommended. Students without the required math background must take appropriate deficiency courses before entry or immediately upon enrollment at ASU. Associate degree transfer students are expected to have completed college algebra and trigonometry.

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

The GPA requirement for admission of transfer students into the School of Construction and Technology is 2.25 for Arizona residents and 2.50 for non residents. The freshman and sophomore programs of study are designed to facilitate transfer of junior and community college students or associate degree graduates.

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

DEGREE REQUIREMENTS

All baccalaureate degree programs in the School of Construction and Technology require completion of the university English proficiency requirement, a general studies component, and a construction and technology core component. The engineering technology programs also require completion of an engineering technology core. All programs require a minimum of 132 semester hours.

The specific course requirements for the English proficiency, general studies, construction and technology core, and the engineering technology core are listed below. Refer to the individual majors or options for their additional required courses.

	<i>Semester Hours</i>
English Proficiency	
ENG 101, 102 First Year Composition 6	6
Advanced First Year Composition 3)	
General Studies	
Literacy and Critical Inquiry ²	
One L1 course ³ ..	3
ETC 400 Technical Communications	3
Numeracy	
ECE 106 Introduction to Computer Aided Engineering ¹	3
MAT 118 Precalculus Algebra and Trigonometry ¹	3
Humanities and Fine Arts and Social and Behavioral Sciences²	
(15 semester hours minimum)	
At least one course must be of upper division level, two courses must be from the same department, and two or more departments must be represented in total selection	
Hu anities and fine arts	6-9
Social and behavioral sciences ..	3-6
ECN 111 Macroeconomic Principles	3
Natural Sciences	
PHY 111 General Physics ¹	3
PHY 112 General Physics ¹	3

PHY 113 General Physics Laboratory ¹	1
PHY 114 General Physics Laboratory ¹	1
Total general studies	35

NOTE: Six semester hours taken in two of the three awareness areas are required in the final list of courses offered in the student's graduation program of study. These can be included in the humanities and fine arts social and behavioral sciences course selections. See the list of acceptable courses

- ¹ Graduation requirement for the baccalaureate degree
- ² See pages 45-65 for the requirements and the approved list
- ³ See page 46 for a description of L1 courses.

Construction and Technology Core

The following courses constitute the Construction and Technology Core and are required in all baccalaureate degree programs in the School. These courses, with the exception of ECE 105, are included in the general studies component. Refer to the individual department descriptive material for specific departmental degree requirements

	<i>Semester Hours</i>
ECE 105 Introduction to Languages of Engineering	3
ECE 106 Introduction to Computer Aided Engineering	3
ECN 111 Macroeconomics Principles	3
ETC 400 Technical Communications	3
PHY 111 General Physics	3
PHY 112 General Physics	3
PHY 113 General Physics Laboratory	1
PHY 114 General Physics Laboratory	1
Total	20

Engineering Technology Core

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

	<i>Semester Hours</i>
CHM 101 Introductory Chemistry ..	4
or CHM 113 General Chemistry (4) or CHM 114 General Chemistry for Engineers (4)	
ETC 201 Applied Electrical Science ..	4
ETC 211 Applied Engineering Mechanics: Statics	3
ETC 340 Applied Thermodynamics and Heat Transfer	3
MAT 260 Technical Calculus I	3
MAT 261 Technical Calculus II	3
Total	20

GRADUATION REQUIREMENTS

In order to qualify for graduation from the School of Construction and Technology, a student must have an overall GPA of at least 2.00 and a GPA of at least 2.00 for the required courses in the major field.

PROFESSIONAL ACCREDITATION AND AFFILIATIONS

The Department of Construction is a member of the Associated Schools of Construction, an organization dedicated to the development and advancement of construction education. The Construction program is accredited by the American Council for Construction Education (ACCE).

The undergraduate programs in Aeronautical Engineering Technology, Electronics Engineering Technology, and Manufacturing Engineering Technology are accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology.

SPECIAL PROGRAMS

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

ASU 3+2 Programs. The Department of Construction participates in the ASU 3+2 programs with Grand Canyon University and Southwestern University. See pages 214-215 for details.

ENGINEERING TECHNOLOGY CORE

ETC 201 Applied Electrical Science. 4 F S SS
Principles of electricity passive elements, and dc and ac circuit analysis. Laboratory experimentation of circuit concepts and techniques using instrumentation and the computer as a tool. Lecture lab Prerequisites: ECE 105 MAT 118.

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

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

400 Technical Communications. (3) F, S, SS
Planning and preparing technical publications and oral presentations based on directed laboratory research related to current technical topics. Prerequisites: senior standing as a CEAS major; completion of first year Engineering requirements; L1 course. *General studies: L2.*
Omnibus Courses: See page 40 for omnibus courses that may be offered

Aeronautical Technology

Robert O. Meitz
Chair
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PROFESSOR
MATTHEWS

ASSOCIATE PROFESSORS
GESELL, LATIGO, MEITZ, REED,
ROPER, STANFORD

INSTRUCTOR
ROGERS

LECTURER
HOMAN

PROFESSORS EMERITI
CARLSEN, COX, PEARCE, SALMIRS,
SCHOEN, THOMASON

The Department of Aeronautical Technology offers two majors leading to a Bachelor of Science degree. The majors are Aeronautical Engineering Technology and Aeronautical Management Technology. The Aeronautical Management Technology major includes options in aircraft flight management and airway science management.

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

AERONAUTICAL ENGINEERING TECHNOLOGY—B.S.

The Aeronautical Engineering Technology degree program is accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology. The curriculum is designed to prepare the technologist for technical support of engineering activities throughout the aerospace field. Areas of responsibility include the application of applied engineering practice related to fixed wing aircraft and aerospace vehicle design, internal combustion engines, combustion processes, turbomachinery, systems analysis, computer modeling, quality assurance and nondestructive testing, and low speed wind tunnel applications.

Aeronautical Engineering Technology students are required to complete a minimum of 132 semester hours, including at least 50 semester hours of upper division courses. All degree requirements are shown on the student's Curriculum Check Sheet. These requirements include English proficiency, general studies, construction and technology core, engineering technology core, and specific additional courses listed in the following section.

Degree Requirements

In addition to the required courses listed for English proficiency, general studies, construction and technology core, and the engineering technology core (see page 223), the following additional courses are required: AET 280, 281, 287, 300, 310, 312, 320, 321, 409, 414, 415, 417, 487; CHM 114; COM 225; CSE 183; ECE 105; EET 205 or MET 325; IEE 300; MAT 262; MET 230 (or CET 250), 313, 432; STP 420; three elective hours.

Suggested Course Pattern for Freshmen

First Semester		<i>Semester Hours</i>
ECN 111	Macroeconomic Principles ...	3
ENG 101	First Year Composition ...	3
MAT 118	Precalculus Algebra and Trigonometry ...	3
PHY 111	General Physics ..	3
PHY 113	General Physics Laboratory ..	1
	Humanities and social and behavioral science elective	3
Total		16

Second Semester

CSE 183	Applied Problem Solving with FORTRAN	3
ECE 105	Introduction to Languages of Engineering	3
ENG 102	First-Year Composition ...	3
MAT 260	Technical Calculus I	3
PHY 112	General Physics	3
PHY 114	General Physics Laboratory ..	1
Total		16

AERONAUTICAL MANAGEMENT TECHNOLOGY—B.S.

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

Aircraft Flight Management Option

Flight training is certified by the Federal Aviation Administration

Aircraft flight management combines academic studies and flight training to prepare graduates for a variety of positions within the air transportation industry, primarily in the area of flight operations. Ground school and flight training are available, allowing the student to obtain the private pilot, commercial pilot, and flight instructor certificates and also the instrument pilot, instrument instructor, and multiengine pilot ratings.

This curriculum concentrates on flying plus the technical, management, and computer-related applications necessary to operate aircraft in the high density environment of modern airspace. This career option leads to the development, administration, and enforcement of safety regulations, including airworthiness and operational standards in civil aviation. The program

emphasizes critical thinking, and cognitive, analytical, and communication skills.

While enrolled at ASU, students do not receive college credit for flight instruction received at flight schools other than schools with which the university has currently contracted for such instruction. Consideration for credit is given for flight experience and certificates received before enrollment at the university.

Flight instruction costs are not included in university tuition.

Aircraft flight management students are required to complete a minimum of 132 semester hours, including at least 50 semester hours of upper division courses. All degree requirements are shown on the student's Curriculum Check Sheet. These requirements include English proficiency, general studies, the construction and technology core, and specific additional courses listed in the following section.

Degree Requirements

In addition to the required courses listed for English proficiency, general studies, and the construction and technology core (see page 223), the following additional courses are required: AET 182, 183, 220, 222, 280, 281, 287, 300, 308, 314, 342, 344, 382, 383, 385, 386, 387, 389, 391, 392, 393, 395, 408, 410, 489; CHM 113 or 114; COM 225; CSE 181; ECE 105; ETC 201; HIS 414; IST 346 (or MGT 301), 452 (or MGT 311), 480 (or MGT 352); MAT 260; MET 230 (or CET 250); PGS 100; STP 420.

Suggested Course Pattern for Freshmen

	<i>Semester Hours</i>
First Semester	
AET 100 Primary Flight Course	0
AET 182 Private Pilot Ground School ..	3
CHM 113 General Chemistry	4
or CHM 114 General Chemistry for Engineers (4)	
CSE 181 Applied Problem Solving with BASIC	3
ENG 101 First Year Composition	3
MAT 118 Precalculus Algebra and Trigonometry	3
Total	16
Second Semester	
AET 183 Private Pilot Certificate	1
AET 220 Aviation Meteorology	3
ECE 105 Introduction to Languages of Engineering	3
ENG 102 First Year Composition	3
MAT 260 Technical Calculus I	3

PHY 111 General Physics	3
PHY 113 General Physics Laboratory ..	1
Total	17

Airway Science Management Option

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

Airway science management students are required to complete a minimum of 132 semester hours, including at least 50 semester hours of upper division courses. All degree requirements are shown on the student's Curriculum Check Sheet. These requirements include English proficiency, general studies, the construction and technology core, and specific additional courses listed in the following section.

Degree Requirements

In addition to the required courses listed for English proficiency, general studies, and the construction and technology core (see page 223), the following additional courses are required: ACC 230; AET 182, 201, 280, 281, 287, 308, 342, 344, 408, 410, 489; CHM 113 or 114; COM 225; CSE 181; ECE 105; ECN 112; ETC 201; HIS 414; IEE 431; IST 346 (or MGT 301), 452 (or MGT 311), 480 (or MGT 352), 491 (or MGT 423), 498 (or BLW 305); MAT 260; MET 230 or CET 250; PGS 100; SOC 301; STP 420; nine elective hours.

Suggested Course Pattern for Freshmen

	<i>Semester Hours</i>
First Semester	
AET 182 Private Pilot Ground School ..	3
CHM 113 General Chemistry	4
or CHM 114 General Chemistry for Engineers (4)	
CSE 181 Applied Problem Solving with BASIC	3
ENG 101 First Year Composition	3
MAT 118 Precalculus Algebra and Trigonometry	3
Total	16

Second Semester

ECE 105 Introduction to Languages of Engineering	3
ECN 111 Macroeconomic Principles ..	3
ENG 102 First-Year Composition ..	3
MAT 260 Technical Calculus I	3
PHY 111 General Physics	3
PHY 113 General Physics Laboratory ..	1
Total	16

STUDENT ORGANIZATIONS

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

AERONAUTICAL TECHNOLOGY

Flight instruction costs are not included in university tuition

AET 100 Primary Flight Course. (0) F, S, SS Allows student to accrue flight time in preparation for the Private Pilot Certificate. Flight participation is required. Pre or corequisite: AET 182 or equivalent.

182 Private Pilot Ground School. (3) F, S, SS Ground school leading to FAA Private Pilot Certification. Student may begin flight training when concurrently enrolled in AET 100. Aerodynamics, navigation performance, and regulations.

183 Private Pilot Certificate. (1) F, S, SS Flight training for the FAA private pilot certificate. Satisfactory completion of FAA tests is required. Prerequisites: AET 182; passed FAA written.

200 Interim Flight Course. (0) F, S, SS Allows students to accrue flight time in preparation for advanced ratings and certificates. Flight participation is required. Prerequisite: Private Pilot Certificate or instructor approval.

201 Air Traffic Control. (3) S Ground and air operations. Weather services communications and routing. Flight plans and IFR operations. Departures and arrivals. Airport conditions and emergencies. Prerequisite: AET 182.

220 Aviation Meteorology. (3) F, S Evaluation, analysis, and interpretation of atmospheric phenomena. Low and high altitude weather from the pilot's viewpoint. Prerequisite: AET 182.

222 Instrument Pilot Ground School. (3) F Ground school leading to the FAA Instrument Pilot Rating. 10 hours ground training included. Prerequisite: Private Pilot Certificate. Pre or corequisite: AET 220

280 Aerospace Structures and Materials.

3 F
Basic aerodynamics aerospace vehicle structure design and materials Manufacturing processes assembly and repair techniques and hardware section Lecture, lab. Prerequisites: PHY 111 113.

281 Aerospace Systems. (3 S)

Modern aircraft and aerospace vehicle systems (hydraulic pneumatic auxiliary control instrument etc) weight and balance and inspection requirements and methods Lecture, lab Prerequisites: PHY 111 113

283 Instrument Pilot Rating. 1) F S SS

Flight training for the FAA Instrument Pilot Rating Satisfactory completion of FAA Instrument Rating requirement. Not for Aeronautics Technology majors Prerequisites: AET 222 passed FAA written.

287 Aircraft Powerplants. (4 F S)

Theory and performance analysis of gas turbine and reciprocating aircraft engines Engine accessories, systems and environmental control Lecture, lab Prerequisites: CHM 113 or 114; PHY 112, 114 Pre or corequisite: MAT 260

300 Aircraft Design I (3) F, S

Basic applied aerodynamics proper performance, and airplane performance analysis Prerequisites: AET 280 287, ECE 106; MAT 260, PHY 112, 114

308 Air Transportation. (3) F

Study of the historical and international development of air transportation and its social, political, and economic impact upon global interrelationships Prerequisite: junior or standing. *General Studies G*

310 Instrumentation. (3) F

Measurement systems components, system response and the characteristics of experimental data. Methods of collecting and analyzing data Lecture, lab Prerequisites: ETC 201 MAT 261 MET 313

312 Applied Engineering Mechanics:

Dynamics. (3) F S
Masses; motion kinematics dynamics of machinery Prerequisites: ETC 211 MAT 261

314 Commercial Pilot Ground School. (3) S

Ground school leading to Commercial Pilot certificate. 10 hours ground training included Prerequisite: Private Pilot Certificate. Pre or corequisite: AET 222

320 Applied Aerodynamics I. (3) F

Introduction to potential and viscous flows and the relationship to aircraft lift and drag. Prerequisites: AET 300 ECE 106; MAT 262

321 Applied Aerodynamics II. (3) S

Wind tunnel theory measurements, and analysis. Aircraft stability and control Lecture, lab Prerequisite: AET 320

342 Aviation Law Regulations. (3) F

Study which encompasses the field of aviation within the context of the U.S. Common Law system. Public law administrative rule making, sovereignty, enforcement and case law analysis Prerequisite: junior or standing.

344 Airport Management and Planning. (3) S

Career orientation into administrative and management of modern public airports, to include an overview of planning, funding, and development of a report facilities. Prerequisite: AET 308 or instructor approval.

360 Introduction to Helicopter Technology.

(3) S
Introduction to the working functions of modern rotary wing aircraft. Rotary wing flight theory aerodynamics, controls, flight and power requirements Prerequisites: PHY 111, 113; junior or standing.

382 Air Navigation. (3) F

Advanced D.R. including theory application of modern navigation systems pressure pattern, and grid navigation Prerequisite: AET 222

383 Commercial Pilot Certificate and Instrument Rating. (2) F, S SS

Flight training for the FAA Commercial Pilot Certificate with Airplane Single Engine Land and Instrument Airplane Ratings Satisfactory completion of FAA Certificate Rating requirement Prerequisites: AET 222 314 passed FAA written flying time, 150 hours minimum

385 Flight Instructor Ground School. (3) F

Ground school preparation for the FAA Flight Instructor Certificate Pre or corequisite: AET 383

386 Flight Instructor Certificate. (1) F, S, SS

Flight training for FAA Flight Instructor Certificate Certificate required for course completion Prerequisites: AET 385 passed FAA written

387 Multi-Engine Ground School. (1) F

Ground school preparation for the FAA Multi-Engine Rating Pre or corequisite: AET 383 or instructor approval.

389 Multi-Engine Rating. (1) F, S, SS

Flight training for addition of an unrestricted FAA Multi-Engine Rating to a commercial pilot certificate. FAA rating required for course completion Corequisite: AET 387.

391 Multi-Engine Instructor Ground

School. (2) F, S
Ground school preparation for the FAA Multi-Engine Flight Instructor Rating Prerequisites: AET 386, 387, 389

392 Flight Instructor Instrument Ground

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

393 Flight Instructor Instrument Rating. (1)

F, S, SS
Flight training for the FAA CF I, CFII Rating required for course completion. Prerequisites: AET 386 392 passed FAA written.

395 Multi-Engine Land, Airplane Flight

Instructor Rating. (1) F, S, SS
Normal and emergency flight operations instruction on techniques and procedures associated with light multi-engine and airplane CFAME Rating required for course completion. Prerequisites: AET 386 389

408 National Airspace System. (2) F

Airway facilities Operations and communications, air route traffic control centers and flight service stations Navigation at an airport environment, certification and security Prerequisites: AET 201 (or 222 344).

409 Nondestructive Testing and Quality

Assurance. (3) F S
Purpose of inspection and quality assurance Theory and application of nondestructive inspection methods Application of pertinent standards, specifications and codes Lecture, lab Prerequisite: AET 280 or MET 230. Pre or corequisite: ETC 400

410 Aviation Safety. (3) F

Aviation accident prevention human factors life support, fire prevention accident investigation and crash survivability. Development and analysis of aviation safety programs. Prerequisite: junior or standing completion of one semester of tertiary and certification (L1) requirement

414 Applied High Speed Aerodynamics. (3) F

Basic concepts of compressible fluid mechanics including internal and external flows. Prerequisites: ETC 340; MAT 262

415 Propulsion. (3) S

Thrust performance cycles and aerothermodynamic analysis of rocket and air breathing aircraft engines Introduction to advanced propulsion systems Prerequisite: AET 414.

417 Aerospace Structures. (3) F

Analysis and design of aircraft and aerospace structures. Shear flow. Semi-monocoque structures. Effects of dynamic loading. Prerequisites: AET 300 312 320; MAT 262 MET 313

461 Applied Helicopter Aerodynamics and

Performance Measurements. (3) F

Hovering theory vertical flight, blade motion and rotor control. Aerodynamics of forward flight stability Prerequisites: AET 300, 360

462 Aerodynamics of Wind Tunnel Models.

(3) S
Helicopter model types design considerations propulsion loads surfaces mountings and instrumentation Prerequisites: AET 321 461

463 Aircraft/Helicopter Handling Qualities.

(3) F
FARs, MILSPECs human resources, analytical techniques simulator, and flight test techniques Wind tunnel data acquisition and analysis. Prerequisite: AET 461.

464 Flow Modeling Validation. (3) S

Flow model concepts and flow models in air plane and helicopter design Test requirements data analysis and error analysis. Prerequisite: AET 462

484 Aeronautical Internship. (1) (3) F, S, SS

Work experience assignment at airports or within aerospace industry commensurate with student's program. Special projects guidance by industry with university supervision Prerequisites: advisor approval; junior or standing

487 Aircraft Design II. (3) S

Basic aerodynamics and airplane performance analysis methods applied to practical design project Prerequisite: AET 300.

489 Airline Administration. (2) S

Administrative organizations economics of airline administration, operational structure and relationship with federal government agencies. Prerequisite: AET 308 or instructor approval

490 Advanced Applied Aerodynamics. (3) S

Study of fluid motion and aerodynamics. Essential of incompressible aerodynamics and computational fluid dynamics Elements of laminar and turbulent flows Lecture, lab Prerequisites: AET 312 ECE 106, MAT 262

Omnibus Courses: See page 40 for omnibus courses that may be offered

Construction

William W. Badger
 Chair
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**PROFESSORS
 BADGER ROUNDS**

ASSOCIATE PROFESSORS
 BASHFORD, BURTON, MAYO
 MULLIGAN, WEBER, WILSON

PROFESSORS EMERITI
 HASTINGS, MICHELS, PETERMAN,
 WARD, WOODING

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

Degrees. The Department of Construction offers the Bachelor of Science degree with a major in Construction. Five options are available, general building, general development, heavy construction, military construction, and specialty construction.

Each option is arranged to accent requisite technical skills and to develop management, leadership, and competitive qualities in the student. Prescribed are a combination of general studies, technical courses basic to engineering and construction, and a broad range of applied management subjects fundamental to the business of construction contracting. The military construction option complements the heavy construction option but permits the use of

18 semester hours of ROTC credits for appropriate technical electives and management type courses. The Department of Construction also offers the Master of Science degree which is described on page 212.

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

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

DEGREE REQUIREMENTS

Students complete the following basic requirements before registering for advanced courses: (1) all first semester, first year courses and the university English requirement (see page 66) must be completed by the time the student has accumulated 48 semester hours of program requirements and (2) all second semester, first year courses must be completed by the time the student has completed 64 semester hours of program requirements. Transfer students are given a one semester waiver.

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

Construction—B.S.

Students in all options are required to complete a construction core of science based engineering, construction, and management courses. Since the semester hours vary for some alternative courses in the core, any difference in credits is made up in the selected fields of specialization to achieve a minimum of 132 semester hours. The sequential arrangement of course work is shown below.

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

General Studies Requirements (36 semester hours minimum)	
<i>Literacy and Critical Inquiry</i> ¹ (6 semester hours minimum)	
COM 225 Public Speaking ¹	3
ETC 400 Technical Communications	...3
<i>Numeracy</i> (6 semester hours minimum)	
ECE 106 Introduction to Computer Aided Engineering ¹	3
MAT 200 Calculus with Analytic Geometry I	... 4
or 260 and 261	
<i>Humanities and Fine Arts and Social and Behavioral Sciences</i> ² (15 semester hours minimum)	
At least one course must be of upper- division level, two courses must be from the same department, and two or more departments must be repre- sented in the total selection	
Humanities and fine arts	... 3-6
CON 101 Construction and Culture A Built Environment	3
Social and behavioral sciences	... 0-3
ECN 111 Macroeconomic Principles ¹	3
ECN 112 Microeconomic Principles ¹	3
<i>Natural Sciences</i> (8 semester hours minimum)	
PHY 111 General Physics ¹	3
PHY 112 General Physics ¹	3
PHY 113 General Physics Laboratory ¹	1
PHY 114 General Physics Laboratory ¹	1
Total general studies	... 36
NOTE Six semester hours in two of the three awareness areas ² are re- quired in the final list of courses offered in the student's gradu- ation program of study. If de- sired, these can be included in the humanities and fine arts so- cial and behavioral sciences course selections.	

¹ Required for graduation
² See pages 45-65 for the requirements and
 the approved list.

**Construction Core Requirements
 Common to All Options**

	<i>Semester Hour</i>
ACC 230 Introductory Accounting I	... 3
CON 221 Applied Engineering Mechanics- Statics	3
CON 243 Heavy Construction Equip- ment, Methods, and Materials	... 3
CON 244 Construction Graphics	... 2
CON 251 Microcomputer Applications for Constructors	3

CON 252	Building Construction Methods, Materials, and Equipment	3
CON 323	Strength of Materials	3
CON 341	Surveying	3
CON 383	Construction Estimating	3
CON 389	Construction Cost Accounting and Control	3
CON 495	Construction Planning and Scheduling	3
CON 496	Construction Contract Administration	3
ECE 105	Introduction to Languages of Engineering	3
STP 226	Elements of Statistics	3
	Science elective	4
Total common to all options		45

Secondary Core for General, Heavy, and Speciality Options

		<i>Semester Hours</i>
BLW 306	Business Law	3
CEE 310	Testing of Materials for Construction	3
CEE 340	Hydraulics and Hydrology	3
CEE 450	Soil Mechanics in Construction	3
CON 273	Electrical Construction Fundamentals	3
CON 345	Mechanical Systems	3
CON 371	Construction Management and Safety	3
CON 424	Structural Design	3
CON 453	Construction Labor Management	3
CON 463	Foundations and Concrete Structures	3
	Technical elective	3
Total secondary core required		33

Secondary Core for the General Development Option

		<i>Semester Hours</i>
ACC 240	Introductory Accounting II	3
APH 300	World Architecture I Western Cultures	3
BLW 306	Business Law	3
COM 222	Argumentation	3
CON 483	Advanced Building Estimating	3
FIN 300	Fundamentals of Finance	3
FIN 361	Managerial Finance	3
GPH 111	Introduction to Physical Geography	4
PUP 301	Introduction to Urban Planning	3
REA 251	Real Estate Principles	3
	Technical elective	2
Total secondary core required		33

Secondary Core for the Military Option

		<i>Semester Hours</i>
CEE 310	Testing of Materials for Construction	3

CEE 450	Soil Mechanics in Construction	3
CON 273	Electrical Construction Fundamentals	3
CON 344	Route Surveying	3
CON 345	Mechanical Systems	3
CON 371	Construction Management and Safety	3
CON 424	Structural Design	3
CON 463	Foundation and Concrete Structures	3
CON 472	Development Feasibility Reports	3
Total secondary core required		27

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

The course work for the first two years is the same for the general, heavy, and speciality options. The specific lower division requirements are shown below:

First Semester

		<i>Semester Hour</i>
CON 101	Construction and Culture. A Built Environment	3
ECN 111	Microeconomic Principles	3
ENG 101	First Year Composition	3
MAT 270	Calculus with Analytical Geometry	4
PHY 111	General Physics	3
PHY 113	General Physics Laboratory	1
Total		17

Second Semester

ECE 105	Introduction to Languages of Engineering	3
ECN 112	Microeconomic Principles	3
ENG 102	First Year Composition	3
PHY 112	General Physics	3
PHY 114	General Physics Laboratory	1
	Humanities elective	3
Total		16

Third Semester

CON 221	Applied Engineering Mechanics: Statics	3
CON 243	Heavy Construction Equipment, Methods, and Materials	3
ECE 106	Introduction to Computer Aided Engineering	3
STP 226	Elements of Statistics	3
	Basic science elective	4
Total		16

Fourth Semester

ACC 230	Introductory Accounting I	3
CON 244	Construction Graphics	2
CON 251	Microcomputer Applications for Constructors	3

CON 252	Building Construction Methods, Materials, and Equipment	3
CON 273	Electrical Construction Fundamentals	3
CON 323	Strength of Materials	3
Total		17

Option in General Building Construction

The general building option provides a foundation for students who wish to pursue careers as estimators, project managers, project engineers, and, eventually, owners of firms engaged in the construction of residential, commercial, and institutional structures. Educational focus is on building systems required for the mass development and production of large scale projects. General building construction is addressed as an integrated process from conception through delivery of completed facilities to users.

Requirements

		<i>Semester Hours</i>
BLW 411	Real Estate Law	3
CON 472	Development Feasibility Reports	3
CON 483	Advanced Building Estimating	3
REA 251	Real Estate Principles	3
Total		12

Option in General Development

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

Requirements

		<i>Semester Hours</i>
BLW 411	Real Estate Law	3
CON 472	Development Feasibility Reports	3
CON 484	Internship	3
CON 494	ST: Construction Process	3
Total		12

Option in Heavy Construction

The heavy construction option prepares students for careers related to the public works discipline. Typical projects in which they are involved are highways, railroads, airports, power plants, rapid transit systems, process plants, harbor and waterfront facilities, pipelines, dams, tunnels, bridges, canals, sewerage and water works, and mass earthwork.

	<i>Semester Hours</i>
Requirements	
BLW 307 Business Law	3
CON 344 Route Surveying	3
CON 482 Cost Engineering	3
CON 486 Heavy Construction Estimating	3
Total	12

Option in Military Construction

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

	<i>Semester Hours</i>
Requirements	
Approved military science courses	18

Option in Specialty Construction

The specialty construction option prepares students for careers with specialty constructors, such as mechanical and electrical construction firms. It emphasizes the construction process at the subcontractor level.

	<i>Semester Hours</i>
Requirements	
CON 455 Construction Office Methods	3
CON 468 Conceptual and Electrical Estimating	3
CON 482 Cost Engineering	3
Approved technical elective	3
Total	12

CONSTRUCTION

CON 101 Construction and Culture: A Built Environment. (3) F, S

An analysis of the cultural context of construction emphasizing its centrality in the evolution and expansion of built environments as expressions of ethical and historical values systems. Lecture, speakers, field trips. *General studies: HU G*

221 Applied Engineering Mechanics: Statics. (3) F, S, SS

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

243 Heavy Construction Equipment, Methods, and Materials. (3) F, S

Emphasis on horizontal construction. Fleet operations, maintenance programs, methods, and procedures to construct tunnels, roads, dams, and the excavation of buildings. Lab field trips.

244 Construction Graphics. (2) F, S

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

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

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

252 Building Construction Methods, Materials, and Equipment. (3) F, S

Emphasis on vertical construction. Methods, materials, codes, and equipment used in building construction corresponding to the 16 divisions on "Master Format." Lecture, lab. Prerequisite: CON 243.

273 Electrical Construction Fundamentals. (3) F, S

Circuits and machinery. Power transmission and distribution, with emphasis on secondary distribution systems. Measurements and instrumentation. Field trips. Prerequisites: MAT 261 or 270, PHY 112, 114.

323 Strength of Materials. (3) F, S

Analysis of strength and rigidity of structural members under static applied forces. Stress, strain, shear moment, deflections, combined stresses, connections, and moment distribution. Both US and SI units of measurement. Prerequisite: CON 221.

341 Surveying. (3) F, S

Theory and field work in construction and surveys. Lecture, lab. Prerequisite: MAT 118.

344 Route Surveying. (3) F

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

345 Mechanical Systems. (3) F, S

Design parameters and equipment related to heating and cooling systems for mechanical construction. Computer aided calculations. Lecture, lab, field trips. Prerequisites: CON 251, 252, PHY 111, 113.

371 Construction Management and Safety. (3) F, S

Organization and management theory applied to the construction process. Leadership functions. Safety procedures and equipment. OSHA requirement for construction. Prerequisite: junior standing or instructor approval.

383 Construction Estimating. (3) F, S

Methods and techniques used in estimating construction costs. Standard approach to quantity surveys emphasized. Practice in takeoffs, costing, and final bid preparation. Microcomputer usage for semester project. Lecture, project workshop. Prerequisites: CON 244, 251, 252. Construction major or instructor approval.

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

Nature of construction cost. Depreciation and tax theory and variable equipment costs. Cash flow theory, investment models, profitability, and analysis. Computer applications. Funding sources and arrangements. Builder's insurance. Prerequisites: ACC 230, CON 251 (or equivalent), 383. *General studies: N3.*

424 Structural Design. (3) F, S

Economical use of steel, reinforced concrete and wood in building and engineered structures. Design of beams, columns, and connections. Elastic and ultimate strength design. Student design projects. Field trips. Prerequisite: CON 323.

453 Construction Labor Management. (3) F, S

Labor and management history, union, and open shop organization of building and construction workers. Applicable laws and government regulations. Goals, economic power, jurisdictional disputes, and grievance procedures. Lecture, lab. Prerequisites: CON 371; ECN 112. *General studies: H*

455 Construction Office Methods. (3) S

Administrative systems and procedures for the construction company office. Accounting methods, improvement and work simplification, office layout, business forms and design, and office manuals. Prerequisite: CON 389.

463 Foundations and Concrete Structures. (3) F, S

Subsurface construction theory and practice for foundations of buildings and engineered facilities. Concrete form design for foundations and structural frames. Underpinning, piling, dry and wet excavation, dewatering, coffer dams, and caissons. Lecture, recitation, field trips. Prerequisites: CEE 450; CON 424.

468 Conceptual and Electrical Estimating. (3) F

System of estimating construction costs before design has been initiated. Cost estimating for large projects. Analysis and organization of electrical estimate. Prerequisite: CON 383.

472 Development Feasibility Reports. (3) S

Integration of economic location theory, development cost data, market research data, and financial analysis into a feasibility report. Computer orientation. Prerequisite: CON 389, ECN 112; REA 251.

477 Residential Construction. (3) F

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

482 Cost Engineering. (3) F, S

Application of engineering principals to project costs. System analysis of estimating design construction and operating functions to optimize the life cycle cost. Prerequisites: CON 389, 483 (or 486).

483 Advanced Building Estimating. (3) F, S

Concepts of pricing and markup, development of historic costs, life cycle costing, change order and conceptual estimating, and emphasis on microcomputer methods. Prerequisite: CON 383.

486 Heavy Construction Estimating. (3) F, S

Methods analysis and cost estimation for construction of highways, bridges, tunnels, dams, and other engineering works. Field trips. Prerequisites: CON 344 and 383 or instructor approval.

495 Construction Planning and Scheduling. (3) F, S

Various network methods of project scheduling, such as AOA, AON, Pert, bar-charting, line of balance, and VPM techniques. Microcomputers used for scheduling, resource allocation, and time/cost analysis. Prerequisites: CON 389. Construction major or instructor approval. *General studies: N3.*

496 Construction Contract Administration. 3 F S

Case studies Effects of organization on construction contract operations. Elements of construction law. Prime contracts subcontract joint venture and consortium agreements and change orders. Documentation. Claims arbitration and litigation. Quality control requirements. Bonding insurance and indemnification procedures. Ethical practice. Licensing, codes, etc. Field trips. Prerequisites: CON 371, ETC 400 and senior standing or instructor approval.

531 Economics of the Construction Industries. 3 F

The economic environment of construction, with emphasis on unique aspects critical review of economic literature dealing with the construction industry. Prerequisite: CON 496 or instructor approval.

551 Facilities Operation and Maintenance. 3 S

Analysis of maintenance work. Structure of the maintenance work and organization. Contract maintenance and force account economics. Maintenance control and supervision of operations. Field trips. Prerequisite: CON 495 or instructor approval.

577 Construction Systems Engineering. 3 F

Systems theory as applied to the construction process. Alternatives for structuring information flows and the control of projects. Prerequisite: EE 476 or equivalent.

Omnibus Courses: See page 40 for omnibus courses that may be offered.

Electronics and Computer Technology

Albert L. McHenry
Chair
(TC 301) 602 965-3137

PROFESSORS
MA SEL MCHENRY

ASSOCIATE PROFESSORS
FORDEMWALT McBRIEN, NOWLN,
STRAWN, WOOD

ASSISTANT PROFESSORS
MAC A, PETERSON, ZENG

VISITING ASSISTANT PROFESSOR
SADDLER

PROFESSORS EMERITI
BAXTER EDWARDS

Purpose. Electronics engineering technology is a technological field of specialization that requires the application of scientific and engineering knowledge and methods combined with technical skills in support of electrical electronics engineering activities. It lies in the occupational spectrum between the craftsman and the engineer at the end

of the spectrum closest to the engineer. The electronics engineering technologist is a member of the electrical engineering team that consists of electrical engineers, electronics engineering technologists, and electronics engineering technicians.

The electronics engineering technologist is applications oriented, building upon a background of applied mathematics including the concepts and applications of calculus. Utilizing applied science and state of the art technology, the electronics technologist is able to produce practical, workable, and safe results quickly and economically, to install and operate technical systems, to configure hardware for unique applications from proven concepts, to develop and produce products, to service machines and systems, to manage construction and production processes, and to provide customer support to technical products and systems.

Degrees. The Department of Electronics and Computer Technology offers the Bachelor of Science degree in Electronics Engineering Technology (B.S./EET). Four options are available: computer systems, electronic systems, microelectronics, and telecommunications.

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

The *electronic systems* option is aimed at preparing persons for careers in instrumentation, control, and power systems applications. This option allows a student to develop a broad based knowledge of electrical electronic fundamentals with an applications perspective. Sixteen of the 26 specialization hours are specified and the remaining 10 hours are approved technical electives. The Department of Electronics and Computer Technology has had a concentration in electronic systems or instrumentation and systems control for many years. The course patterns in support of these emphasis areas have been well developed and continue to provide strong support for the electronic systems option under the B.S. EET program.

The *microelectronics* (UET) option combines applied electronics, monolithic and hybrid integrated circuit

processing and applications, device and component fabrication, and manufacturing. The objective of this option is to prepare persons to assume positions in the area of microelectronics manufacturing with immediately applicable knowledge as well as to develop a strong foundation of electronic fundamentals and methods. Students should be interested in the design, fabrication, and manufacture of imprinted circuitry, monolithic integrated circuits (bipolar and MOS), and hybrid thick film and thin film circuitry, components, and systems. Graduates of this program have various career opportunities in industry, particularly in semiconductor processing, fabrication, manufacturing, and device product application areas. The continuing explosion in semiconductor and related technologies and their applications to electronic and computer related products offers unique and challenging opportunities. Graduates of this program option secure positions in processing, manufacturing, operations, and applications areas in industry as members of the diverse scientific engineering team.

The *telecommunications* option has been structured to take advantage of the recent changes in the telecommunications industry. The program encompasses the fundamentals of information and signal processing, modern bandwidth efficient digital radio analysis with RF and microwave circuits and systems. Applications include telephone pulse code modulation, cable TV, fiber optic links, and satellite transmission circuits and systems.

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

ELECTRONICS ENGINEERING TECHNOLOGY—B.S.

The departmental curriculum is organized into two categories, technical studies and general studies. Technical studies consist of core areas and the option specialty area. General studies consist of courses selected to meet the university general studies requirement as well as the math/science requirement of TAC/ABET. A minimum of 50 up

per-division hours is required, including at least 24 semester hours of EET, CET, or UET upper-division hours to be taken at ASU. Complete program of study guides with typical four-year patterns are available from the department for each option.

The technical studies curriculum component consists of 91 semester hours of course work, which includes the engineering technology core (20 hours), electronics engineering technology core (45 hours), and an option (26 hours). The general studies portion of the B.S./EET curriculum has been carefully structured to meet the specific requirements of the university and to include the content required by TAC/ABET, the professional accrediting agency for such curricula.

DEGREE REQUIREMENTS

In addition to the courses listed for English proficiency, general studies, and the construction and technology core, the following courses are required:

	<i>Semester Hours</i>
Literacy and critical inquiry elective	
COM 225 Public Speaking	3
Social and behavioral science elective	
ECN 112 Microeconomic Principles ...	3

Engineering Technology Core

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

	<i>Semester Hours</i>
CHM 113 General Chemistry	4
ETC 201 Applied Electrical Science ...	4
ETC 211 Applied Engineering Mechanics. Statics	3
ETC 340 Applied Thermodynamics and Heat Transfer	3
MAT 260 Technical Calculus I	3
MAT 261 Technical Calculus II	3
Total	20

Electronics Engineering Technology Core Requirements

	<i>Semester Hours</i>
CET 250 Digital Systems and Microprocessors	3
CET 350 Digital Logic Principles	4
CET 354 Microcomputer Principles ..	4
CSE 183 Applied Problem Solving with FORTRAN	3
ECE 105 Introduction to Engineering Languages	3
EET 205 Electronic Devices and Circuits	4
EET 208 Electric Circuits	3
EET 301 Electric Networks	3

EET 310 Electronic Circuits	4
EET 372 Communication Systems	4
EET 396 Professional Orientation*	1
MAT 262 Technical Calculus III	3
UET 331 Semiconductor Materials Science/Devices	3
UET 415 Electronic Manufacturing Engineering Principles	3
Total	45

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

Electronics Engineering Technology Options

Computer Systems. CET 452, 456, 457, 473, 483; eight hours of approved technical electives.

Electronic Systems. EET 307, 406, 430, 460; 10 hours of approved technical electives.

Microelectronics CHM 116, UET 416, 418, 432; 12 hours of approved technical electives.

Telecommunications Systems. CET 473; EET 304, 470, 478; 11 hours of approved technical electives.

**Electronics Engineering Technology Program of Study
Typical First- and Second-Year Sequence
Freshman Year**

	<i>Semester Hours</i>
First Semester	
ENG 101 First-Year Composition	3
MAT 118 Precalculus Algebra and Trigonometry	3
PHY 111 General Physics	3
PHY 113 General Physics Lab	1
HU/SB elective	6
Total	16

	<i>Semester Hours</i>
Second Semester	
ECE 105 Introduction to Languages of Engineering	3
ENG 102 First Year Composition	3
ETC 201 Applied Electrical Science	4
MAT 260 Technical Calculus I	3
PHY 112 General Physics	3
PHY 114 General Physics Laboratory	1
Total	17

Sophomore Year

	<i>Semester Hours</i>
First Semester	
CHM 113 General Chemistry	4
ECE 106 Introduction to Computer Aided Engineering	3
EET 208 Electric Circuits	3

EET 205 Electronic Devices and Circuits ..	4
MAT 261 Technical Calculus II	3
Total	17

Second Semester

CET 250 Digital Systems and Microprocessors	3
COM 225 Public Speaking	3
CSE 183 Applied Problem Solving with FORTRAN	3
ETC 211 Applied Engineering Mechanics Statics	3
MAT 262 Technical Calculus III	3
Total	15

STUDENT ORGANIZATIONS

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

ELECTRONICS ENGINEERING TECHNOLOGY

EET 205 Electronic Devices and Circuits. (4) F, S

Active device characteristics, modes, and basic circuit analysis. Lecture, lab. Prerequisite: ETC 201

208 Electric Circuits. (3) F, S

Graphical and analytical analysis of electric circuits, transient and sinusoidal excitation on Applications of circuit theorems and computer solutions. Prerequisite: ETC 201. Corequisite: MAT 261

301 Electric Networks. (3) F, S

Analysis of electric networks, transients, steady state sinusoidal frequency response, and transfer function using Laplace transforms and Fourier Series. Prerequisite: EET 208. Pre- or corequisite: MAT 262.

304 Transmission Lines and Waveguides. (4) S

Theory and application of transmission lines, waveguide, fiber optics, and microwave components and impedance matching. Lecture, lab. Prerequisite: EET 301

307 Electrical Power Circuits and Machines. (4) F, S

Principles and analysis of electrical power circuits and components, transformers, rotating machines, and related control equipment. Lecture, lab. Prerequisite: EET 208.

310 Electronic Circuits. (4) F, S

Multistage amplifier analysis and design using modes and computer simulation. Lecture, lab. Prerequisites: EET 205, 208.

372 Communication Systems. (4) F, S

Systems analysis and design of AM, FM, PCM, and SSB communication systems. Noise and distortion on performance of communication systems. Lecture, lab. Pre- and corequisites: EET 301, 310

396 Professional Orientation. (1) F, S
Technica, professional, economic and ethical aspects of electronics computer engineering technology practice and industry organization. Lecture, projects. Prerequisite: junior standing.

401 Digital Filters and Applications. (3) S
Analysis and design of digital filters. Time frequency and Z transform techniques and waveform analysis. Computer applications. Prerequisites: EET 301; MAT 262.

406 Control System Technology. (4) S
Control system components, analysis of feedback control systems, stability, performance, and application. Lecture, lab, computer simulation. Prerequisite: EET 301; MAT 262

410 Linear Filters and Applications. (3) A
Frequency response and feedback design of multistage electronic circuits. Active and passive filter design. Computer analysis. Prerequisites: EET 301, 310

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

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

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

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

460 Power Electronics. (4) S
Analysis of circuits for control and conversion of electrical power and energy. Lecture, lab. Prerequisites: EET 301, 307, 310

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

478 Electromagnetic Propagation and Applications. (3) S
Applied design of transmission and propagation on systems, feeds, waves, and antennas. Prerequisites: EET 304, 372; MAT 262

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

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

501 Digital Signal Processing and Applications. (3) F
Fundamentals and applications of discrete signals and systems, DFT and FFT and the

design of FIR and IIR filters using computer techniques. Prerequisites: EET 401 or instructor approval. MAT 262

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

506 System Dynamics and Control. (3) S
Time, frequency and transform domain analysis of physical systems. Transfer function analysis of feedback control systems performance and stability. Compensation. Prerequisites: EET 301, 501 (or MAT 262)

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

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

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

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

560 Industrial Electronics and Applications. (3) A
Analysis, design, and application of special electronic devices and systems to industrial control, power, communications and processes. Prerequisites: CET 350, EET 301, 307, 310.

574 Communication Circuits and Applications. (3) F
Analysis and design of microwave circuits using S parameters and computer aided design. Matching networks, couplers, filters and amplifiers. Prerequisites: EET 304, 372.

576 Modern Telecommunication Systems. (3) S
Applied analysis and design of digital satellite communication systems. Applications of coherent systems design and compensation. Prerequisites: CET 473, MAT 262 or instructor approval

578 Electromagnetic Propagation Systems. (3) S
Electromagnetic signal propagation and antenna principles and applications. Prerequisites: EET 304, 372; MAT 262

Omnibus Courses: See page 40 for omnibus courses that may be offered

COMPUTER ENGINEERING TECHNOLOGY

CET 250 Digital Systems and Microprocessors. (3) F, S
Fundamentals of digital systems and microprocessors with Boolean Algebra and combinatorial logic. Microprocessor programming and applications. Lecture, demonstration. Prerequisites: ECE 105; ETC 201. *General studies N3*

350 Digital Logic Principles. (4) F, S
Combinational and sequential logic analysis, design concepts and applications. Lecture, lab. Prerequisite: CET 250.

354 Microprocessor Principles. (4) F, S
Microprocessor organization, programming, and interfacing. Prerequisite: CET 250.

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

456 Assembly Language Applications. (3) F
Programming BIOS, DOS, and high level language interfaces. Device drivers and TRS routines. Prerequisites: CET 354, CSE 183 or 100.

457 Microcomputer Systems Interfacing. (4) S
Applications of microcomputer hardware and software. Special purpose controllers, interface design. Lecture, lab. Prerequisites: CET 354, CSE 183; EET 310.

458 Digital Computer Networks. (3) A
Network technology, topologies, protocols, control techniques, reliability and security. Prerequisite: CET 354

473 Digital Data Communications. (4) F, S
Signal distortion, noise and error detection/correction. Transmission and systems design, interface techniques and standards. Lecture, lab. Prerequisites: CET 354; EET 372

483 Unix Utilities Using C Language. (3) S
Applications of C language to the development of practical programs for the Unix operating system. Prerequisite: senior standing in technology or equivalent.

485 Digital Testing Techniques. (3) A
Hardware software aspects of digital testing technology systems, board, and logic testing and equipment. Lecture, lab. Prerequisites: CET 354, CSE 183; EET 310.

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

508 Computer Process Control Technology. (3) A
Sample data control techniques and applications to process control. Prerequisites: CET 354; EET 406

552 Digital Systems Design. (3) S
Digital system design techniques and applications. Prerequisite: CET 452 or instructor approval

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

557 Microcomputers and Applications. (3) F
Applications of small computer systems, main and microcomputer hardware and software. Prerequisites: CET 354, CSE 100 or 183, EET 310

Omnibus Courses: See page 40 for omnibus courses that may be offered

**MICROELECTRONICS
ENGINEERING TECHNOLOGY**

UET 331 Electronic Materials. (3) F S
Physical, chemical, electromagnetic and mechanical properties of electronic materials. Solid state device characteristics and their material properties. Prerequisites: CHM 113, EET 205, PHY 112, 114.

415 Electronic Manufacturing Engineering Principles. (3) F S
Electronic equipment design and fabrication principles and practice. Comparison of electronics hardware design project and report. Lecture/lab. With lab fee. Prerequisite: EET senior standing (113 hours).

416 Monolithic Integrated Circuit Technology. (3) F
Processing and fabrication of monolithic bipolar and MOS integrated circuits. Lecture, lab. Prerequisite: UET 331.

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

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

437 Integrated Circuit Testing. (3) S
Principles, techniques, and strategies employed at wafer level and final product testing, both destructive and nondestructive. Prerequisite: UET 416.

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

516 IC Technology and Applications. (3) F
Advanced processing and fabrication technology of monolithic integrated circuits. Lecture, lab. Prerequisite: UET 416.

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

Omnibus Courses: See page 40 for omnibus courses that may be offered.

**Manufacturing and
Industrial Technology**

Donald W. Collins
Chair
(TC 201F) 602 965-3781

PROFESSORS

COLLINS, H. LD., HOROWITZ

ASSOCIATE PROFESSORS

DAHL, H. RATA, KELLEY,
KIS ELEWSKI, LAWLER, MATSON,
PALMGREN, SCHILDGEN, SCHMIDT

ASSISTANT PROFESSORS

BARCHLON, GAFFORD, HUMBLE,
LAMERAND, McCLELLAND, PELTIER

VISITING ASSISTANT PROFESSORS

HARRIS, KELLY

PROFESSORS EMERITI

AUTORE, BROWN, BURDETTE,
BURK, CAVALLIERE, KEITH, KIGNON,
MINTER, PARDINI, PRUST, ROE,
ROOKS, SELLER, STADTMILLER,
WATKINS, WILCOX

Purpose. Technology is the study of the application of science, systematic methods, techniques, procedures, materials, and devices for the development, improvement, and implementation of state-of-the-art solutions to industrial problems. Increased complexity and sophistication have created great demand for those individuals who possess a working knowledge of the technical phases of planning, testing, production, and fabrication of consumer and industrial products and equipment. Emphasis is placed on health and safety within the workplace.

The mission of the Department of Manufacturing and Industrial Technology is to provide students with a broad technical and managerial background in a variety of disciplines that qualify them for positions of leadership and responsibility in industrial, commercial, educational, and government activities.

The goal of the department is to prepare graduates who are able to develop technological solutions to industrial problems, to perform management functions in systems operations, product improvement, production evaluation, and customer support, and to serve as industrial trainees to facilitate technical transfer in industry and government.

Majors and Options. To accomplish the mission, the department offers two majors leading to the Bachelor of Science degree, Industrial Technology and Manufacturing Engineering Technology. Three options are available under the Industrial Technology major, which is accredited by the North Central Association of Colleges and Secondary Schools (NCACSS): graphic communications, industrial management, and interactive computer graphics. Five options are available under the Manufacturing Engineering Technology major, which is accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology: computer integrated manufacturing engineering technology, manufacturing engineering technology, mechanical engineering technology, robotic and automation engineering technology, and welding engineering technology.

Admission. Those students who seek admission to the program from other programs within the College of Engineering and Applied Sciences may be admitted with a minimum GPA of 2.25 for Arizona residents and 2.50 for non residents. Students admitted to the program are required to develop an area of specialization.

DEGREE REQUIREMENTS

**Manufacturing Engineering
Technology—B.S.**

	<i>Semester Hours</i>
Engineering technology core	10
General studies requirements	45
Manufacturing Engineering Technology core	28
Selected option	43
University English proficiency	6
Total	132

The following courses constitute the Manufacturing Engineering Technology Core and are required of all Manufacturing Engineering Technology students. Refer to the specific options for additional requirements.

**Manufacturing Engineering
Technology Core**

	<i>Semester Hours</i>
ECE 105 Introduction to Languages of Engineering	3
ECE 106 Introduction to Computer- Aided Engineering	3
MET 230 Engineering Materials and Processing	3

MET 231	Manufacturing Processes	3
MET 300	Applied Metallurgy	3
MET 302	Welding Survey	4
MET 313	Applied Engineering Mechanics Materials	3
MET 325	Electrical Power Source Analysis	4
MET 401	Statistical Process Control	3
MET 460	Manufacturing Capstone Project	3
	or MET 461 Mechanical Capstone Project (3) or MET 462 Capstone Project/ Weldment Design (3)*	
Total . . .	.....	32

* For robotic and CIM projects, see department chair.

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

Required courses: IST 452; MET 303, 341, 345, 416, 443, 448, 451, 453; 15 hours approved technical electives.

Option in Manufacturing Engineering Technology. This option is designed to prepare technologists with both conceptual and practical applications of processes, materials, and products related to metalworking industries. Accordingly, this concentration is intended to prepare students to meet the responsibilities in planning the processes of production, developing the tools and machines, and integrating the facilities of production or manufacturing.

Required courses: AET 409; MET 303, 341, 344, 345, 346, 416, 442, 444, 448; 12 hours approved technical electives.

Option in Mechanical Engineering Technology. The primary objective of the mechanical engineering technology option is to prepare the student for entry level work in mechanical design and testing either in engineering or manufacturing departments in product oriented industries. Major emphasis is placed on reducing the amount of time

required by industry to make the graduate productive in any area of work. The student obtains a well rounded academic background with an emphasis in mechanics and thermal sciences.

Required courses: IST 452; MET 303, 331, 341, 416, 432, 433, 434, 436, 438, 444, 451; 8 hours of approved technical electives.

Option in Robotic and Automation Engineering Technology. The challenges to improve productivity, product quality, and reliability and to reduce costs must be addressed by integrating robots and automation in manufacturing. This option addresses the field of automating manufacturing processes.

Required courses: MET 303, 341; 345, 346, 416, 444, 448, 451, 452, 453; 12 hours approved technical electives.

Option in Welding Engineering Technology. This option is designed primarily to prepare individuals for technical positions in industries utilizing welding and related processes. The focus is on the application of welding technology as applied to current and near future industrial needs. The program is structured to provide the individual with a balance of theory, application, and hands on experience. The general areas covered by the courses are welding processes, materials, non destructive testing, and weldment design. The student also has the opportunity to work with robots in robotic welding applications. Also, a laser is available for investigating the area of high energy welding processes.

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

Graduates may find employment in the aerospace, automotive, heavy machinery, heavy fabrication, and energy production industries.

Required courses: AET 409; MET 321, 322, 341, 344, 346, 416, 420, 421, 425, 444, 448; 7 hours of approved technical electives.

Industrial Technology—B.S.

	<i>Semester</i>	
	<i>H ours</i>	
General studies requirements		39
Industrial Technology core		25

Selected option	62
University English proficiency	6
Total	132

The following courses constitute the Industrial Technology Core and are required of all Industrial Technology students. Refer to the specific options for additional requirements.

Industrial Technology Core

		<i>Semester</i>	
		<i>H ours</i>	
ECE 105	Introduction to Languages of Engineering		3
ECE 106	Introduction to Computer Aided Engineering		3
ETC 201	Applied Electrical Science ...		4
ITC 200	Impact of Communications Technology on Society		3
ITC 202	Creative Thinking and Design		3
ITC 343	Occupational Safety		3
ITC 444	Industrial Organization		3
MET 230	Engineering Materials		3
Total			25

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

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

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

To achieve its objectives, the graphic communications option offers the following required and technical elective courses: GRC 135, 237, 331, 332, 333, 334, 336, 339; IST 346; 35 hours approved technical electives.

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

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

Sales Marketing Customer education; estimating and job costing; finance, personnel and human relations; markets for printing; print and electronic media; sales management; sales service; strategic planning; market planning.

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

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

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

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

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

To achieve its objectives, the industrial management and supervision option requires the following courses: IST 346, 402, 430, 451, 452, 453, 461, 480, 491; 35 hours approved technical electives.

A technical support area of emphasis must be chosen by the student in consultation with an advisor. Typical areas of emphasis are: aeronautics, construction, electronics, fire science, hazardous materials and waste management, safety and health, technology, and manufacturing. Articulation agreements are to be followed by consulting an advisor.

Option in Interactive Computer Graphics. The purpose of the interactive computer graphics (ICG) option is to prepare students for entry into the diverse field of computer graphics. The ICG option provides a strong academic foundation in the technological, managerial, and discipline specific applications of graphics analysis, communication, databases, design, documentation, image generation, modeling, programming, and visualization.

Graduates are qualified computer graphics technologists who have acquired extensive knowledge and technical competency in their respective areas of emphasis, thereby preparing them to advance into professional positions of leadership within the industry. The ICG courses are industry responsive and provide a high level of technical applicability in the use of computer graphics systems, hardware, and software within a variety of discipline environments.

Typical areas of emphasis leading to specialized career paths may include: applications development, applications management and supervision; business and analytical graphics; design (specialty areas such as electronics, advertising/graphics design, mechanical, manufacturing, multimedia, animation, rendering and illustration, and computer aided design and drafting); field engineering, service and support; graphics systems and database analysis; sales

and marketing, technical graphics and publication; testing, and implementation; training (administration and instruction).

To achieve its objectives, the interactive computer graphics option requires the following courses: ICG 212, 310, 312, 313, 314, 412, 417, 461; 38 hours approved technical electives.

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

INDUSTRIAL TECHNOLOGY

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

Developing an awareness of issues such as privacy, depersonalization, and control of information that have been affected by recent developments in communication technology. Activities include research, evaluation findings and presenting arguments in support of positions. Prerequisite: ENG 102 or 105 or 108 *General studies L1*

202 Creative Thinking and Design. 3) F S Fundamental methods, concepts, and techniques of creative thinking, design, and problem solving. Also includes communication management, culture, and societal influences. Lecture/lab. Prerequisite: ECE 106 or instructor approval

343 Occupational Safety. (3) F Accident prevention, accident factors, methods of recording and reporting, analytical psychological aspects, attitudes, recent legislation on safety consciousness and ability. Prerequisite: junior or status.

444 Industrial Organization. 3) S Industrial organization concepts. Topics relate to industrial relations, governmental regulations, organizational structure, labor relations, human factors, and current industrial practices. Field trips. Prerequisite: junior or status

Omnibus Courses: See page 40 for omnibus courses that may be offered

GRAPHIC COMMUNICATIONS

GRC 135 Graphic Communications. 3 F, S Introduction to the technologies involved in the design, image generation, transmission, and production of multiple images for consumer utilization. Lecture/lab, field trips.

136 History of Printing in the Western World. 3) N Historical perspective of technological developments in printing and social impacts on Western civilization relative to other forms of communication. Field trips

237 Image Preparation. 3) F Basic principles of typographic layout. Preparation of thumbnails, roughs, comprehensions and mechanicals. Introduction to photocomposition systems. Lecture/lab

331 Quality Assurance for the Reproduction Processes. 3 S Instrumentation and methodologies for material testing and quality control in the major reproduction processes. Field trips

332 Film Assembly and Platemaking. (3) F
Stripping negatives and positives; line, half tone, duo tone and full color contact printing onto various types of image carriers. Lecture, lab field trips. Prerequisite: GRC 135.

333 Sheetweb Press Technology. (3) S
Function of the offset printing equipment. Lithographic dynamics of both sheetfed and sheetweb systems. Lecture, lab. Prerequisite: GRC 332 or instructor approval.

334 Photomechanical Reproductions. (3) F
Theory and production of line work, halftones, contact work, and special effects for the graphic arts industry. Lecture lab.

335 Printing and Finishing Techniques. (3) S
Analysis of major printing processes of flexography screen process, and relief production on bindery and finishing procedures. Prerequisite: GRC 135

336 Color Separation. (3) S
Methods of producing separation negatives and positives. Prerequisite: GRC 334

337 Production Management. (3) F
Planning and controlling workflow of graphic arts products. Field trips. Prerequisite: GRC 135.

339 Estimating and Cost Analysis. (3) S
Management relationship between financial, production, and sales departments in printing industries; analysis of equipment labor, and material costs use of paper and standard pricing catalogs. Prerequisite: GRC 135

433 Production Techniques. (3) N
Systematic production planning experience. Lecture, lab. Prerequisites: GRC 333, 334

435 Plant Management. (3) F
Concepts, practices, and processes used by the commercial printing plant manager relative to the operation of the plant. Prerequisite: GRC 135 or instructor approval.

436 Gravure Technology. (3) S
In-depth study of the market profile and production sequences related to the gravure method of printing. Prerequisite: GRC 336

437 Advanced Color Reproduction. (3) F
Scientific analysis for the engineering of color reproduction systems used in the graphic arts industry. Field trips. Prerequisite: GRC 336

438 Graphic Arts Techniques and Processes. (3) F, S, SS
Survey of production sequences and profile of the printing and publishing industry. Lecture lab. Prerequisite: junior or standing

439 Electronic Imaging for Publications. (3) S
Introduction and in-depth investigation into electronic publishing systems used in printing and publishing industry for transmission and generation of copy

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

Omnibus Courses: See page 40 for omnibus courses that may be offered.

INDUSTRIAL MANAGEMENT

IST 346 Management Dynamics. (3) S
Elements of human relations training and the consequences of supervisory behavioral patterns in effective decision-making with employees.

402 Industrial Laws, Contracts, and Regulations. (3) F

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

430 Ethical Issues in Technology. (3) N
Topics in social responsibility for industrial technology and engineering

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

451 Materials Control. (3) F
Activities of material handling, including purchasing, receiving, warehousing, traffic, plant layout, inventory, and production control and shipping relative to technical procedures.

452 Industrial Human Resource Management. (3) S
Concepts and practices of human resource management in a global industrial environment.

453 Safety Management. (3) S
Development and management of safety programs, education and training and relationships with an organization. Prerequisite: ITC 343 or instructor approval.

454 Occupational Hygiene. (3) N
Fundamental concepts and principles of industrial hygiene and occupational/environmental health. Includes OSHA and EPA laws regulations standards chemical and physical hazards, air sampling equipment, and control measures. Prerequisite: ITC 343 or instructor approval

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

460 Risk and Legal Aspects of Safety. (3) F
Examines the risk management factors of industrial activities, including legal and insurance considerations

461 Production Supervision Principles. (3) F
Introduction to supervisory principles as applied to production of goods and services. Prerequisite: ITC 444

480 Organizational Effectiveness. (3) F
Human aspects of supervisory behavior in the industrial setting and how they influence efficiency, morale, and organizational practice.

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

542 Global Management Philosophies. (3) F
Analysis and comparison of significant supervisory philosophies developed in various industrial nations and their potential application in the United States.

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

550 Industrial Training. (3) S

Training techniques and learning processes. Planning, developing and evaluating training programs in industry and governmental agencies. Prerequisite: advisor approval.

570 Project Management. (3) S

Planning, organizing, coordinating and controlling staff and project groups to accomplish the project objective

598 Special Topics. (1-3) F, S, SS
Special topics courses, including the following, which are regularly offered are open to qualified students. These courses are taught Fridays, Saturdays, Sundays, and Mondays

- Principles of Hazardous Materials and Waste Management
- Regulatory Framework for Toxic and Hazardous Substances
- Principles of Toxicology
- Techniques for Storage, Treatment and Disposal of Hazardous Materials
- Quantitative Analysis and Practical Laboratory Techniques
- Occupational Hygiene
- Air Pollution and Toxic Chemicals
- Soils and Groundwater Contamination
- Emergency Preparedness, Response and Planning for Hazardous Materials
- Risk Assessment for Hazardous Materials
- Current issues: Radon, Asbestos, and USTs

Omnibus Courses: See page 40 for omnibus courses that may be offered.

INTERACTIVE COMPUTER GRAPHICS

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

310 Computer Graphics Fundamentals. (3) S
Computer image creation, transformation, and manipulation. Current techniques for database generation. Concepts of applications software development. Hands-on experience. Lecture, lab, field trips. Prerequisite: programming background helpful but not necessary. *General studies: N3.*

312 Computer-Aided Design and Drafting. (3) F
Using computer aided design and drafting application software for advanced geometric construction. System and workstation configuration and productivity. Modeling applications. Lecture, lab, field trips. Prerequisite: ICG 212. *General studies: N3.*

313 Technical Illustration. (3) F
Pictorial drawing shades and shadows and multimedia rendering techniques. Lecture, lab. Prerequisite: CG 212

314 Computer Graphics Database. (3) S
Preparing the product definition database for computer-integrated manufacturing. Documentation and process requirements, systems, and standards. Precision dimensioning. Lecture, lab, field trips. Prerequisite: ICG 212 or MET 230 or CET 250 or equivalent

412 Computer Graphics Modeling. (3) F
Establishing and manipulating 3-dimensional computer models. Applications, including solids modeling concepts, design analysis, dynamic simulation, and graphic data exchange files. Lecture/lab, field trips. Prerequisite: ICG 312. *General studies:* N3.

413 MicroCADD Applications. (3) F
Student selected modules, including architectural, construction utility, and electronic drawing/mechanical manufacturing animation, computer graphics, and others. Lecture/lab, field trips. Prerequisite: ICG 212.

417 Graphics Systems Management. (3) S
Planning, implementing, and managing computer graphics systems. Applications, needs assessment, analysis of components, system ergonomics, interfacing/maintenance, and human resources management. Lecture/lab, field trips. Prerequisite: instructor approval.

461 Computer Animation. (3) F
Fundamental technology used in creating 2-dimensional and 3-dimensional animation through modeling/scripting, and rendering as related to engineering simulation. Lecture/lab, field trips. Prerequisite: ICG 310 or instructor approval.

517 Graphics Systems Development. (3) S
Research and development in computer graphics systems. Applied project management, development/evaluation, and implementation. Lecture/lab, field trips. Prerequisite: ICG 412 or instructor approval.

Omnibus Courses: See page 40 for omnibus courses that may be offered.

MANUFACTURING TECHNOLOGY

MET 110 Welding Survey. (3) N
Oxyacetylene, arc brazing, resistance, and gas tungsten arc welding procedures for ferrous and nonferrous metals. Lecture/lab.

116 Aeronautical Welding. (2) F
Oxyacetylene and tungsten gas tungsten arc welding procedures and brazing techniques used for aircraft structures. Lecture/lab.

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

231 Manufacturing Processes. (3) F
Metal removal processes, emphasizing drilling, milling and lathe processes, including tool grinding. Emphasis on production speeds and feeds. Lecture/lab. Prerequisites: ECE 106/MET 230.

300 Applied Metallurgy. (3) F
Principles of metallurgy, emphasizing concepts most relevant to typical manufacturing requirements; factors affecting properties and evaluation methods, metallography experiences. Lecture/lab. Prerequisite: MET 230 or instructor approval.

302 Welding Survey. (4) F
Theory and application of industrial welding processes, introductory welding metalurgy and weldment design; SMAW, GTAW, GMAW. Oxyacetylene, and brazing experiences. Lecture/lab. Prerequisite: upper class standing.

303 Machine Control Systems. (3) S
Theory and application of electromechanical, hydraulic, pneumatic, fluidic, and electrical control systems for manufacturing. Lecture/lab. Prerequisites: ETC 201 or PHY 112/MAT 260.

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

321 Engineering Evaluation of Welding Processes. (3) N
Theory and application of the arc welding processes and oxy fuel cutting; fixturing, procedures, safety, codes and experimental techniques are covered. Lecture/lab. Prerequisites: MET 302; PHY 112.

322 Engineering Evaluation of Nontraditional Welding Processes. (3) N
Theory and applications of EBW, LBW, solid state bonding, brazing, and soldering. Lecture/lab. Prerequisites: MET 302/PHY 112.

325 Electrical Power Source Analysis. (4) S
Design and operating characteristics of electrical power sources and related equipment. Equipment selection, setup and troubleshooting procedures covered. Lecture/lab. Prerequisites: ETC 201, MET 302; PHY 112, 114.

331 Design for Manufacturing I. (3) S
Introduction to design of machines and structures, with emphasis on layout design/drawing. Basics of gears, cams, fasteners, springs, bearing packages, cylindrical fits/flat pattern development and surface finish requirements emphasized. Prerequisite: MET 313.

341 Manufacturing Analysis. (3) S
Introduction to the organization and functional requirements for effective production. Includes writing production operation plans. Prerequisite: MET 231.

343 Material Processes. (4) S
Industrial processing as applied to low, medium and high volume manufacturing. Basic and secondary processing, fastening and joining/coating and quality control. Lecture/lab.

344 Casting and Forming Processes. (3) S
Analysis of various forming processes to determine load requirements necessary for a particular metal forming operation. This information is used to select equipment and design tooling. Metal casting processes and design of castings. Introduction to powder metallurgy. Prerequisites: MET 300 and 313 or instructor approval.

345 Advanced Manufacturing Processes. (4) S
Metal removal processes, emphasizing milling/grinding/turret and tracer lathe, and cutter sharpening. Application of machinability theory to practice. Production feeds, speeds, and tool wear measurement. Lecture/lab. Prerequisites: MET 231 and 300 or instructor approval.

346 Numerical Control Point to Point and Continuous Path Programming. (3) N
Methods of programming, setup and operation of numerical control machines/emphasizing lathe and mill systems. Lecture/lab. Prerequisite: MET 231.

354 Mechanics of Materials. (4) F
Vectors/force systems/friction/equilibrium, centroids and moment of inertia. Concepts of

stress/strain, and stress analysis as applied to beams/columns and combined loading. Nonmajors only. Prerequisites: MAT 118; PHY 111.

401 Statistical Process Control. (3) S
Introduction to statistical quality control methods as applied to tolerances, process control, sampling, and reliability. Prerequisite: MAT 118.

407 Aerospace Materials. (2) N
Materials used for aircraft powerplants and airframes; emphasis on criteria for selection in terms of mechanical properties and manufacturing processes. Prerequisite: MET 230 or equivalent.

416 Applied Computer Integrated Manufacturing. (3) F
Techniques and practices of Computer Integrated Manufacturing, with emphasis on Computer Aided Design and Computer Aided Manufacturing. Prerequisite: MET 346 or instructor approval. *General studies:* N3.

420 Welding Metallurgy. (4) N
Metallurgical principles applied to structural and alloy steel and aluminum weldments; laboratory emphasis on welding experiments, metallography and mechanical testing. Lecture/lab. Prerequisites: CHM 114; MET 300/302.

421 Welding Metallurgy. (3) N
Metallurgical principles as applied to stainless steel/superalloy/titanium, and other refractory metal weldments and braze joints. Prerequisites: CHM 114/MET 300.

425 Welding Codes. (2) N
Familiarization with and application of the various codes/standards and specifications applicable to weldments. Prerequisite: MET 302 or equivalent.

432 Applied Thermodynamics and Heat Transfer. (3) F S
Thermodynamics of mixtures/combustion process. Applications of thermodynamics to power and refrigeration cycles. Heat transfer, including steady state conduction, convection, and radiation. Prerequisite: ETC 340.

433 Thermal Power Systems. (4) N
Analysis of gas power/vapor power and refrigeration cycles. Components of a refrigeration system. Direct energy conversion. Psychrometry. Analysis of internal combustion engines and fluid machines. Lecture/lab. Prerequisite: MET 432 or instructor approval.

434 Applied Fluid Mechanics. (3) F
Fluid statics. Basic fluid flow equations. Viscous flow in pipes and channels. Compressible flow. Applications to fluid measurement and flow in conduits. Prerequisite: ETC 340.

436 Turbomachinery Design. (3) N
The application of thermodynamics and fluid mechanics to the analysis of machinery design and power cycle performance predictions. Prerequisite: MET 432 or instructor approval.

438 Design for Manufacturing II. (4) F
The application of mechanics in the design of machine elements and structures. The use of experimental stress analysis in design evaluation. Lecture/lab. Prerequisites: AET 312 and MET 231 and 331 or instructor approval.

442 Specialized Production Processes. (3) F
Nontraditional manufacturing processes emphasizing EDM, ECM, ECG, CMP/HEFP, EBW, LBW, etc. Prerequisite: MET 230.

443 N/C Computer Programming. (3) F Theory and application of computer-aided N/C languages with programming emphasis with APT and suitable postprocessors. Lecture, lab. Prerequisite: MET 346 or instructor approval.

444 Production Tooling. (3) F Fabrication and design of jigs, fixtures, and special industrial tooling related to manufacturing methods. Lecture, lab. Prerequisite: MET 345.

448 Expert Systems in Manufacturing. (3) F Introduction to expert systems through conceptual analysis, with an emphasis on manufacturing applications. Prerequisite: MET 231.

451 Introduction to Robotics. (3) F Introduction to industrial robots. Topics included are robot geometry, robot workspace, trajectory generation, robot actuators and sensors, design of end effectors, and economic justification. Prerequisite: MET 303 or instructor approval.

452 Implementation of Robots in Manufacturing. (3) N Robotic workcell design, including end effectors, parts presenters, and optimum material flow. Prerequisite: MET 451 or instructor approval.

453 Robotic Applications. (3) S Lab course utilizing robots and other automated manufacturing equipment to produce a part. Students are required to program robots, as well as interface the robots with other equipment. Prerequisite: MET 303 or 325 or instructor approval.

460 Manufacturing Capstone Project. (3) S Small group project applying manufacturing techniques, with an emphasis on demonstrating state-of-the-art technology. Prerequisite: MET 416.

461 Mechanical Capstone Project. (3) S Integration of materials, mechanics, and power into analysis of engineering design of system components. Prerequisites: MET 432, 438.

462 Capstone Project/Weldment Design. (3) S Design of welded structures and machine elements in terms of allowable stresses, joint configurations, process capabilities, and cost analysis; welding procedures emphasized. Prerequisites: MET 302, 313.

517 Applied Computer Integrated Manufacturing. (3) F Techniques and practices of Computer Integrated Manufacturing, with an emphasis on

Computer-Aided Design and Computer-Aided Manufacturing. Prerequisite: MET 346 or instructor approval.

542 N/C Computer Programming. (3) F Theory and application of computer-aided N/C languages with programming emphasis with APT and suitable postprocessors. Application case studies are included. Lecture, lab. Prerequisite: MET 346 or instructor approval.

552 Introduction to Robotics. (3) F Introduction to industrial robots. Topics included are robot workspace, trajectory generation, robot actuators and sensors, design of end effectors, and economic justification. Application case studies. Prerequisite: MET 303 or instructor approval.

Omnibus Courses: See page 40 for omnibus courses that may be offered.

School of Engineering

George C. Beakley Jr.
Director
(ECG 104) 602/965-1726

PURPOSE

A large percentage of all engineering degree holders are found in leadership positions in a wide variety of industrial settings. Although an education in engineering is generally considered to be one of the best of technical educations, it also provides an opportunity for the development of many additional activities, aptitudes and interests, including moral, ethical, and professional concepts. In this era of rapid technological change, an engineering education serves our society well as a truly liberal education. Society's needs in the decades ahead call for engineering contributions on a scale not previously experienced. The well-being of our civilization as we know it may well depend upon how effectively this resource is developed.

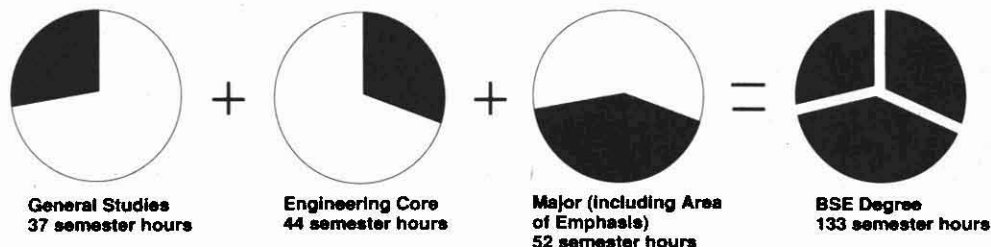
Students studying engineering at ASU are expected to acquire a thorough understanding of the fundamentals of mathematics and the sciences and their applications to the various engineering fields. The program is designed to develop a balance between science and engineering and an understanding of the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

The courses offered are designed to meet the needs of the following students:

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

ADMISSION

See pages 27-32, 43-45, 207-209, and 213-214 for information regarding requirements for admission, transfer, retention, disqualification, and reinstatement.



In addition, college students who are beginning their initial college work in the School of Engineering should present certain secondary school units in addition to the minimum university requirements. A total of three units is required in mathematics. College algebra, geometry, and trigonometry must be included. The laboratory sciences chosen must include at least one unit in physics and one unit in chemistry. Calculus and biology are recommended.

Students who have omissions or deficiencies in subject matter preparation may be required to complete additional university credit course work that may not be applied toward an engineering degree. One or more of the courses CHM 113 General Chemistry, ENG 101 First Year Composition*, MAT 118 Precalculus Algebra and Trigonometry, PHY 111 and 113 General Physics (or PHY 105) are taken to satisfy omissions or deficiencies.

DEGREES AND MAJORS

The Bachelor of Science (B.S.) and Bachelor of Science in Engineering (B.S.E.) degrees are composed of three parts: University General Studies, an engineering core, and a major. This combination is illustrated in the charts shown on pages 238-239.

The general studies courses satisfy a university requirement and include literacy and critical inquiry, humanities and fine arts, social and behavioral sciences, numeracy and natural sciences (see pages 45-48). In addition, there are requirements in the areas of cultural, historical, and global awareness. These courses constitute approximately 28% of the degree program.

* See statement on English examinations under "Placement Examinations for Proficiency," page 33.

The engineering core is a specific and organized body of knowledge that serves as a foundation to engineering and for further specialized studies in a particular engineering major. These courses constitute approximately 33% of the degree program.

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

The majors available are of two types: 1) those associated with a particular department within the School of Engineering (for example, Electrical Engineering and Civil Engineering) and 2) those offered as special and interdisciplinary studies (for example, nuclear engineering sciences and pre-medical engineering). In general, all curricula are extensions beyond the engineering core and cover a wide variety of subject areas within each field. About one-fourth of the major credits are reserved for the student's use as an area of emphasis. These credits are traditionally referred to as *technical electives*.

Majors and areas of emphasis are offered by the six engineering departments: Chemical, Bio and Materials Engineering; Civil Engineering; Computer Science and Engineering; Electri-

cal Engineering; Industrial and Management Systems Engineering; and Mechanical and Aerospace Engineering. The majors of the Engineering Special Studies and Engineering Interdisciplinary Studies are administered by the Office of the Dean and are designed for those students whose educational objectives require more intensity of concentration or flexibility than is possible in the traditional departmental fields (see pages 273-278).

The first two years of study are concerned primarily with the general studies and the engineering core, with more time being spent on general studies. The final two years of study are concerned with the engineering core and the major, with a considerable part of the time being spent on the major. This arrangement can be illustrated by the chart below.

The sequential arrangement of all course work for the B.S. and B.S.E. degrees into the three categories shown below is especially helpful to the beginning student. The semester by semester selection of courses varies from one field to another. An example of a typical freshman engineering schedule is shown below.

Typical Freshman Year

First Semester		Semester Hours
CHM 114	General Chemistry for Engineers ¹ ..	4
	or CHM 116 General Chemistry 4)	
ECE 105	Introduction to Languages of Engineering	3
MAT 290	Calculus I ³ ..	5
	General studies electives (HU or SB) ⁴ or ENG 101 First Year Composition 3) ⁵	6
Total	.....	18

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

Second Semester

ECE 106	Introduction to Computer Aided Engineering	3
ENG 102	First Year Composition or ENG 105 Advanced First Year Composition (3) ⁵	3
MAT 291	Calculus II ³	5
PHY 121	University Physics I. Mechanics ⁶	3
PHY 122	University Physics Laboratory I	1
	General studies elective (HU or SB) ⁴	3
Total		18

¹ Chemical Engineering, Bioengineering, Materials Science and Engineering, and Pre medical engineering students take CHM 113 and 116.
² Students with no computer background should enroll in CSE 181 Applied Problem Solving with BASIC before enrolling in ECE 105.
³ MAT 270, 271, and 272 may be taken in lieu of MAT 290 and 291 (only 10 hours may be used to satisfy graduation requirements).
⁴ See pages 45–65.
⁵ Students not eligible for ENG 105 should complete ENG 101 in the first semester.
⁶ Students who have not completed one unit of physics in high school should complete PHY 105 (or 111 and 113) in the preceding semester

Well prepared students usually can complete the program of study leading to an undergraduate degree in engineering in four years or less by attending summer sessions. Many students, however, may find it advantageous or necessary to devote more than four years to the undergraduate program by pursuing, in any semester, fewer studies than are regularly prescribed. Where omissions or deficiencies exist, e.g., in chemistry, English, mathematics, and physics, the student must complete more than the minimum of 133 semester hours. Therefore, in cases of inadequate secondary preparation, poor health, or financial necessity requiring much time for outside work, the undergraduate program should be extended to five or more years.

DEGREE REQUIREMENTS

The degree programs in engineering at ASU are intended to develop habits of quantitative thought having equal utility for both the practice of engineering and other professional fields. It is

the intent of the faculty that all students be prepared in the following areas:

- 1. Competency in oral and written English.** This is considered to be essential for the engineering graduate. Although the requirement of specific course work may serve as a foundation for such competency, the development of communication skills should be demonstrated by student work in engineering courses. As a minimum and in addition to the 133 semester hour course requirements, all students must satisfy the university English proficiency requirements (see page 66).
- 2. General studies.** This is to ensure that the engineering student acquires a satisfactory level of basic knowledge in the humanities and fine arts, social and behavioral sciences, literacy and critical inquiry, numeracy and natural sciences. These subjects are so selected as to give the engineer an increased awareness of social responsibilities, to provide an understanding of related factors in the decision making process, and to provide a foundation for the study of engineering. *School of Engineering students must use caution in selecting their lower division literacy and critical inquiry course (L1) because of accreditation requirements. The course selected should be one that is evaluated by the University General Studies Council as "L1" and "HU" or "LI" and "SB" Otherwise, the student must complete a total of 16 semester hours of humanities and social and behavioral sciences to satisfy the baccalaureate degree requirements in engineering.* *Because of accreditation requirements, aerospace studies (AES) courses are not acceptable for engineering degree credit as a social and behavioral science.*
- 3. Fundamental studies.** Studies in engineering and related subjects further develop the foundation for engineering and provide the base for specialized studies in a particular engineering discipline.

- 4. Major studies.** These courses provide a depth of understanding for a more definitive body of knowledge appropriate to a particular aspect of societal concern. These studies include technical elective course work in an area of emphasis that may be selected by the student with the assistance of an advisor.

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

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

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

		<i>Semester Hours</i>
English Proficiency		
ENG 101, 102	First Year Composition or ENG 105 Advanced First Year Composition (3)	6
General Studies		
	<i>Literacy and Critical Inquiry¹</i>	
ECE 400	Engineering Communications ²	3
	One L1 and HU or L1 and SB course ¹	3
	<i>Numeracy</i>	
ECE 106	Introduction to Computer Aided Engineering ²	3
MAT 290	Calculus I ² or MAT 270 Calculus with Analytic Geometry I (4)	5
	<i>Humanities and Fine Arts and Social and Behavioral Sciences¹</i>	
	At least one course must be of upper-division level; two courses must be from the same department; and two or more departments must be represented in total selection. If L1 course is not also an HU or SB course, 16 hours are required.	
ECN 111	Macroeconomic Principles ² or ECN 112 Microeconomic Principles (3)	3
	Humanities and fine arts	6–10
	Social and behavioral sciences ³	3–7
	<i>Natural Sciences</i>	
PHY 121	University Physics I: Mechanics ²	3
PHY 122	University Physics Laboratory I ²	1
PHY 131	University Physics II: Electricity and Magnetism ²	3
PHY 132	University Physics Laboratory II ²	1
Total general studies		37

NOTE: Six semester hours taken in two of the three awareness areas¹ are required in the final list of courses in

the student's graduation program of study. These courses can be included in the humanities and fine arts/social and behavioral sciences course selections

- ¹ Refer to pages 45–65 for the specific requirements and the approved list
- ² Required for graduation.
- ³ Aerospace studies (AES) courses are not acceptable for engineering degree credit.

Engineering Core		Semester Hours
CHM 114	General Chemistry for Engineers 4 or CHM 116 General Chemistry (4)	4
ECE 105	Introduction to Languages of Engineering	3
ECE 210	Engineering Mechanics I: Statics 3 or PHY 321 Newtonian Mechanics (3) ¹	3
ECE 301	Electrical Networks I	4
MAT 274	Elementary Differential Equations	3
MAT 291	Calculus II 5 or MAT 271 (4) and MAT 272 (4)	5
Approved mathematics content electives ... 4		
Basic science elective 3		3
Minimum five of the following six courses are required ² ... 15		15
ECE 312	Engineering Mechanics II: Dynamics (3) or PHY 322 Analytical Mechanics (3) ¹	
ECE 313	Introduction to Deformable Solids (3)	
ECE 333	Electrical Instrumentation (3) or ECE 334 Electronic Devices and Instrumentation (4)	
ECE 340	Thermodynamics (3) or CHM 441 General Physical Chemistry (3)	
ECE 350	Structure and Properties of Materials (3) or CHM 442 General Physical Chemistry (3) or ECE 351 Engineering Materials (3) or ECE 352 Properties of Electronic Materials (3)	
Microcomputer/Microprocessor elective (3) Select one ² .		
CEE 400	Microcomputer Applications in Civil Engineering (3)	
CHE 461	Process Control (3)	
CSE/EEE 225	Assembly Language Programming (Motorola) (3)	
CSE/EEE 226	Assembly Language Programming (Intel) (3)	
IEE 463	Computer Aided Manufacturing and Control (3)	

MAE 305	Measurements and Microcomputers (4)	—
Total required minimum engineering core		44

- ¹ Subject to department approval. If PHY 321 is selected, PHY 322 must also be completed.
- ² Courses to be selected are subject to department approval. See department requirements.

A summary of the degree requirements is as follows:

	Semester Hours
General studies	37
Engineering core	44
Major (including area of emphasis)	52
The requirements for each of the majors offered are described on the following pages.	
<hr/>	
Total degree requirements	133
Plus university First-Year Composition requirements.	

GRADUATION REQUIREMENTS

To qualify for graduation from the School of Engineering, a student must have a minimum cumulative GPA of 2.00 in addition to having a GPA of at least 2.00 for the 52 semester hours of required courses in the major field.

PROFESSIONAL ACCREDITATION

The undergraduate programs Aerospace Engineering, Bioengineering, Chemical Engineering, Civil Engineering, Computer Systems Engineering, Electrical Engineering, Industrial Engineering, Mechanical Engineering, Engineering Special Studies and Engineering Interdisciplinary Studies are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).

ANALYSIS AND SYSTEMS

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

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

485 Engineering Statistics. (3) F, S, SS
Statistical methods applied to engineering problems. Estimation, tests of hypotheses, regression, correlation, analysis of variance, and nonparametric statistics. Prerequisite: ECE 383. *General studies: N2*

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

496 Professional Seminar. (0) F, S
Topics of interest to students in the engineering special and interdisciplinary studies.

500 Research Methods: Engineering Statistics. (3) F, S, SS
Statistical methods applied to engineering problems. Estimation, tests of hypotheses, regression, correlation, and analysis of variance and nonparametric statistics. Open only to students without previous credit in ASE 485. Prerequisite: ECE 383 or 500.

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

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

Omnibus Courses: See page 40 for omnibus courses that may be offered.

ENGINEERING CORE

ECE 105 Introduction to Languages of Engineering. (3) F, S, SS
Computer programming using C, freehand drawing, visualization, and computer graphics. Lecture, recitation, lab. Prerequisites: CSE 181 or BAS C programming experience; algebra.

106 Introduction to Computer-Aided Engineering. (3) F, S
Computer aided analysis and design, computer graphics, modeling, optimization, and graphic documentation. Lecture, recitation, lab. Prerequisites: ECE 105 and 1 year high school physics or corequisite of PHY 105 or 112 or 131. *General studies: N3*

107 Freehand Drawing and Visualization. (1) F, S, SS
Representational drawing from direct observation to assist visualization, spatial awareness, and perception. Techniques include contour gesture, and value drawing. Media include pencil and computer graphics. 3 hours lab.

210 Engineering Mechanics I: Statics. (3) F, S, SS
Force systems, resultants, equilibrium, distributed forces, area moments, fluid statics, internal stresses, friction, energy criterion for equilibrium, and stability. Lecture, recitation. Prerequisites: ECE 106; MAT 271 or 291; PHY 121, 122.

301 Electrical Networks I. (4) F, S, SS
Introduction to electrical networks. Component models, transient, and steady state analysis. Lecture, recitation, lab. Prerequisites: ECE 106, PHY 131, 132. Corequisite: MAT 274.

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

Kinematics and kinetics of particles, translation and rotation in coordinate systems rigid body kinematics dynamics of systems of particles and rigid bodies, and energy and momentum principles. Lecture recitation Prerequisites ECE 210 MAT 274

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

Equilibrium, strain displacement relations, and stress-strain-temperature relations Applications to force transmission and deformations in axial, torsion, and bending of bars Combined loadings. Lecture recitation Prerequisites ECE 210 MAT 274

333 Electrical Instrumentation. 3 F, S, SS

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

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

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

340 Thermodynamics. 3 F, S, SS

Work, heat, and energy transformations and relationships between properties; laws, concepts, and modes of analysis common to applications of thermodynamics in engineering. Lecture, recitation Prerequisites CHM 114 or 116 ECE 210 PHY 131 Corequisite MAT 274

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

Basic concepts of material structure and its relation to properties. Application to engineering problems. Prerequisites: CHM 114 or 116 PHY 121

351 Engineering Materials. 3 F, S

Structure and behavior of civil engineering materials. Laboratory investigations and test criteria. Lecture lab Prerequisite: ECE 313

352 Properties of Electronic Materials. 3 F, S, SS

Introduction of Schrodinger wave equation, treatment of potential barrier problems in wave mechanics, hydrogen atom and the periodic table bonds of crystals, free electron model the band theory of solids, semiconductors introduction of semiconductor devices superconductor dielectric and magnetic properties of electronic materials. Prerequisites: ECE 333 or 334 MAT 274

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

Probability, random variables, discrete and continuous distributions descriptive statistics, and sampling distributions Prerequisite: MAT 272 or MAT 291 *General studies N2*

384 Numerical Analysis for Engineers I. 2 F, S

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

385 Numerical Analysis for Engineers II. 2 S

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

386 Partial Differential Equations for Engineers. 2 F, S

Boundary value problems separation of variables and Fourier series as applied to partial boundary value problems. Prerequisite: MAT 274

400 Engineering Communications. 3 F, S, SS

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

500 Research Methods: Probability and Statistics for Engineers. 2 F, S, SS

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

Omnibus Courses: See page 40 for omnibus courses that may be offered

SOCIETY, VALUES, AND TECHNOLOGY**STE 202 Global Awareness within Engineering Design.** 3 F

Strategies for integrating long-term environmental economic and ethical considerations into engineering design. Biomedical, environmental, biotechnology, and material science engineering case studies. Lecture critical case course. Cross-listed as BME 202. Prerequisites: ECE 106; ECN 111 or 112; ENG 102. *General studies L1*

Omnibus Courses: See page 40 for omnibus courses that may be offered

Chemical, Bio and Materials Engineering

Joseph D. Henry
Chair

(ECG 202) 602 965-3313

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

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

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

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

The department offers three B.S.E. degrees, in Chemical Engineering, in Bioengineering, and in Materials Science and Engineering. A B.S.E. degree program in pre-medical engineering is also available at ASU; it is described separately on pages 276-277

CHEMICAL ENGINEERING—B.S.E.

PROFESSORS

BERMAN, CALE, DORSON,
GUILBEAU, HENRY, KUESTER
SATER, ZW EBEL

ASSOCIATE PROFESSORS

BECKMAN, BELLAMY RAUPP,
RIVERA, TORREST

ASSISTANT PROFESSORS

BURROWS, GARCIA

PROFESSOR EMERITUS

REISER

Chemical engineers are generally concerned with chemical change. They design and operate processes that ac-

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

Consequently, in addition to the chemical and petroleum industries, chemical engineers find challenging opportunities in the plastics, solid state, electronics, computer, metals, space, food, drug, and health care industries, where they practice in a wide variety of occupations, such as environmental control, surface treatments, energy and materials transformations, biomedical applications, fermentation, protein recovery, extractive metallurgy, and separations. While a large percentage of the industrial positions are filled by graduates with bachelor's degrees, there are lucrative and creative opportunities in research and development for those who acquire postgraduate education.

Subspecializations have developed within the profession. However, the same broad body of knowledge is generally expected of all chemical engineers for maximum flexibility in industrial positions. The preparation for chemical engineering is accomplished by a blend of classroom instruction and laboratory experience.

DEGREE REQUIREMENTS

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

<i>General studies</i>	39
Sixteen hours of HU and SB type courses must be included (see page 240, general studies, for special requirements) since CHE 351 and 352 must be taken to satisfy literacy and critical inquiry elective.	
<i>Engineering core</i>	44
CHE 461; CHM 116, 331, 441, 442; ECE 105, 210, 301, 313, 333, 384, 385, MAT 274, 291 (or 271 and 272)	
<i>Major</i>	50
CHE 311, 312, 331, 332, 333, 342, 432, 442, 451, 462; CHM 113, 332, 335, 343; 12 hours technical electives	
The technical electives must be selected from among CHE upper division	

or graduate level courses or technical courses in other departments with advisor's approval. One elective course must have chemical content and be selected from CHE 458, CHM 361, or any three-semester hour 400 level CHM course.

To fulfill accreditation requirements and to prepare adequately for the advanced chemistry courses, Chemical Engineering majors are required to take the CHM 113 and 116 introductory chemistry sequence (CHM 117 and 118 are acceptable substitutes). Other freshman chemistry courses are *not acceptable*, and transfer students who have taken another chemistry course may be required to enroll in CHM 113 and 116.

Students are required to enroll in CHE 496 Professional Seminar during at least one semester of each academic year in attendance. A total of five semesters of seminar credit is necessary to meet degree requirements.

The Department of Chemical, Bio and Materials Engineering also offers graduate programs leading to the M.S.E., M.S., and Ph.D. degrees. These programs provide a blend of classroom instruction and research. A wide variety of topical and relevant research projects are available for thesis topics. Students interested in these programs should contact the department for up to date descriptive literature.

Chemical Engineering Areas of Emphasis

Students who wish to specialize may develop an area of interest through the use of technical electives and selective substitutions for required courses. Substitutions must be approved by the advisor and the Department Standards Committee and must be consistent with ABET accreditation criteria. No substitution of CHE 462 is allowed. The following are possible elective areas of emphasis with suggested courses. A student may choose electives within the general department guidelines and does not have to select one of the areas listed.

Biochemical. Students wishing to prepare for a career in biotechnology, pharmaceuticals, fermentation, food processing, and other areas within biochemical engineering should select from:

Chemical content elective: CHM 361, 461.

Technical electives: AGB 425, 426; CHE 475, 476, 477.

Biomedical. Students who are interested in biomedical engineering but wish to maintain a strong, broad chemical engineering base should select from:

Chemical content elective: CHM 361, 461

Technical electives: BME 318, 414, 416, 435, CHE 411, 412, 413.

Environmental. Students interested in the management of hazardous wastes and air and water pollution should select from:

Chemical content elective: CEE 361; CHM 361, 461, 481.

Technical electives: CEE 362, 561, 563, 564; CHE 494, 533, 552, 553; EEE 461.

Materials Students interested in the development and production of new materials such as ceramics, polymers, semiconductors, composites, superconductors, and alloys should select from:

Chemical content elective: CHE 458; CHM 438, 453, 471.

Technical electives: BME 318; ECE 350, 352; MSE 431, 470, 471, 472.

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

Process Engineering The engineering core and required chemical engineering courses serve as a suitable background for students intending to enter the traditional petrochemical and chemical process industries. Students can build on this background by selecting courses with the approval of their advisor. Examples:

Energy conversion and conservation: CHE 552, 553, 554, 556; MAE 436, 437, 438

Plant administration and management: CHE 528, 553; IEE 300, 431

Simulation, control, and design: CHE 527, 528, 556, 562, 563.

Semiconductor Processing. Students who are interested in the development and manufacturing of semiconductor and other electronic devices should select from:

Chemical content elective: CHE 458.

Technical electives: ECE 352; EEE 435, 436, MSE 472.

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

First Year	
First Semester	Semester Hours
CHE 496 Professional Seminar	0
CHM 113 General Chemistry	4
ECE 105 Introduction to Languages of Engineering	3
ENG 101 First Year Composition	3
MAT 290 Calculus I	5
General studies elective (HU or SB)*	3
Total	18
Second Semester	
CHE 496 Professional Seminar	0
CHM 116 General Chemistry	4
ECE 106 Introduction to Computer Aided Engineering	3
MAT 291 Calculus II	5
PHY 121 University Physics I Mechanics	3
PHY 122 University Physics Laboratory I	1
Total	16
Second Year	
First Semester	
CHE 311 Material Balances	3
CHE 496 Professional Seminar	0
CHM 331 General Organic Chemistry	3
CHM 335 General Organic Chemistry Laboratory	1
ENG 102 First Year Composition	3
MAT 274 Elementary Differential Equations	3
PHY 131 University Physics II: Electricity and Magnetism	3
PHY 132 University Physics Laboratory II	1
Total	17
Second Semester	
CHE 312 Introduction to Thermodynamics	3
CHE 331 Transport Phenomena I: Fluids	3
CHE 496 Professional Seminar	0
CHM 332 General Organic Chemistry	3
ECE 210 Engineering Mechanics I: Statics	3
ECE 384 Numerical Analysis for Engineers I	2
General studies elective (HU or SB)*	3
Total	17
Third Year	
First Semester	
CHE 332 Transport Phenomena II: Energy Transfer	3
CHE 342 Applied Chemical Thermodynamics	3
CHM 343 Physical Chemistry Laboratory	1
CHE 351 Measurements Laboratory	2
CHE 496 Professional Seminar	0
CHM 441 General Physical Chemistry	3

ECE 385 Numerical Analysis for Engineers II	2
General studies elective (HU or SB)*	4
Total	18
Second Semester	
CHE 333 Transfer Phenomena III: Mass Transfer	3
CHE 352 Transport Laboratories	2
CHE 496 Professional Seminar	0
CHM 442 General Physical Chemistry	3
ECE 301 Electrical Networks I	4
ECE 313 Introduction to Deformable Solids	3
General studies elective (HU or SB)*	3
Total	18

Fourth Year

First Semester	
CHE 432 Principles of Chemical Engineering Design	3
CHE 442 Chemical Reactor Design	3
CHE 451 Chemical Engineering Laboratory	2
CHE 461 Process Control	3
CHE 496 Professional Seminar	0
Technical elective	6
Total	17
Second Semester	
CHE 462 Process Design	3
CHE 496 Professional Seminar	0
ECE 333 Electrical Instrumentation	3
ECE 400 Engineering Commun- ications	3
General studies elective (HU or SB)*	3
Technical elective	6
Total	18

*Degree requirements 133 semester hours
plus English proficiency*

* See pages 45-65 for requirements and approved list.

BIOENGINEERING—B.S.E.

PROFESSORS

CHEN, DORSON, GULBEAU

ASSOCIATE PROFESSOR

TOWE

ASSISTANT PROFESSORS

PZZICONI, SWEENEY, YAMAGUCH

Bioengineering (synonyms: biomedical engineering, medical engineering) is the discipline of engineering that applies principles and methods from engineering, the physical sciences, the life sciences, and the medical sciences to understand, define, and solve problems in medicine, physiology, and biology. Bioengineering bridges the engineering, physical, life, and medical sciences. More specifically, the bioengineering program at

ASU educates engineering students to use engineering principles and technology to develop instrumentation, materials, diagnostic and therapeutic devices, artificial organs, and other equipment needed in medicine and biology and to discover new fundamental principles regarding the functioning and structure of living systems. The multidisciplinary approach to solving problems in medicine and biology has evolved from exchanges of information between specialists in the concerned areas.

Because a depth of knowledge from at least two diverse disciplines is required in the practice of bioengineering, students desiring a career in bioengineering should plan for advanced study beyond the bachelor's degree. The Bioengineering major at ASU is especially designed for students desiring advanced study in bioengineering in graduate programs, a career in the medical device industry, a career in biomedical research, a career in biotechnology research, or entry into a medical college.

Graduate degree programs in Bioengineering are offered at ASU at both the master's and doctoral levels. For more information concerning these degree programs, consult the *Graduate Catalog*.

Academic Requirements

In addition to the general studies requirement, CHM 116 General Chemistry and BIO 181 General Biology (basic science elective) must be selected in the engineering core. In the engineering core, students must take ECE 313, 333, 340, and 350 and a microcomputer/microprocessor elective selected from either CSE/EEE 225, CSE/EEE 226, IEE 463, or MAE 305. The following courses are required in the undergraduate Bioengineering major. They have been selected to meet all university requirements and ABET accreditation requirements:

	Semester Hours
AGB/BME 435 Animal Physiology I	4
BIO 182 General Biology	4
BME 318 Biomaterials	3
BME 331 Transport Phenomena I: Fluids	3
BME 334 Heat and Mass Transfer	3
BME 411 Biomedical Engineering I or BME 412 Biomedical Engineering II (3)	3
BME 413 Physiological Instrumentation	3
BME 417 Biomedical Engineering Design	3

BME 423	Physiological Instrumentation Laboratory	1
BME 490	Biomedical Engineering Projects	2
BME 496	Professional Seminar	0
CHM 113	General Chemistry	4
	Technical electives	18
	Total	51

Bioengineering Areas of Emphasis

Students interested in a career in bioengineering may elect to emphasize either biochemical, bioelectrical, biomechanical, bionuclear, biosystems, or pre-medical engineering. Although organic chemistry and biochemistry are not required in the bioelectrical, biomechanical, bionuclear, and biosystems engineering areas of emphasis, students selecting these areas are encouraged to include organic and biochemistry in their advanced degree programs of study.

Biochemical Engineering. This emphasis is designed to strengthen the student's knowledge of chemistry and transport phenomena and is particularly well suited for students interested in biotechnology. Technical electives must include: CHM 331, 332, and 361 (or 461 or 462). The remaining technical electives must be upper-division engineering courses of suitable engineering science and design content.

Bioelectrical Engineering. This emphasis is designed to strengthen the student's knowledge of electrical systems, signal processing, and medical imaging. It emphasizes bioelectrical phenomena, medical instrumentation, noninvasive imaging, and electrophysiology. Technical electives must include BME 414, ECE 334, and EEE 302 and 303. Remaining technical electives are selected from BME 412, 419, and 520, and any 400-level EEE course with acceptable engineering science and design content.

Biomechanical Engineering. This emphasis is designed to strengthen the student's knowledge of mechanics, materials science, control theory and mechanical design. It emphasizes the design of orthopedic load bearing joint replacement devices, orthotic devices, and other mechanical devices important in the practice of medicine. It also provides the fundamentals for the study of neuromuscular control and the study of human motion. The following courses are required in the engineering core:

ECE 384 and MAE 305. Technical electives may be selected from one of the following two groups:

Biomechanics: BME 416; ECE 312; MAE 404 (or MSE 440), 422, 441.

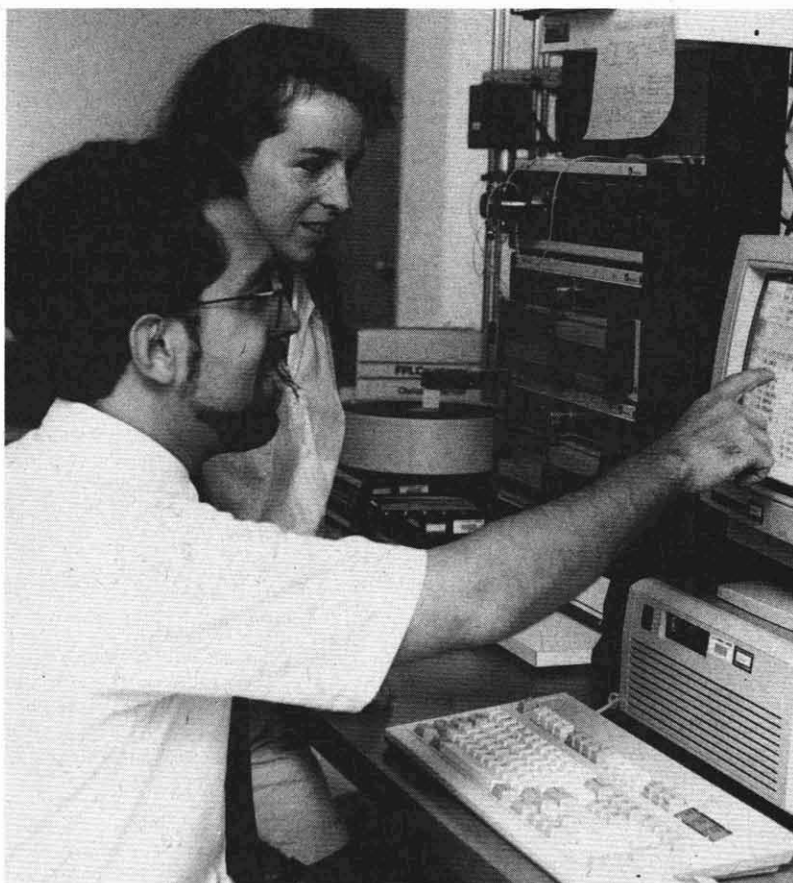
Biocontrols: BME 416, 419; ECE 312; MAE 317, 417 (or 447).

Bionuclear Engineering. This emphasis is designed to strengthen the student's knowledge of radiation interactions and shielding, health physics, radiation biology, and nuclear instrumentation. It emphasizes radiological imaging, medical physics, nuclear medicine, radiotherapy, and radiation protection. Technical electives include: BME 461, 465; PHY 361. Remaining technical electives are selected from BME 414 (or any 400-level BME, MAE [nuclear] or EEE courses with acceptable engineering science and design content) and EEE 464.

Biosystems Engineering. This emphasis is designed to strengthen the background of students interested in physiological systems analysis and design of artificial organs and medical devices that are based on chemical reactions

and include momentum, heat, or mass transfer phenomena. Analyzing or designing flowing and reacting systems requires a background in transport phenomena, thermodynamics, and reaction engineering. Whether the system involves the microcirculation and physiological events or an artificial organ and extracorporeal circulation, there is a core of bioengineering sciences and design common to both applications. Technical electives must include: BME 419; CHE 311, 312, 342; ECE 312.

Pre-medical Engineering. This emphasis is designed to meet the needs of students desiring entry into a medical or dental school. The course sequence provides an excellent background for advanced study leading to a career in research in the medical or life sciences. Technical electives must include CHM 331, 332, 335, and 336. Remaining technical electives must consist of BME prefix courses plus biology or biochemistry courses, which must meet engineering science and design content requirements.



Bioengineering Program of Study Typical Four-Year Sequence

First Year		<i>Semester Hours</i>
First Semester		
BME 496	Professional Seminar	0
CHM 113	General Chemistry	4
ECE 105	Introduction to Languages of Engineering	3
ECN 111	Macroeconomic Principles	3
ENG 101	First-Year Composition	3
MAT 290	Calculus I	5
Total		18
Second Semester		
BME 496	Professional Seminar	0
CHM 116	General Chemistry	4
ECE 106	Introduction to Computer Aided Engineering	3
MAT 291	Calculus II	5
PHY 121	University Physics I: Mechanics	3
PHY 122	University Physics Laboratory I	1
Total		16
Second Year		
First Semester		
BIO 181	General Biology	4
BME 496	Professional Seminar	0
ENG 102	First Year Composition	3
MAT 274	Elementary Differential Equations	3
PHY 131	University Physics II: Elec tricity and Magnetism	3
PHY 132	University Physics Laboratory II	1
General studies elective (HU or SB) ¹		3
Total		17
Second Semester		
BIO 182	General Biology	4
BME 496	Professional Seminar	0
ECE 210	Engineering Mechanics I: Statics	3
ECE 301	Electrical Networks I	4
General studies elective (HU or SB) ¹		3
Literacy and critical inquiry elective ^{1, 2}		3
Total		17
Third Year		
First Semester		
BME 331	Transport Phenomena I: Fluids	3
BME 435	Animal Physiology I	4
BME 496	Professional Seminar	0
ECE 340	Thermodynamics or CHM 441 General Physical Chemistry (3)	3
ECE 350	Structure and Properties of Materials	3

ECE 384	Numerical Analysis for Engineers I	2
or ECE 386 Partial Differen tial Equations for Engineers (2) or MAT 242 Elementary Linear Algebra (2)		
Technical elective		3
Total		18

Second Semester		
BME 318	Biomaterials	3
BME 334	Heat and Mass Transfer	3
BME 496	Professional Seminar	0
ECE 313	Introduction to Deformable Solids	3
ECE 333	Electrical Instrumentation	3
General studies elective HU or SB ¹		3
Technical elective		3
Total		18

Fourth Year

First Semester		
BME 411	Biomedical Engineering I, or BME 412 Biomedical Engineering II (3)	3
BME 413	Physiological Instrumentation	3
BME 423	Physiological Instrumenta tion Laboratory	1
BME 490	Biomedical Engineering Projects	2
BME 496	Professional Seminar	0
CSE/EEE 225	Assembly Language Programming (Motorola)	3
or CSE/EEE 226 As sembly Language Programming (Intel (3 or IEE 463 Computer Aided Manufacturing and Control (3)		
Technical electives		6
Total		18

Second Semester		
BME 417	Biomedical Engineering Design	3
BME 496	Professional Seminar	0
ECE 383	Probability and Statistics for Engineers	2
ECE 400	Engineering Communi cations	3
General studies elective (HU or SB) ¹		3
Technical elective		6
Total		17
<i>Degree requirements 133 semester hours plus English proficiency</i>		

¹ See pages 45–65 for the requirements and the approved list of courses.

² See page 240 for special requirements and selection of an L1 elective

MATERIALS SCIENCE AND ENGINEERING—B.S.E.

REGENTS' PROFESSOR
WAGNER

PROFESSORS
CARPENTER, JACOBSON
KRAUSE, STANLEY

ASSOCIATE PROFESSORS
HENDRICKSON, SHIN

ASSISTANT PROFESSOR
DEY

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

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

The tools of a materials scientist include highly sophisticated analytical equipment. Since a considerable emphasis in materials science is placed on the microscopic world, instruments such as transmission and scanning electron microscopes, X ray diffractometers, and Auger spectrometers are a necessary part of the field

DEGREE REQUIREMENTS

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

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

General studies 37

See pages 240–241 for School of Engineering requirements

Engineering core 44

CHM 116, 441; ECE 105, 210 (or PHY 321, 301, 313, 333 or 312 or PHY 322, 350, 383 or 384 or 386) IEE 463 or MAE 305, MAT 242, 274, 291 or 271 and 272; PHY 361

Major 52

CHE 311, CHM 113, MAE 351, 441; MSE 355, 420, 430, 440, 450, 470, 471, 472, 464, 482, 490, 496

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

Materials Science and Engineering Areas of Emphasis

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

Chemical Processing and Energy Systems CHE 432, 442, 451; MAE 371, 372, 388, 430, 437, 438; MSE 530, 531, 533.

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

Manufacturing and Materials Processing MAE 372, 403, 415, 422, 441, 442; MSE 441, 540, 549, 560.

Mechanical Metallurgy. MAE 305, 415, 422, 441, 442, 520, 522, 524, 527, 557, MSE 431, 441, 480, 520, 521, 540, 549, 550, 558, 560

Physical Metallurgy. CHM 471; MAE 372, 388, 422, MSE 431, 441, 480, 520, 521, 550, 558, 559, 560, 561, 573; PHY 361, 362, 471, 481.

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

Materials Science and Engineering

Program of Study

Typical Four-Year Sequence

First Year

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

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

Second Year

First Semester			
CHE 311	Material Balances	3	
ECE 210	Engineering Mechanics I: Statics	3	
	or PHY 321 Newtonian Mechanics 3)		
MAT 272	Calculus with Analytic Geometry III	4	
MSE 496	Professional Seminar	0	
PHY 31	University Physics II Electricity and Magnetism	3	
PHY 132	University Physics Laboratory II	1	
	General studies elective (HU or SB)	3	
Total			17

Second Semester			
ECE 301	Electrical Networks I	4	
ECE 313	Introduction to Deformable Solids	3	
ECE 350	Structure and Properties of Materials	3	
MAT 242	Elementary Linear Algebra	2	
MAT 274	Elementary Differential Equations	3	
MSE 496	Professional Seminar	0	
	Literacy and critical inquiry elective ²	3	
Total			18

Third Year

First Semester			
CHM 441	General Physical Chemistry	3	
ECE 312	Engineering Mechanics II. Dynamics	3	
	or ECE 333 Electrical Instrumentation 3) or		

	PHY 322 Analytical Mechanics (3)		
IEE 463	Computer Aided Manufacturing and Control	3	
	or MAE 305 Measurements and Microcomputers (4)		
MSE 355	Introduction to Material Science and Engineering	3	
MSE 496	Professional Seminar	0	
PHY 361	Introductory Modern Physics	3	
	General studies elective (HU or SB) ¹	3	
Total			18

Second Semester			
ECE 383	Probability and Statistics for Engineers	2	
	or ECE 384 Numerical Analysis for Engineers I (2) or ECE 386 Partial Differential Equations for Engineers (2)		
MAE 351	Manufacturing Processes Survey	3	
MAE 441	Design Theory and Techniques	3	
MSE 420	Physical Metallurgy	4	
MSE 496	Professional Seminar	0	
	General studies elective (HU or SB) ¹	3	
	Technical elective	3	
Total			18

Fourth Year

First Semester			
ECE 400	Engineering Communications	3	
MSE 440	Mechanical Properties of Solids	3	
MSE 450	X Ray and Electron Diffraction	3	
MSE 471	Introduction to Ceramics	3	
MSE 482	Materials Engineering Design	3	
MSE 496	Professional Seminar	0	
	General studies elective (HU or SB) ¹	3	
Total			18

Second Semester			
MSE 430	Thermodynamics of Materials	3	
MSE 470	Polymers and Composites	3	
MSE 472	Integrated Circuit Materials Science	3	
MSE 476	Nonmetallic Materials Laboratory	2	
MSE 490	Capstone Design Project	3	
MSE 496	Professional Seminar	0	
	Technical elective	3	
Total			17

Degree requirements 133 semester hours plus English proficiency

¹ See pages 45–65 for the requirements and the approved list.

² See page 240 for special requirements and selection of an L1 elective.

CHEMICAL ENGINEERING

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

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

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

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

333 Transport Phenomena III: Mass Transfer. (3) F, S
The application of transport phenomena to mass transfer. The design of mass transfer equipment, including staged processes. Pre- or corequisites: CHE 332, 342.

342 Applied Chemical Thermodynamics. (3) F, S
Energy relations and equilibrium conversions based on chemical potentials and phase equilibria. Prerequisites: CHE 312, ECE 384

351 Measurements Laboratory. (2) F
Introduction to laboratory practices and the use of measurement devices. Prerequisites: CHE 311, ENG 102. Pre- or corequisites: CHE 312 or ECE 340, CHM 335. *General studies. L1 (if taken with CHE 352).*

352 Transport Laboratories. (2) S
The demonstration of transport phenomena principles with experiments in fluid flow, heat, and mass transfer. Prerequisites: CHE 331, 351. Corequisite: CHE 332. *General studies L1 (if taken with CHE 351)*

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

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

413 Physiological Instrumentation. (3) F
Problems, concepts, and techniques of biomedical instrumentation in static and dynamic environments. Cross-listed as BME 413. Prerequisites: AGB BME 435 ECE 333 or 334

432 Principles of Chemical Engineering Design. (3) F
Multicomponent distillation, engineering economics, equipment sizing and costs, plant operation economics, and simulation and optimization on techniques. Prerequisites: CHE 333 342

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

451 Chemical Engineering Laboratory. (2) F
Operation, control, and design of experimental and industrial process equipment. Independent research projects. 6 hours lab. Prerequisite: CHE 352. Corequisites: CHE 432, 442.

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

461 Process Control. (3) F
Process dynamics, instrumentation, and feedback applied to automatic process control. Lecture, lab. Prerequisite: ECE 301. *General studies N3*

462 Process Design. (3) S
Application of economic principles to optimize equipment selection and design development and design of process systems. Prerequisites: CHE 432, 442

475 Biochemical Engineering. (3) N
Application of chemical engineering methods, mass transfer, thermodynamics, and transport phenomena to industrial biotechnology. Prerequisite: instructor approval

476 Bioreaction Engineering. (3) N
Principles of analysis and design of reactors for processing with cells and other biological catalytic materials, applications of reaction engineering in biotechnology. Prerequisite: instructor approval

477 Bioseparation Processes. (3) N
Principles of separation of biological catalytic chemicals. The application, scale-up, and design of separation processes in biotechnology. Prerequisite: instructor approval

490 Chemical Engineering Projects. (1) S, SS
Individual projects in chemical engineering operations and design. Prerequisite: instructor approval.

496 Professional Seminar. (0) F, S
Professional and ethical aspects with a discussion of employment opportunities and responsibilities. Lectures. *fe d tr ps*

501 Introduction to Transport Phenomena. (3) F, S
Transport phenomena with emphasis on fluid systems. Prerequisite: transition student with instructor approval.

502 Introduction to Energy Transport. (3) F, S
Continuation of transport principles, with emphasis on energy transport in stationary and fluid systems. Prerequisite: transition student with instructor approval

503 Introduction to Mass Transport. (3) F, S
The application of transport phenomena to mass transfer. The design of mass transfer equipment including staged processes. Prerequisite: transition student with instructor approval

504 Introduction to Chemical Thermodynamics. (3) F, S
Energy relations and equilibrium conversions based on chemical potentials and phase equilibria. Prerequisite: transition student with instructor approval

505 Introduction to Chemical Reactor Design. (3) F, S
Application of kinetics to chemical reactor design. Prerequisite: transition student with instructor approval

515 Biomedical Transport Processes. (3) N
Principles of momentum, heat, and mass transport with applications to medical and biological systems and medical device design. Cross-listed as BME 515. Prerequisite: instructor approval

517 Medical Transport Devices I. (3) N
Heat, mass, and momentum transfer concepts are developed from first principles and applied to the design and application of medical devices. Emphasis is on extracorporeal treatment of blood with channel dimensions which greatly exceed cellular dimensions. Cross-listed as BME 517. Prerequisites: partial differential equations; at least 1 course in heat, mass, or momentum transfer

518 Introduction to Biomaterials. (3) F
Topics include structure-property relationships for synthetic and natural biomaterials, biocompatibility, and uses of materials to replace body parts. Cross-listed as BME 518. Prerequisite: ECE 313 or instructor approval

527 Advanced Applied Mathematical Analysis in Chemical Engineering. (3) F
Formulation and solution of complex mathematical relationships resulting from the description of physical problems in mass, energy, and momentum transfer and chemical kinetics.

528 Process Optimization Techniques. (3) S
Method for optimizing engineering processes. Experimental design and analysis, linear and nonlinear regression methods; case studies, search, and dynamic programming algorithms

533 Transport Processes I. (3) F
Unified treatment of momentum, heat, and mass transfer from molecular theory, and continuum points of view. Continuum equations of microscopic and macroscopic systems and multicomponent and multiphase systems. Cross-listed as BME 533

534 Transport Processes II. (3) S
Continuation of CHE/BME 533, emphasizing mass transfer. Cross-listed as BME 534. Prerequisite: BME/CHE 533.

535 Turbulent Mixing. (3) N
Turbulence and mixing in multicomponent systems without chemical reactions. Computational models applied to chemical processes. Prerequisite: CHE 533

536 Convective Mass Transfer. (3) N
Turbulent flow for multicomponent systems, including chemical reactions with applications in separations and a pollution. Prerequisite: CHE 533 or MAE 571

543 Thermodynamics of Chemical Systems. (3) F
Classical and statistical thermodynamics of nonequilibrium physicochemical systems and processes. Prediction of optimum operating conditions. Cross-listed as BME 543

544 Chemical Reactor Engineering. (3) S
Reaction rates, thermodynamics, and transport principles applied to the design and operation of chemical reactors. Cross-listed as BME 544. Prerequisite: BME/CHE 543.

548 Topics in Catalysis. (3) N
Engineering catalysis emphasizes adsorption kinetics, characterization, diffusional considerations, and reactor design. Other topics include mechanistic, surface analyses, and electronic structure.

552 Industrial Water Quality Engineering. (3) N

Water pollutants quality criteria and control chemical treatment processes and system design. Case studies. Prerequisite: CHE 331 or equivalent.

553 Air Quality Control. (3) N

Air pollutants origins, effects and control. Physical and chemical processes including dispersion, combustion sampling control equipment design and special topics. Prerequisite: CHE 331 or equivalent.

554 New Energy Technology. (3) N

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

556 Separation Processes. (3) N

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

558 Electronic Materials. (3) N

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

561 Advanced Process Control. (3) S

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

562 Chemical Systems Engineering. (3) N

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

563 Chemical Engineering Design. (3) N

Computational methods, the design of chemical plants and processes.

Omnibus Courses: See page 40 for omnibus courses that may be offered.

BIOENGINEERING**BME 202 Global Awareness within Engineering Design.** (3) F

Strategies for integrating long-term environmental, economic and ethical considerations into engineering design. Biomedical, environmental biotechnology and materials engineering case studies. Lecture, critical discussion course. Cross-listed as STE 202. Prerequisites: ECE 106, ECN 111 or 112, ENG 102. *General studies: L1*

318 Biomaterials. (3) S

Material properties of natural and artificial biomaterials. Tissue and blood biocompatibility. Uses of materials to replace body parts. Prerequisites: ECE 313, 350.

331 Transport Phenomena I: Fluids. (3) F, S

Transport phenomena with emphasis on fluid systems. Cross-listed as CHE 331. Prerequisites: CHE 311 (except BME majors); MAT 274; PHY 131.

334 Bioengineering Heat and Mass Transfer. (3) S

Application of the principles of heat and mass transfer phenomena to solution of problems in medical and medical device design. Prerequisites: BME 331, ECE 340.

411 Biomedical Engineering I. (3) F

Review of diagnostic and prosthetic methods using engineering methodology. Introduction

to transport, metabolic and autoregulatory processes in the human body. Cross-listed as CHE 411. Prerequisite: instructor approval.

412 Biomedical Engineering II. (3) S

Review of electrophysiology and nerve pacemaker applications, introduction to biomechanics and joint/limb replacement technology, cardiovascular and pulmonary fluid mechanics, and the application of mathematical modeling. Cross-listed as CHE 412. Prerequisite: instructor approval.

413 Physiological Instrumentation. (3) F

Problems, concepts and techniques of biomedical instrumentation in static and dynamic environments. Cross-listed as CHE 413. Prerequisites: AGB BME 435, ECE 333 or 334.

414 Biomedical Instrumentation II. (3) F

Electrical, physical and mechanical principles governing the operation of modern biomedical instrumentation including biosensors, EEG, ECG recorders, ultrasonic imaging, and diagnostic devices. Lecture/lab. Prerequisite: ECE 333 or 334.

415 Biomedical Transport Processes. (4) A

Principles of momentum, heat, and mass transfer with applications to medical and biological systems and medical device design. Prerequisites: MAT 274, PHY 131.

416 Biomechanics. (3) F

Mechanical properties of bone, muscle and soft tissues. Static and dynamic analysis of human movement tasks such as locomotion. Prerequisite: ECE 313. Corequisite: ECE 312.

417 Biomedical Engineering Design. (3) S

Technical regulatory, economic, legal, social, and ethical aspects of medical device systems engineering design. Prerequisites: BME 318, 334.

419 Biocontrol Systems. (3) S

Application of near and non-linear control systems techniques toward analysis of neuromusculoskeletal, cardiovascular, thermal and mass transfer systems of the body. Prerequisites: ECE 301, MAT 274.

423 Biomedical Instrumentation Laboratory. (1) F

Laboratory experience with problems, concepts, and techniques of biomedical instrumentation in static and dynamic environments. Lab. Prerequisites: AGB BME 435, ECE 333 or 334. Corequisite: BME/CHE 413.

435 Animal Physiology I. (4) F

Control and function of the nervous, muscular, cardiovascular, respiratory and renal systems of domestic animals. Lecture/lab. Cross-listed as AGB 435. Prerequisites: BO 181, CHM 113.

436 Animal Physiology II. (3) N

Control and function of the endocrine, digestive, and reproductive systems of domestic animals. Principles of adaptation of animals to the environment. Prerequisite: BME 435 or ZOL 360.

437 Animal Physiology Laboratory. (1) N

Selected physiological experiments to accompany BME 436. Lab. Corequisite: BME 436.

461 Health Physics Principles and Radiation Measurements. (3) S

Source characteristics, dosimetry, shielding, and measurement techniques for cosmogenic terrestrial, and anthropogenic radiation ionizing and non-ionizing radiation theory. ALARA concept. Emphasis on instrumentation, detectors and environmental monitoring. Lecture/lab. Prerequisite: ECE 301.

465 Clinical Nuclear Engineering I. (3) N

Fundamentals of clinical nuclear engineering and medical health physics practice. Radiation biology, dosimetry and shielding for radionuclide therapy and diagnostic procedures. Prerequisite: instructor approval.

490 Biomedical Engineering Projects. (1-5) F, S, SS

Individual projects in medical systems or medical device design and development.

496 Professional Seminar. (0) F, S

Professional and ethical aspects with a discussion of employment opportunities and responsibilities. Lecture/field trips.

511 Biomedical Engineering. (3) A

Diagnostic and prosthetic methods using engineering methodology. Transport, metabolic, and autoregulatory processes in the body.

512 Biomedical Engineering II. (3) A

Electrophysiology and nerve pacemaker applications, introduction to biomechanics and joint/limb replacement, technology, cardiovascular and pulmonary fluid mechanics, and mathematical modeling.

513 Physiological Instrumentation I. (3) A

Problems, concepts, and techniques of biomedical instrumentation in static and dynamic environments.

514 Biomedical Instrumentation. (3) F

Electrical, physical, and mechanical principles governing the operation of modern biomedical instrumentation. Prerequisites: ECE 334, MAT 274.

515 Biomedical Transport Processes. (3) N

Principles of momentum, heat, and mass transport with applications to medical and biological systems and medical device design. Cross-listed as CHE 515. Prerequisite: instructor approval.

516 Topics in Biomechanics. (3) S

Mechanical properties of bone, muscle, and soft tissues. Static and dynamic analysis of human movement tasks, including in-depth project. Prerequisites: ECE 312 and 313 or instructor approval.

517 Medical Transport Devices I. (3) N

Heat, mass, and momentum transfer concepts are developed from first principles and applied to the design and application of medical devices. Emphasis is on extracorporeal treatment of blood with channel dimensions which greatly exceed cellular dimensions. Cross-listed as CHE 517. Prerequisites: partial differential equations at least 1 course in heat, mass or momentum transfer.

518 Introduction to Biomaterials. (3) F

Topics include structure-property relationships for synthetic and natural biomaterials, biocompatibility and uses of materials to replace body parts. Cross-listed as CHE 518. Prerequisite: ECE 313 or instructor approval.

519 Topics in Biocontrol Systems. (3) F

Linear and non-linear control systems analysis of neuromusculoskeletal, cardiovascular, thermal and mass transfer systems of the body, including in-depth project. Prerequisite: MAT 274.

520 Bioelectric Phenomena. (3) N

Study of the origin, propagation and interaction of bioelectricity involving living volume conductor problem, mathematical analysis of bioelectric interactions, and uses in medical diagnosis.

521 Neuromuscular Control Systems. 3) S
Overview of sensor motor brain structures
Application of nonlinear, adaptive optimal
and supervisory control theory to eye head
hand coordination and locomotion

522 Biosensor Design and Application. 3
A
Theory and principles of biosensor design and
application in medicine and biology. Principles
of measurements with biosensors. Prerequisite:
instructor approval

523 Physiological Instrumentation Lab. (1)
F

Laboratory experience with problems, concepts,
and techniques of biomedical instrumentation
on static and dynamic environments. Lab.
Prerequisites: AGB BME 435; ECE 333
or 334 Corequisite: BME/CHE 413

524 Fundamentals of Applied Neural Control. (3) A
Fundamental concepts of electrical stimulation
and recording in the nervous system with the
goal of functional control restoration. Corequisite:
BME 435 or instructor approval

532 Prosthetic and Rehabilitation Engineering. (3) A
Analysis and critical assessment of design
and control strategies for state-of-the-art
medical devices used in rehabilitation engineering.
Prerequisites: BME 416 (or EPE
610 435; ECE 312, 313. Corequisite BME
419.

533 Transport Processes I. 3 F
Unified treatment of momentum, heat and
mass transfer from molecular theory, and
continuum points of view. Continuum equations of
microscopic and macroscopic systems and
multicomponent and multiphase systems
Cross listed as CHE 533

534 Transport Processes II. (3) S
Continuation of BME/CHE 533 emphasizing
mass transfer. Cross listed as CHE 534. Prerequisite:
BME/CHE 533

543 Thermodynamics of Chemical Systems. (3) F
Classical and statistical thermodynamics of
nonideal physicochemical systems and processes,
prediction of optimum operating conditions.
Cross listed as CHE 543.

544 Chemical Reactor Engineering. (3) S
Reaction rates, thermodynamics, and transport
principles applied to the design and operation
of chemical reactors. Cross listed as
CHE 544. Prerequisite: BME/CHE 543

566 Medical Imaging Instrumentation. (3) N
Design and analysis of imaging systems and
nuclear devices for medical diagnosis, therapy
and research. Laboratory experiments
using diagnostic radiology, fluoroscopy, ultrasound,
and CAT scanning. Lecture, lab. Prerequisite:
BME 465 or EEE/NUC 465 or instructor approval

567 Radiation Shielding and Transport. (3)
F
Shielding for radiation therapy, diagnostic radiology,
cyclotrons and nuclear reactors. Monte Carlo
and empirical computational methods.
Regulations, and design problems. Cross
listed as EEE/NUC 567. Prerequisite:
BME 465 or EEE/NUC 465

568 Medical Tomography. (3) S
CT, SPECT, PET and MR. 3-dimensional *in vivo*
measurements. Instrument design,
physiological modeling, clinical protocols, reconstruction
algorithms, and quantitative issues. Prerequisite:
EEE/NUC 465

569 Radiochemistry and Radiopharmaceutical Production. (3) N

Advanced principles of cyclotron design,
targetry, operation, and utilization. Novel
synthesis, tracer preparation, quality control and
distribution studies. Prerequisite: BME 465
or EEE/NUC 465

Omnibus Courses: See page 40 for omnibus
courses that may be offered

MATERIALS SCIENCE AND ENGINEERING

MSE 355 Introduction to Materials Science and Engineering. (3) F

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

420 Physical Metallurgy. 4 F
Crystal structure and defects. Phase diagrams,
metallography, solidification and casting,
deformation and annealing. Lecture, lab.
Prerequisite: ECE 350

430 Thermodynamics of Materials. (3) N
Principles of statistical mechanics, statistical
thermodynamics of single crystals, solutions,
phase equilibrium, free energy of reactions,
free electron theory, and thermodynamics of
defects. Prerequisite: CHE 312 or ECE 340.

431 Corrosion and Corrosion Control. (3) S
Introduction to corrosion mechanisms and
methods of preventing corrosion. Topics include
the following: electrochemistry, polarization,
corrosion rates, oxidation, coatings and
cathodic protection. Prerequisite: ECE 350

440 Mechanical Properties of Solids. (3) S
Effects of environmental and microstructural
variables of mechanical properties, including
plastic deformation, fatigue, creep, brittle fracture
and internal friction. Prerequisite: ECE
350.

441 Analysis of Material Failures. (3) S
Identification of types of failures. Analytical
techniques: Fractography, SEM, non-destructive
inspection, and metallography. Mechanical
and electronic components. Prerequisite:
ECE 350

450 X-Ray and Electron Diffraction. (3) F
Fundamentals of X-ray diffraction, transmission
electron microscopy, and scanning electron
microscopy. Techniques for studying surfaces,
internal microstructures, and fluorescence.
Lecture, demonstrations. Prerequisite:
ECE 350

470 Polymers and Composites. (3) F
Relationship between chemistry, structure,
and properties of engineering polymers. Design
properties and behavior of fiber composite
systems. Cross listed as MAE 455.
Prerequisite: ECE 350.

471 Introduction to Ceramics. (3) F
Principles of structure and property relations
in ceramic materials. Processing techniques.
Applications in mechanical, electronic, and
superconducting systems. Prerequisite: ECE
350.

472 Integrated Circuit Materials Science.
(3) N
Principles of materials science applied to
semiconductor processing and fabrication in
metals, ceramics, polymers, and semiconductors.
Prerequisite: ECE 350

476 Nonmetallic Materials Laboratory. (2) S
Experimental measurement of properties of
polymeric, ceramic, and electronic materials.
Structure characterization. Lecture, lab. Prerequisite:
ECE 350; MSE 355

480 Manufacturing Engineering. (3) F
Analysis and optimization of manufacturing
processes. Prerequisite: ECE 350.

482 Materials Engineering Design. (3) F, S
Principles of the design process. Feasibility
and optimization. Manufacturing processes,
materials selection, failure analysis, and economic
analysis. Prerequisites: ECE 313, 350

490 Capstone Design Project. (1, 3) F, S
For teams/groups. Fundamental or applied
aspects of engineering materials; emphasis
on experimental problems and design. Prerequisite:
MSE 430, 440, 450

496 Professional Seminar. (0) F, S
Professional and ethical aspects with a discussion
of employment opportunities and responsibilities.
Lectures, field trips

510 X-Ray and Electron Diffraction. (3) F
Fundamentals of X-ray diffraction, transmission
electron microscopy and scanning electron
microscopy. Techniques for studying surfaces,
internal microstructures, and fluorescence.
Lecture, demonstrations. Prerequisite:
transition student with instructor approval

511 Corrosion and Corrosion Control. (3) S
Introduction to corrosion mechanisms and
methods of preventing corrosion. Topics include
the following: electrochemistry, polarization,
corrosion rates, oxidation, coatings and
cathodic protection. Prerequisite: transition
student with instructor approval

512 Analysis of Material Failures. (3) S
Identification of types of failures. Analytical
techniques: Fractography, SEM, non-destructive
inspection, and metallography. Mechanical
and electronic components. Prerequisite:
transition student with instructor approval

513 Polymers and Composites. (3) F
Relationship between chemistry, structure
and properties of engineering polymers. Design,
properties and behavior of fiber composite
systems.

514 Physical Metallurgy. (4) F
Crystal structure and defects. Phase diagrams,
metallography, solidification and casting,
and deformation and annealing. Lecture,
lab. Prerequisite: transition student with
instructor approval

515 Thermodynamics of Materials. (3) N
Principles of statistical mechanics, statistical
thermodynamics of single crystals, solutions,
phase equilibrium, free energy of reactions,
free electron theory, and thermodynamics of
defects. Prerequisite: transition student with
instructor approval

516 Mechanical Properties of Solids. (3) S
Effects of environmental and microstructural
variables of mechanical properties including
plastic deformation, fatigue, creep, brittle fracture
and internal friction. Prerequisite: transition
student with instructor approval

517 Introduction to Ceramics. (3) F
Principles of structure, property relations in
ceramic materials. Processing techniques.
Applications in mechanical, electronic and
superconducting systems. Prerequisite: transition
student with instructor approval

518 Integrated Circuits Materials Science. 3 N

Principles of materials science applied to semiconductor processing and fabrication in metals, ceramics, polymers, and semiconductors. Prerequisite: transition student with instructor approval

520 Theory of Crystalline Solids. 3 F
Anisotropic properties of crystals tensor treatment of elastic, magnetic, electric and thermal properties, and crystallography of Martensitic transformations

521 Defects in Crystalline Solids. 3 S
Introduction to the geometry interaction, and equilibrium between dislocations and point defects Relations between defects and properties will be discussed Prerequisite: ECE 350 or instructor approval

530 Materials Thermodynamics and Kinetics. (3 S)
Thermodynamics of alloy systems, diffusion in solids, kinetics of precipitation, and phase transformations in solids Prerequisites: CHE 312 or ECE 340, ECE 350

531 Statistical Thermodynamics. (3) N
Kinetic and quantum theory Statistical mechanics ensemble theory Structure and thermodynamics of non-interacting and interacting particles Boltzmann integro-differential equation Cross listed as MAE 582 Prerequisite: MAE 581

533 Direct Energy Conversion. 3 N
Advanced selected topics in direct energy conversion theory, design and applications. Cross listed as MAE 537 Prerequisite: MAE 581

540 Fracture, Fatigue, and Creep. 3 F
Relationship between microstructure and fracture, fatigue and creep properties of materials Environmental effects and recent developments Current theories and experimental results Prerequisite: MSE 440 or equivalent

549 Manufacturing Analysis. (3) S
Analysis and optimization of manufacturing processes Prerequisite: MSE 480

550 Advanced Materials Characterization. (3) N
Analytical instrumentation for characterization of materials SEM, S MS Auger, analytical TEM, and other advanced research techniques

556 Electron Microscopy Laboratory. 3 F
Laboratory support for MSE 558 Cross listed as SEM 556 Prerequisite: MSE/SEM 558

557 Electron Microscopy Laboratory. (3) S
Lab support for MSE 559 Cross listed as SEM 557 Prerequisite: MSE/SEM 559

558 Electron Microscopy I. (3) F
Microanalysis of the structure and composition of materials using images diffraction and X-ray and energy loss spectroscopy. Knowledge of elementary crystallography rockwell attitude, stereographic projections, and complex variables is required Cross listed as SEM 558 Prerequisite: instructor approval

559 Electron Microscopy II. 3 S
Microanalysis of the structure and composition of materials using images diffraction and X-ray, and energy loss spectroscopy Knowledge of elementary crystallography rockwell attitude stereographic projections and complex variables is required Cross listed as SEM 559 Prerequisite: instructor approval

560 Strengthening Mechanisms. 3 S
Deformation of crystalline materials. Properties of dislocations Theories of strain hardening, solid solution precipitation, and transformation strengthening Prerequisite: ECE 350 or equivalent

561 Phase Transformation in Solids. 3 N
Heterogeneous and homogeneous precipitation on reactions, shear displacement reactions and order-disorder transformation

562 Ion Implantation. 3 S
Includes defect production and annealing Generalized treatment including ion implantation, neutron irradiation damage, and the interaction of other incident beams Prerequisite: MSE 450

570 Polymer Structure and Properties. 3 F
Relationships between structure and properties of synthetic polymers including glass transition molecular relaxations crystalline state viscoelasticity morphology characterization, and processings

571 Ceramics. 3 A
Includes ceramic processing, casting molding, firing, sintering, crystal defects and mechanical electronic, and physical properties Prerequisites: MSE 521, 561

572 Semiconductor Phase Diagrams. (3) A
Analysis of binary and ternary phase diagrams and application to semiconductor growth and vapor and liquid phase epitaxy Prerequisite: MSE 521.

573 Magnetic Materials. 3 A
Emphasis on ferromagnetic and ferrimagnetic phenomena Domains, magnetic anisotropy and magnetocrystallinity. Study of commercial magnetic materials Prerequisite: MSE 520 or equivalent

Omnibus Courses: See page 40 for omnibus courses that may be offered

Civil Engineering

Larry W. Mays
Chair

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PROFESSORS

BETZ, W HOUSTON, MAMLOUK,
MATTAS, MAYS, O BANNON,
RUFF, SINGHAL

ASSOCIATE PROFESSORS

DUFFY, FAF T S, HAUSER HINKS,
S. HOUSTON RAJAN,
UPCHURCH, ZAN EWSK

ASSISTANT PROFESSORS

BAAJ, FOX, MOBASHER

PROFESSORS EMERITI

BLACKBURN, BORGIO, KLOCK,
LUNDGREN, P AN

Civil engineers are involved in some of the most critical and visible problems facing modern society. Civil engineers are technical problem solvers, meeting such challenges as providing

efficient transportation systems, energy and water conservation and development, urban planning, and flood and earthquake damage reduction.

Civil engineering is primarily concerned with the public domain. The profession involves analysis, planning, design, construction, and maintenance of many types of buildings for government, commerce and industry for example, high rise office towers, factories, schools, airports, tunnels and subway systems, dams, canals, and water purification and environmental protection facilities such as solid waste and wastewater treatment systems. Civil engineers are concerned with the impact of their projects on the public and the environment and coordinate the needs of society with technical and economic feasibility.

ENTRANCE REQUIREMENTS

See "Admission," and "Degrees and Majors," pages 238-240 for information regarding entrance requirements.

DEGREE REQUIREMENTS

The B.S.E. degree in Civil Engineering requires a minimum of 133 semester hours of course work, not including the university English requirement. The minimum requirements are for a student who has successfully completed at least a year (each) of high school chemistry, physics, computer programming, and precalculus algebra and trigonometry.

The B.S.E. degree program consists of three categories:

1. general studies and university English (see pages 45-48, 66);
2. engineering core (see page 241); and
3. major (Civil Engineering).

For the Civil Engineering program, delete ECE 333 and 350, and add ECE 351 and CEE 400 from the engineering core. The major consists of the Civil Engineering core, design electives, and technical electives.

Civil Engineering Core

Thirty-five hours are required. CEE courses, except CEE 296 and 321, may not be taken until all mathematics (MAT) and all engineering core courses (ECE), except ECE 400, have been completed with an average grade of "C" or better.

	Semester Hours
CEE 296 Introduction to Civil Engineering.....	1
CEE 321 Structural Analysis.....	3
CEE 322 Steel Structures.....	3
CEE 323 Concrete Structures.....	3
CEE 341 Hydraulic Engineering... ..	4
CEE 351 Soil Mechanics.....	4
CEE 361, 362 Environmental Engineering.....	6
CEE 372 Transportation Engineering..	4
CEE 496 Topics in Civil Engineering Practice	1
IEE 300 Economic Analysis for Engineers.....	3
MAE 371 Fluid Mechanics.....	3

Civil Engineering Design Electives

Two courses (six semester hours) from the following list are required.

	Semester Hours
CEE 423 Structural Design.....	3
CEE 441 Water Resources Engineering.....	3
CEE 452 Foundations.....	3
CEE 466 Sanitary Systems Design	3
CEE 475 Highway Geometric Design.....	3

Civil Engineering Technical Electives

Eleven hours are required. A maximum of six hours may be selected outside civil engineering with advisor's approval. Courses, in addition to those listed, are available and are indicated as CEE 498 on the three year teaching plan of the department.

Construction Engineering. CON 344, 383, 495, 496. Only one course may be selected for technical elective credit.

Environmental Engineering. Water treatment, industrial and domestic waste treatment and disposal, public health engineering, industrial hygiene. CEE 466; CHM 231; MIC 220 (or 205 and 206).

Geotechnical Engineering. Assessment of engineering properties and design utilizing soils and rocks as engineering materials. CEE 452.

Structural Engineering. Analysis and design of structures for buildings, bridges, space frames, structural mechanics. CEE 423, 432.

Transportation Engineering. Analysis and design of transportation facilities, transportation planning and economics, transportation in the urban environment. CEE 412, 471, 475.

Water Resources Engineering. Planning and design of facilities for collec-

tion, storage and distribution of water, water systems management, estimating availability of water resources. CEE 441.

Civil Engineering Program of Study Typical Four-Year Sequence

	Semester Hours
First Semester	
CEE 296 Introduction to Civil Engineering.....	1
CHM 114 General Chemistry for Engineers ²	4
ECE 105 Introduction to Languages of Engineering.....	3
ENG 101 First Year Composition.....	3
MAT 270 Calculus with Analytic Geometry I.....	4
General studies elective (HU or SB) ¹	3
Total	18
Second Semester	
ECE 106 Introduction to Computer Aided Engineering.....	3
ENG 102 First Year Composition.....	3
MAT 271 Calculus with Analytic Geometry II.....	4
PHY 121 University Physics I Mechanics	3
PHY 122 University Physics Laboratory I	1
General studies elective (HU or SB)	3
Total	17

Sophomore Year

	Semester Hours
First Semester	
ECE 210 Engineering Mechanics I: Statics	3
MAT 272 Calculus with Analytic Geometry III	4
MAT 274 Elementary Differential Equations	3
PHY 131 University Physics II: Electricity and Magnetism	3
PHY 132 University Physics Laboratory II	1
Literacy and critical inquiry elective ^{1 3} ..	3
Total	17
Second Semester	
ECE 301 Electrical Networks I	4
ECE 312 Engineering Mechanics II: Dynamics	3
ECE 313 Introduction to Deformable Solids	3
ECE 340 Thermodynamics	3
ECE 383 Probability and Statistics for Engineers	2
ECN 111 Macroeconomic Principles	3
or ECN 112 Micro economic Principles (3)	3
Total	18

Junior Year

	Semester Hours
First Semester	
CEE 321 Structural Analysis	3
ECE 351 Engineering Materials	3
ECE 384 Numerical Analysis for Engineers I	2
IEE 300 Economic Analysis for Engineers	3
MAE 371 Fluid Mechanics	3
Basic science elective ⁴	3
Total	17
Second Semester	
CEE 322 Steel Structures	3
CEE 341 Hydraulic Engineering	4
CEE 351 Geotechnical Engineering	4
CEE 361 Environmental Engineering	3
CEE 372 Transportation Engineering	4
Total	18

Senior Year

	Semester Hours
First Semester	
CEE 323 Concrete Structures	3
CEE 362 Environmental Engineering	3
CEE 496 Topics in Civil Engineering Practice	1
Design elective	3
General studies elective (HU or SB) ¹	3
Technical elective	6
Total	19
Second Semester	
CEE 400 Microcomputer Applications in Civil Engineering	3
ECE 400 Engineering Communications	3
Design elective	3
General studies elective (HU or SB) ¹	3
Technical elective	5
Total	17

Graduation requirements 133 semester hours minimum plus English proficiency

¹ See pages 45-65 for the requirements and the approved list.

² Students who have taken no high school chemistry should take CHM 113 and 116.

³ See page 240 for special requirements and selection of an L1 elective.

⁴ Must be an earth science or life science course; if physics or chemistry, the course must be of a more advanced level than PHY 131 or CHM 114 116

Seventeen semester hours of design and technical electives with an average grade of "C" or better is required. Two graduate courses may be taken for undergraduate credit by students whose cumulative GPA is 2.80 or better and with the instructor's and advisor's approval.

Concurrent Studies in Architecture and Civil Engineering

Undergraduate. Qualified lower division students interested in combining studies in architecture and civil engineering may prepare for upper division and graduate courses in both programs by taking courses listed in option "B" of the School of Architecture (page 155).

Graduate. Qualified students may develop a program of study that leads to the concurrent degrees Master of Architecture and M.S.E. with a focus in Civil Engineering. The student's program of study is developed in conjunction with advisors in both departments. For specific details consult with advisors in the departments.

CIVIL ENGINEERING

CEE 296 Introduction to Civil Engineering. (1) F, S

Introduction to the profession. Description of areas of specialization. Degree requirements, academic standing, and advising procedures. Introduction to laboratory facilities. Prerequisite: freshman standing

310 Testing of Materials for Construction. (3) F, S

Structural and behavioral characteristics engineering properties, measurements, and application of construction materials. Lecture/lab. Not open to engineering students. Prerequisite: CON 323

321 Structural Analysis. (3) F, S
Statistically determinate and indeterminate structures by classical and matrix methods such as trusses, beams, and frames. 2 hours lecture, 2 hours recitation. Prerequisite: ECE 313.

322 Steel Structures. (3) F
Behavior of structural components and systems. Design of steel members and connections. Load and resistance factor design methods. Lecture, recitation. Prerequisites: CEE 321 (completion of engineering core (except ECE 400)); minimum core grade requirements satisfied.

323 Concrete Structures. (3) S
Behavior of concrete structures and the design of reinforced and prestressed concrete members including footings. Partial design of concrete building system. Lecture, recitation. Prerequisites: CEE 321, completion of engineering core (except ECE 400), minimum core grade requirements satisfied.

340 Hydraulics and Hydrology. (3) F, S
Application of hydraulic engineering principles to flow of liquids in pipe systems and open channels; hydrostatic characteristics of pumps and turbines. Introduction to hydrology. Not open to engineering students. Lecture/lab. Prerequisite: CON 221.

341 Hydraulic Engineering. (4) F, S
Fundamental principles and methods of fluid mechanics forming analytical basis for water resources engineering. Flow in conduits and

open channels. Introduction to hydrology. Lecture, lab. Prerequisites: MAE 371 (completion of engineering core (except ECE 400)) minimum core grade requirements satisfied.

351 Soil Mechanics. (4) F, S
Index properties and engineering characteristics of soils. Compacton, permeability and seepage, compressibility and settlement, and shear strength. Lecture/lab. Prerequisites: CEE 321 (completion of engineering core (except ECE 400)), minimum core grade requirements satisfied.

361 Environmental Engineering. (3) F, S
Natural environment, water resources, hydrologic cycle, chemistry of natural waters, quality requirements and water treatment and water distribution systems. Corequisite: CEE 341.

362 Environmental Engineering. (3) S
Natural environment, the carbon cycle and biochemistry of wastes, principles of waste treatment, and drainage systems. Prerequisite: CEE 361.

371 Introduction to Urban Planning. (3) N
Theoretical and practical aspects of city planning. Interrelationships among physical planning, environment, government, and society. Not acceptable as a technical elective for CEE students.

372 Transportation Engineering. (4) F, S
Highway, rail, water, and air transportation. Operational characteristics and traffic control devices of each transport mode. Impact on urban form. Prerequisites: CEE 321 (completion of engineering core (except ECE 400)); minimum core grade requirements satisfied.

400 Microcomputer Applications in Civil Engineering. (3) S
Development of microcomputer literacy in civil engineering applications. Prerequisites: CEE 351, 361, 372; ECE 106. *General studies* N3.

412 Pavement Analysis and Design. (3) F
Design of flexible and rigid pavements for highways and airports. Surface base and subgrade courses. Cost analysis and pavement selection. Prerequisites: CEE 351, ECE 351.

423 Structural Design. (3) F
Analysis and design of reinforced concrete, steel, masonry, and timber structures. Lecture, lab. Prerequisites: CEE 322, 323.

432 Matrix and Computer Applications in Structural Engineering. (3) S
Matrix and computer applications to structural engineering and structural mechanics. Stiffness and flexibility methods, finite elements and differences. Prerequisite: CEE 321.

441 Water Resources Engineering. (3) S
Application of the principles of hydraulics and hydrology to the engineering of water resources projects; design and operation of water resources systems; water quality. Prerequisite: CEE 341.

450 Soil Mechanics in Construction. (3) F, S
Soil mechanics as applied to the construction of foundation, foundations, highways, retaining walls, and slope stability. Relationship between soil characteristics and geologic formations. Not open to engineering students. Lecture/lab. Prerequisite: CON 323.

452 Foundations. (3) F, S
Applications of soil mechanics to foundation systems: bearing capacity, lateral earth pressure, and slope stability. Prerequisite: CEE 351.

466 Sanitary Systems Design. (3) F
Capacity planning and design of water supply, domestic and storm drainage, and solid waste systems. Prerequisite: CEE 361.

471 Planning and Design of Urban Systems. (3) F
For students in city planning, urban systems, civil engineering, and related areas working as interdisciplinary planning and design teams. Effect of economic base employment, and population on urban land use requirements. Location and required capacity of urban systems to serve urban and uses. Lecture, lab. Prerequisite: senior standing.

475 Highway Geometric Design. (3) S
Design of the visible elements of the roadway. Fundamental design controls with application to rural roads, at grade intersections, free ways, and interchanges. Lecture, recitation. Prerequisite: CEE 372.

496 Topics in Civil Engineering Practice. (1) F, S

Professional engineering practice, interview and résumé writing, professional registration requirements, continuing education, graduate study, financial planning, and employment. Prerequisite: senior standing.

512 Pavement Performance and Management. (3) F
Pavement management systems including data collection, evaluation, optimization, economic analysis, and computer applications for highway and airport design. Prerequisite: CEE 412.

514 Bituminous Materials and Mixture. (3) F, 92
Types of bituminous materials used in pavement mixtures. Chemical composition and physical properties, desirable aggregate characteristics, and optimum asphalt contents. Lecture/lab. Prerequisite: ECE 351.

515 Design and Behavior of Portland Cement Concrete Mixtures. (3) S
Properties of cements and aggregates. Mix design for strength and durability requirements. Failures caused by chemical reaction, weathering, and loading. Prerequisite: ECE 351.

521 Stress Analysis. (3) F
Advanced topics in the analytical determination of stress and strain. Prerequisite: CEE 321.

524 Advanced Steel Structures. (3) S
Strength properties of steel and their effects on structural behavior. Elastic design of steel structures. Plastic analysis and design of beams, frames, and bents. Plastic deflections. Plastic design requirements. Multistory buildings. Prerequisite: CEE 322.

526 Finite Element Methods in Civil Engineering. (3) F
Finite element formulation for solutions of structural, geotechnical, and hydraulic problems. Prerequisite: CEE 432.

527 Advanced Concrete Structures. (3) F, 93
Ultimate strength design. Combined shear and torsion. Serviceability. Plastic analysis. Special systems. Prerequisite: CEE 323.

528 Stability of Structures. (3) N
Elastic and inelastic buckling of rods and columned columns and beams. Stability of plates, rigid frames, and trusses. Prerequisites: CEE 322, instructor approval.

529 Complex Structures. (3) N

Classical and numerical investigations of linear and nonlinear structures composed of flat and curved surfaces and near or curved near elements. Prerequisite: instructor approval

530 Prestressed Concrete. (3) F '92

Materials and methods of prestressing. Analysis and design for flexure, shear, and torsion. Prestress losses due to friction, creep, shrinkage, and anchorage set. Statistically indeterminate structures. Design of flat slabs, bridges, and composite beams. Prerequisite: CEE 323

531 Theory of Structures. (3) N

General theorems relating to elastic systems, deflection of trusses and beams, statically indeterminate trusses, beams, rings, arches and frames by consistent deformation, east work, and elastic center; horizontally curved members, bending and torsion. Prerequisite: CEE 321

533 Applied Optimal Design. (3) S '93

Linear and nonlinear programming. Problem formulation. Design sensitivity analysis. FEM based optimal design of structural and mechanical systems. Prerequisite: graduate standing or instructor approval

536 Structural Dynamics. (3) F '92

Structures and structural members subjected to dynamic loads, response spectra theory applications to bridges and power plants. Investigation of the responses of multidegree of freedom structures and matrix and numerical methods of analysis. Lecture, recitation. Prerequisites: CEE 321; instructor approval

537 Topics in Structural Engineering. (1) 3 S

Advanced topics including wind engineering, earthquake engineering, probabilistic concepts, and bridge and building engineering. Prerequisite: instructor approval

540 Groundwater Hydrology. (3) F

Physical properties of aquifers, groundwater exploration, well construction and pumping, subsurface flow modeling and subsidence, groundwater pollution, and water rights. Prerequisite: CEE 341 or instructor approval

541 Surface Water Hydrology. (3) S

Hydrologic cycle and mechanisms including precipitation, evaporation, and transpiration, hydrograph analysis, flood routing; statistical methods in hydrology and hydrologic design. Prerequisite: CEE 341 or instructor approval

542 Water Resources Systems Planning. (2) F '92

Philosophy of water resources planning; economic, social and engineering interaction. Introduction to the theory and application of quantitative planning methodology in water resources planning. Guest lecturers case studies. Prerequisite: instructor approval

543 Water Resources Systems I. (3) S '93

Theory and application of quantitative planning methodology for the design and operation of water resources systems. Class projects using a computer; case studies. Pre- or corequisite: CEE 542 or instructor approval

544 Water Resources Systems II. (3) F '93
Advanced computer oriented workshop in the application of quantitative planning techniques to the design and operation of water resources systems. Prerequisite: CEE 543.

545 Foundations of Hydraulic Engineering.

(2) S '93
Review of incompressible fluid dynamics. Flow in pipes and channels, unsteady and varied flows; wave motion. Prerequisite: CEE 341.

546 Free Surface Hydraulics. (2) F '93

Derivation of differential equations used in open channel flow analysis, computations for uniform and nonuniform flows, unsteady flow and flood routing. Mathematics and physical models. Prerequisite: CEE 341

547 Principles of River Engineering. (2) S '94

Uses of rivers, study of watershed and channel processes. Sediment sources, yield and control, hydrology and analysis. Case studies. Prerequisite: CEE 341 or instructor approval.

548 Sedimentation Engineering. (2) F '92

Introduction to the transportation of granular sedimentary materials by moving fluids. Degradation, aggregation, and local scour in a river channel. Mathematics and physical models. Prerequisite: CEE 547 or instructor approval

550 Soil Behavior. (3) S

Physicochemical aspects of soil behavior, stabilization of soils and engineering properties of soils. Prerequisite: CEE 351

551 Advanced Soil Mechanics Laboratory.

(3) F
Oedometer triaxial static and cyclic back pressure saturated and unsaturated samples, pore pressure measurements, resonant column automatic data acquisition and in situ testing. Lecture, abs. Prerequisite: CEE 351.

552 Geological Engineering. (3) S

Geological investigations for engineering purposes: case histories, geologic structure, weathering, remote sensing, geophysics, and ariophot interpretation for engineering site locations. Lecture, field trips. Prerequisite: CEE 351

553 Advanced Soil Mechanics. (3) S

Application of theories of elasticity and plasticity to soil theories of consolidation, failure theories and response to static and dynamic loading. Prerequisite: CEE 351

554 Shear Strength and Slope Stability. (3) F

Shear strength of saturated and unsaturated soils, strength-deformation relationships, time dependent strength parameters, effects of sampling, and advanced slope stability. Prerequisite: CEE 351

555 Applied Soil Mechanics. (3) S

Deep foundations, braced excavations, anchored bulkheads, reinforced earth, underpinning, and dewatering. Prerequisite: CEE 452.

556 Seepage and Earth Dams. (3) F

Transient and steady state fluid flow through soil, confined and unconfined flow, pore water pressures and application to earth dams. Prerequisite: CEE 351

557 Topics in Geotechnical Engineering.

(3) S
New and developing technological geotechnical engineering. Prerequisite: graduate standing or instructor approval

558 Numerical Methods. (3) F '92

Constitutive relations for soils and numerical techniques applied to geotechnical engineering including computer applications. Prerequisites: CEE 351, computer programming graduate standing

559 Earthquake Engineering. (3) F '93

Characteristics of earthquake motions, selection of design earthquakes, site response analyses, seismic slope stability and liquefaction. Prerequisites: CEE 351 graduate standing

561 Physical-Chemical Treatment of Water and Waste. (3) F

Theory and design of physical and chemical processes for the treatment of water and waste waters. Prerequisite: CEE 361

562 Environmental Biochemistry and Waste Treatment. (3) S

Theory and design of biological waste treatment systems. Pollution and environmental assessment of wastes. Prerequisite: CEE 362

563 Environmental Chemistry Laboratory.

(3) F
Analysis of water, domestic and industrial waste laboratory procedures for pollution evaluation and the control of water and waste treatment processes. Lecture, lab. Prerequisite: CEE 361 or 362

564 Industrial Hygiene. (3) N

Survey methods and 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 the common pollutants and industrial solvents

573 Traffic Engineering. (3) F

Driver, vehicle, and roadway characteristics, laws and ordinances, traffic control devices, traffic engineering studies and Transportation System Management measures. Prerequisite: CEE 372

574 Highway Capacity. (3) S

Highway capacity for all functional classes of highways. Traffic signalization, including traffic studies, warrants, cycle length timing phasing, and coordination. Prerequisite: CEE 372

575 Traffic Flow Theory and Safety

Analysis. (3) F
Traffic flow theory, distribution queuing delay models, and car following. Highway safety accident records systems, accident analysis, identifying problem locations and accident countermeasures. Prerequisite: CEE 573 or 574.

576 Airport Engineering. (3) S

Planning and design of airport facilities. Effect of aircraft characteristics, air traffic control procedures and aircraft demand for runway and passenger handling facilities, on site selection, runway configuration and terminal design. Prerequisite: CEE 372

577 Urban Transportation Planning. (3) S

Application of and use parameters traffic generation theory, traffic distribution and assignment models, transit analysis and economic factors to the solution of the urban transportation problem. Prerequisite: CEE 372

578 Highway Engineering, Planning, and Economics. (3 N)

Highway transportation including design operation planning environmental impact economic feasibility, and financing Highways as a regional system Prerequisite CEE 372

Students enrolled in CEE 580 590 592 599, 792 and 799 are required to attend graduate student seminars at the times shown in the Schedule of Classes Each semester every graduate student enrolled for more than eight semester hours is to enroll for at least one semester hour of CEE 592, 599, 792 or 799 Each civil engineering graduate student holding an appointment as a teaching or research assistant or associate is to enroll for one semester hour of CEE 580; such credit does not apply toward graduation.

Omnibus Courses: See page 40 for omnibus courses that may be offered.

Computer Science and Engineering

Ben M. Huey
Interim Chair
(ECG 252) 602 965-3190

PROFESSORS

ASHCROFT BARNHILL,
BLACKLEDGE, FINDLER, LEWIS,
NIELSON, J. URBAN, WOODFELL

ASSOCIATE PROFESSORS

COLLOFELLO, DASGUPTA FALTZ,
FARIN, FAUSTINI, FOLEY
GOLSHAN HUEY, LINDQU ST,
MILLER, O GRADY,
PHEANIS, ROCKWOOD

ASSISTANT PROFESSORS

CALLISS, DIETRICH,
ELGOT DRAPKIN SEN S. URBAN

INSTRUCTOR

HOUSTON

PROFESSOR EMERITUS

ROBBINS

Computers have a significant impact on our daily lives, and this impact is likely to be even greater in the future as computer professionals continue to develop more powerful, smaller, faster, and less expensive computing systems. Computer science and computer engineering deal with the study, design, development, construction, and application of modern computing machinery. Other important topics include computing techniques and appropriate languages for general information processing, for scientific computation, for the

recognition, storage, retrieval, and processing of data of all kinds, and for the automatic control and simulation of processes.

The curricula offered by the Department of Computer Science and Engineering prepare the student to be a participant in this rapidly changing area of technology by presenting in depth treatments of the fundamentals of computer science and computer engineering. The department offers two undergraduate degrees: a B.S. in Computer Science and a B.S.E. in Computer Systems Engineering.

DEGREE REQUIREMENTS

Minimum Scholastic Requirements.

In addition to the requirement for a cumulative GPA of 2.00 or higher, all computer science and computer engineering students must obtain a minimum grade of "C" in all CSE courses used for degree credit.

Computer Science—B.S.

The Department of Computer Science and Engineering offers a B.S. degree that prepares the student for a career in computer science. A student pursuing a B.S. degree must complete an English proficiency requirement, the general studies requirements described below, the computer science core courses, a senior level breadth requirement in the major, and a set of technical electives.

English Proficiency

ENG 101, 102	First Year Composition	Semester Hours	6
	or ENG 105		
	Advanced First-Year Composition (3)		

General Studies

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

These courses must include at least one upper division course, at least two courses from the same department, and courses from at least two departments

Humanities and fine arts	6-12
Social and behavioral sciences	12-6

Literacy and Critical Inquiry

ECE 400	Engineering Communications	3
One L1 course*		3

Numeracy

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

MAT 270	Calculus with Analytic Geometry I	4
	or MAT 290 Calculus I (5)	

Natural Science

PHY 121	University Physics I: Mechanics	3
PHY 122	University Physics Laboratory I	1
PHY 131	University Physics II: Electricity and Magnetism	3
PHY 132	University Physics Laboratory II	1
Any physics courses requiring PHY 131 as a prerequisite or any laboratory science satisfying the S1 or S2 general studies requirements (except PHY 101, 105, 111, 112)		6

Total general studies 44

NOTE: Six semester hours taken in two of the three awareness areas* are required in the final list of courses in the student's graduation program of study. These can be included in the humanities and fine arts social and behavioral sciences course selections.

* See pages 45-65 for the requirements and the approved list.

Computer Science Core Semester Hours

CSE 100	Introduction to Computer Science I	3
CSE 101	Introduction to Computer Science II	3
CSE 120	Digital Design Fundamentals	3
CSE 201	Application Languages Programming Laboratory	1 2
CSE 202	Functional Languages Programming Laboratory	2 1
CSE 225	Assembly Language Programming (Motorola) or CSE 226 Assembly Language Programming (Intel) (3)	3
CSE 310	Data Structures	3
CSE 325	System Design with Microprocessors (Motorola) or CSE 326 System Design with Microprocessors (Intel) (3)	3
CSE 330	Computer Organization and Architecture	3
CSE 340	Structure of Programming Languages	3
CSE 355	Introduction to Theoretical Computer Science	3
MAT 243	Discrete Mathematical Structures	3
MAT 271	Calculus with Analytic Geometry II	4
	or MAT 291 Calculus II (5)	

MAT 272	Calculus with Analytic Geometry III	4
MAT 342	Linear Algebra	3
Total computer science core		44
Computer science breadth requirement		18
Each student must complete 18 hours of CSE 400 level courses.		
Technical electives		9
Each student must complete nine hours of courses chosen from the computer science technical elective list and approved by the student's advisor.		
Unrestricted electives		7
Total degree requirements		128

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

		<i>Semester Hours</i>
First Semester		
CSE 100	Introduction to Computer Science I	3
ENG 101	First-Year Composition	3
MAT 270	Calculus with Analytic Geometry I	4
General studies elective (HU or SB)*		3
Laboratory science (S1)*		3
Total		16

Second Semester		
CSE 101	Introduction to Computer Science II	3
CSE 120	Digital Design Fundamentals	3
ENG 102	First Year Composition	3
MAT 271	Calculus with Analytic Geometry II	4
Laboratory science (S2)*		3
Total		16

Sophomore Year

First Semester		
CSE 201	Application Languages Programming Laboratory	1
CSE 202	Functional Languages Programming Laboratory	1
MAT 243	Discrete Mathematical Structures	3
MAT 272	Calculus with Analytic Geometry III	4
PHY 121	University Physics I: Mechanics	3
PHY 122	University Physics Laboratory I	1
General studies elective (HU or SB)*		3
Total		16

Second Semester		
CSE 225	Assembly Language Programming (Motorola)	3
CSE 310	Data Structures	3
PHY 131	University Physics II: Electricity and Magnetism	3
PHY 132	University Physics Laboratory II	1

General studies elective (HU or SB)*	3
Literacy and critical inquiry elective*	3
Total	16

Junior Year

First Semester		
CSE 201	Application Languages Programming Laboratory	1
CSE 325	System Design with Microprocessors (Motorola)	3
CSE 340	Structure of Programming Languages	3
MAT 342	Linear Algebra	3
General studies elective (HU or SB)*		3
Unrestricted elective		3
Total		16

Second Semester		
CSE 330	Computer Organization and Architecture	3
CSE 355	Introduction to Theoretical Computer Science	3
ECE 383	Probability and Statistics for Engineers	2
General studies elective (HU or SB)*		3
Technical elective		3
Unrestricted elective		2
Total		16

Senior Year

First Semester		
ECE 400	Engineering Communications	3
400 level CSE computer science breadth electives		9
Technical elective		3
Unrestricted elective		1
Total		16
Second Semester		
General studies elective (HU or SB)*		3
400 level CSE computer science breadth electives		9
Technical elective		3
Unrestricted elective		1
Total		16

* See pages 45-65 for the requirements and the approved list

Computer Systems Engineering—B.S.E.

The Department of Computer Science and Engineering offers a B.S.E. degree that prepares the student for a career in computer systems engineering. This degree program provides training in both engineering and computer science. The degree requirements for the School of Engineering show the requirements for English proficiency and general studies for the B.S.E. degree. The following list specifies the remaining requirements for the B.S.E. degree.

		<i>Semester Hours</i>
Engineering Core		
CHM 114	General Chemistry for Engineers	4
CSE 225	Assembly Language Programming (Motorola)	3
or CSE 226 Assembly Language Programming (Intel) (3)		
ECE 105	Introduction to Languages of Engineering	3
ECE 210	Engineering Mechanics I: Statics	3
ECE 301	Electrical Networks I	4
ECE 312	Engineering Mechanics II. Dynamics	3
ECE 333	Electrical Instrumentation	3
ECE 340	Thermodynamics	3
ECE 352	Properties of Electronic Materials	3
ECE 383	Probability and Statistics for Engineers	2
MAT 274	Elementary Differential Equations	3
MAT 291	Calculus II	5
or MAT 271 (4) and 272 (4)		
MAT 342	Linear Algebra	3
PHY 361	Introductory Modern Physics*	3
Total		45

* Basic science elective.

Computer Science Core

		<i>Semester Hours</i>
CSE 120	Digital Design Fundamentals	3
CSE 200	Concepts of Computer Science	4
CSE 201	Application Languages Programming Laboratory	1
CSE 202	Functional Languages Programming Laboratory	1
CSE 310	Data Structures	3
CSE 325	System Design with Microprocessors (Motorola)	3
or CSE 326 System Design with Microprocessors (Intel) (3)		
CSE 330	Computer Organization and Architecture	3
CSE 340	Structure of Programming Languages	3
CSE 355	Introduction to Theoretical Computer Science	3
CSE 421	Microprocessor System Design I	4
CSE 422	Microprocessor System Design II	4
CSE 423	Microcomputer System Hardware	3
MAT 243	Discrete Mathematical Structures	3
Area of emphasis (technical electives)		13
Total		51

The student selects technical electives from an approved list with approval of an advisor.

**Computer Systems Engineering
Program of Study
Typical Four-Year Sequence**

Freshman Year

	<i>Some Hours</i>
First Semester	
CHM 114 General Chemistry for Engineers ...	4
ECE 105 Introduction to Languages of Engineering ...	3
ENG 101 First Year Composition ...	3
MAT 290 Calculus I ...	5
General studies elective HU or SB	3
Total ...	18

Second Semester

CSE 120 Digital Design Fundamentals ...	3
CSE 200 Concepts of Computer Science ...	4
ECE 106 Introduction to Computer Aided Engineering ...	3
ENG 102 First Year Composition ...	3
MAT 291 Calculus II ...	5
Total ...	18

Sophomore Year

First Semester

CSE 201 Application Languages Programming Laboratory ...	1
CSE 225 Assembly Language Programming (Motorola) ...	3
ECN 111 Macroeconomic Principles ...	3
MAT 243 Discrete Mathematical Structures ...	3
MAT 274 Elementary Differential Equations ...	3
PHY 121 University Physics I: Mechanics ...	3
PHY 122 University Physics Laboratory I ...	1
Total ...	17

Second Semester

CSE 202 Functional Languages Programming Laboratory ...	1
CSE 310 Data Structures ...	3
CSE 325 System Design with Microprocessors Motorola ...	3
ECE 210 Engineering Mechanics I: Statics ...	3
PHY 131 University Physics II Electricity and Magnetism ...	3
PHY 132 University Physics Laboratory II ...	1
Literacy and critical inquiry elective ^{1, 2} ...	3
Total ...	17

Junior Year

First Semester

CSE 330 Computer Organization and Architecture ...	3
CSE 340 Structure of Programming Languages ...	3
ECE 312 Engineering Mechanics II Dynamics ...	3

ECE 383 Probability and Statistics for Engineers ...	2
PHY 361 Introductory Modern Physics ...	3
General studies elective (HU or SB) ...	3
Total ...	17

Second Semester

CSE 355 Introduction to Theoretical Computer Science ...	3
CSE 421 Microprocessor System Design I ...	4
ECE 301 Electrical Networks I ...	4
MAT 342 Linear Algebra ...	3
General studies elective HU or SB ¹ ...	3
Total ...	17

Senior Year

First Semester

CSE 422 Microprocessor System Design II ...	4
ECE 333 Electrical Instrumentation ...	3
ECE 340 Thermodynamics ...	3
ECE 400 Engineering Communications ...	3
Technical e lective ...	4
Total ...	17

Second Semester

CSE 423 Microcomputer System Hardware ...	3
ECE 352 Properties of Electronic Materials ...	3
General studies elective (HU or SB) ¹ ...	3
Technical electives ...	9
Total ...	18

See pages 45-65 for the requirements and the approved list

See page 240 for special requirements and selection of an L1 elective

**COMPUTER SCIENCE
AND ENGINEERING**

CSE 100 Introduction to Computer Science I. (3) F S SS

Concepts of problem solving, algorithm design, structured programming, fundamental algorithms and techniques, and computer systems concepts. Prerequisite: MAT 118.

101 Introduction to Computer Science II. 3 F S, SS

Advanced programming techniques, file processing, implementation of arrays, stacks, queues, linked lists and binary search trees, large program development; team programming. Prerequisite: CSE 100. *General studies N3*

120 Digital Design Fundamentals. (3) F S SS

Number systems, conversion methods, binary and complement arithmetic, boolean and switching algebra, circuit minimization, ROMs, PLAs, flip-flops, synchronous sequential circuits and register transfer design. Lecture/lab. Cross listed as EEE 120. Prerequisite: CSE 100 or ECE 105

180 Computer Literacy. (3) F S SS
Introduction to general problem solving approaches using widely available software tools such as database packages, word processors, spreadsheets and report generators. Nonmajors only. *General studies N3*

181 Applied Problem Solving with BASIC. 3) F S SS

Introduction to systematic definition of problems, solution formulation and method validation. Computer solution using BASIC required for projects. Lecture/lab. Nonmajors only. Prerequisite: MAT 117. *General studies N3*

183 Applied Problem Solving with FORTRAN. (3) F

A human-oriented systems approach to problem definition, formulation and solution using FORTRAN. Computer solution required for projects. Nonmajors only. Prerequisite: MAT 118. *General studies N3*

200 Concepts of Computer Science. (4) A

Accelerated coverage of fundamental concepts of computer science using Pascal for students with a strong background in at least one other high-level programming language. Prerequisite: ECE 105 or equivalent. *General studies N3*

201 Application Languages Programming Laboratory. (1) F S SS

Each module introduces a programming language such as C, FORTRAN, PL/1, or COBOL. Includes programming exercises. May be repeated for different languages. Prerequisite: CSE 101 or 200

202 Functional Languages Programming Laboratory. 1 F, S SS

Each module introduces a programming language such as APL, LISP or PROLOG. Includes programming exercises. May be repeated for different languages. Prerequisite: CSE 101 or 200

225 Assembly Language Programming (Motorola). 3 F, S SS

Assembly language programming, register-level computer organization, data structure and addressing modes, assemblers, and linkers. Motorola based assignments. Cross listed as EEE 225. Prerequisite: CSE/EEE 120. *General studies N3*

226 Assembly Language Programming (Intel). 3 F, S, SS

Assembly language programming, register-level computer organization, data structure and addressing modes, assemblers and linkers. Intel based assignments. Cross listed as EEE 226. Prerequisite: CSE/EEE 120. *General studies N3*

310 Data Structures. 3) F, S, SS

Data representation, advanced treatment of arrays, stacks, queues, static dynamic storage allocation, binary trees, strings, graphs, AVL trees and data abstraction. Prerequisites: CSE 101 or 200, MAT 243

325 System Design with Microprocessors (Motorola). 3) F S SS

CPU Memory management/peripheral device interfaces and programming. Microcontrollers, standard system buses, serial and parallel I/O, direct memory access devices and communications. Lecture/lab. Cross listed as EEE 325. Prerequisite: CSE/EEE 225.

326 System Design with Microprocessors (Intel). 3 F S SS

CPU memory management/periphera device interfaces and programming Microcontrollers standard system buses serial and parallel Odd rect memory access devices communication. Lecture lab Cross listed as EEE 326 Prerequisite CSE EEE 226.

330 Computer Organization and Architecture. 3 F S SS

Instruction set design microcontroller pipeline memory media organization, and management networks and communications Prerequisite CSE/EEE 325 or CSE/EEE 326.

340 Structure of Programming Languages. 3 F S

Formal specifications for language syntax and dynamic runtime environments, and an introduction to language translations Prerequisites CSE 201 or 202, 225 or 226 310

355 Introduction to Theoretical Computer Science. (3 F S

Introduction to formal language theory and automata, Turing machines, decidability undecidability recursive function theory and introduction to complexity theory Prerequisite CSE 310

383 Applied FORTRAN Programming. 3 F S

Advanced FORTRAN including character handling machine dependency sorting and merging plotting tapes disks, time sharing terminals, and binary programs Lecture, lab Nonmajors only Prerequisite CSE 183

408 Introduction to Scene Analysis. 3 A

Image analysis and formaton, overview processing object segmentation texture analysis stereo vision, and motion higher level interpretation on active sensing Prerequisite CSE 310 or instructor approval.

410 Information Processing. 3 A

Primary and secondary file access organizations Multi attribute indexing File processing Introduction to database management and document retrieval Prerequisite CSE 310.

412 Database Management. (3 S

Introduction to DBMS concepts Data models and languages Relation database theory Database security integrity and concurrency Prerequisite CSE 310.

420 Computer Architecture I. (3 F

Computer architecture Performance versus cost tradeoffs instruction set design. Basic processor implementation and pipeline. Prerequisite CSE 330

421 Microprocessor System Design I. (4 F S

Assembly language programming and organic hardware design of systems using 8 bit microprocessors and microcontrollers Fundamental concepts of digital system design Lecture, lab Prerequisite CSE/EEE 225 or 226. Corequisite CSE/EEE 325 or 326

422 Microprocessor System Design II. (4 F S

Design of microcomputer systems using contemporary logic and microcomputer system components Requires assembly language programming. Prerequisite. CSE 421

423 Microcomputer System Hardware. (3 S

Information and techniques presented in CSE 422 are used to develop the hardware design of a multiprocessor multiprogramming, microprocessor based system. Prerequisite CSE 422

428 Computer-Aided Processes. 3 A

Hardware and software considerations for computerized manufacturing systems Specific concentration on automatic inspection numerical control, robotics and integrated manufacturing systems Prerequisite CSE 330.

430 Elementary Concepts of Operating Systems. 3 F S

Design and implementation of supervisory system components. Input/output methods, process management, multiprogramming and multiprocessing systems storage management and file systems Prerequisites. CSE 330, 340

438 Systems Programming. 3 A

Design and implementation of systems programs including text editors, utilities monitors, assemblers operating languages O handlers, schedulers etc Prerequisite. CSE 421 or instructor approval

440 Compiler Construction I. 3 F

Introduction to programming language implementation implementation strategies such as compilation interpretation and translation. Major compilation phases such as lexical analysis semantic analysis optimization and code generation Prerequisite: CSE 340

450 Analysis of Algorithms. (3 F

Design and analysis of computer algorithms using analytical and empirical methods; complexity measures, design methodologies and survey of important algorithms. Prerequisite. CSE 310.

451 Switching Theory. (3 N

Combinational logic function decomposition NAND NOR circuit analysis and synthesis, logic arrays teratve networks fault diagnosis, sequential circuit representation and memory devices Prerequisite CSE 325 or 326.

457 Theory of Formal Languages. (3 A

Theory of grammar, methods of syntactic analysis and specification, types of artificial languages, relationship between formal languages, and automata Cross listed as MAT 401. Prerequisite CSE 355

459 Logic for Computing Scientists I. (3 F

Propositional logic, syntax and semantics, proof theory vs model theory soundness consistency and completeness first order logic logic theories automated theorem proving, ground resolution pattern matching unification and resolution, Dijkstra's logic proof obligations, and program proving Prerequisite CSE 355.

460 Software Project Management and Development I. (3 F, S

Software life cycle analysis programming teams, project documentation and milestones; requirements and specifications design, testing and maintenance tools and techniques. Prerequisite senior standing.

470 Computer Graphics. (3 F, S

Display devices data structures transformations interactive graphics 3 dimensions graphics and hidden line problem Prerequisites CSE 310, MAT 342

471 Introduction to Artificial Intelligence. (3 F S

State space search heuristic search, games, knowledge representation techniques expert systems and automated reasoning Prerequisites CSE 202 L SP and PROLOG), 310

473 Nonprocedural Programming Languages. 3 S

Functional and logic programming using languages like Lucid and Prolog Typical applications would be a Screen Editor and an Expert System Prerequisite CSE 355

474 Modeling for Computer Simulation. (3 A

Mathematical description of general dynamic systems discrete event discrete time, and continuous forms suitable for computer implementation Prerequisites CSE 310 ECE 383

475 Simulation Theory and Languages. (3 A

Statistical background for simulation Model construction and validation, and the analysis of results Languages that support simulation Prerequisite CSE 474.

476 Introduction to Natural Language Processing. (3 F

Principles of computational linguistics formal syntax and semantics, as applied to the design of software with natural human language I/O Prerequisite CSE 310 or instructor approval.

477 Introduction to Computer-Aided Geometric Design. (3 F S

Introduction to parametric curves and surfaces, Bezier and B-spline interpolation and approximation techniques Prerequisites CSE 101 or 200, 470 MAT 342

508 Digital Image Processing I. (3 F

Digital image fundamentals image transformations, image enhancement and restoration techniques image encoding and segmentation methods Prerequisite EEE 303 or instructor approval.

509 Digital Image Processing II. (3 S

Advanced analytical techniques applied to digital image processing computer vision, and applications, including robotics Prerequisite CSE 508

512 Distributed Databases. (3 F

Fragmentation design. Query optimization Distributed joins Concurrency control Distributed deadlock detection Prerequisites CSE 410, 412.

513 Database Machines. 3 N

Nonnumeric processing Von Neumann bottlenecks Parallel and associative processors Database machines survey theory software, and performance Advanced topics in database architectures Prerequisites CSE 330, 410 or 412)

515 Information Storage and Retrieval. (3 N

Concepts of information storage and retrieval such as theory applications, and case studies Prerequisite CSE 410.

516 Digital Testing and Reliability. (3 A

Fault modeling, test generation, and simulation for combinational and sequential circuits memory testing self-checking logic fault tolerant logic, and reliability analysis Prerequisites: CSE 330 (or 423), 355 or 451)

517 Digital Design Automation. (3 N

Typical computer aided design system. Simulation techniques test generation microprogrammed control design aids, and specification sheet analysis Applications Prerequisites CSE 520 or 524

518 Hardware Design Languages. (3) N Introduction to hardware design languages (HDL's). HDL description of integrated circuit components and systems. HDL description of computer organizations. Prerequisite: CSE 330.

520 Computer Architecture II. (3) S Computer architecture description languages, computer arithmetic, memory-hierarchy design, parallel and multi-processors. Prerequisites: CSE 420, 430.

521 Microprocessor Applications. (4) S Microprocessor technology and its application to the design of practical digital systems. Hardware, assembly language programming, and interfacing of microprocessor-based systems. Lecture, lab. Prerequisite: CSE 421.

522 Microprogramming. (3) A Theory, practice, and application of microprogramming. Prerequisite: CSE 330.

523 Microcomputer Systems Software. (3) F Developing system software for a multiprocessor, multiprogramming, microprocessor-based system using information and techniques presented in CSE 421, 422. Prerequisite: CSE 422.

524 Multiprogramming Architectures. (3) N Main-line computer architectures; multiprogramming, timesharing, multiprocessing, hardware/software trade-offs, memory hierarchies, input/output structures, and communications. Prerequisite: CSE 330 or 423.

526 Parallel Processing. (3) N Real and apparent concurrency. Hardware organization of multiprocessors, multiple computer systems, scientific attached processors, and other parallel systems. Prerequisite: CSE 330 or 423.

527 High-Level-Language Machines. (3) N Advantages and disadvantages of high-level-language machines. Languages suitability. Microprogramming and interpretive execution. I/O operations. Examples. Prerequisite: CSE 520 or 524.

529 RISC Design Methodology. (3) N Optimal computer architecture design methodology based on the symbiotic relationship of hardware and software disciplines. Prerequisite: CSE 330 or 423.

530 Operating System Case Study. (3) F Study of the design and implementation of a timeshared multiprogramming operating system, with emphasis on the UNIX operating system. Prerequisites: CSE 430; knowledge of C language.

531 Distributed and Multiprocessor Operating Systems. (3) N Interprocess communications, concurrency control, file system, language constructs, architecture, and network considerations in distributed operating and multiprocessor systems. Case studies. Prerequisite: CSE 530 or instructor approval.

532 Security in Computing Systems. (3) A In-depth development of the concepts of computer security; impact on computer hardware and software and on the user. Prerequisite: CSE 430.

534 Computer Networks. (3) N Computer network protocols, hardware elements, and software algorithms. Error handling, routing, flow control, host-to-host communication, and local area networks. Prerequisite: CSE 325 or 326.

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

536 Theory of Operating Systems. (3) S Formal methods of control of concurrent processes, process scheduling, memory, and auxiliary storage management. Network operating systems. Operating system design. Prerequisite: CSE 430.

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

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

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

554 Advanced Switching Theory. (3) S Lattices, Boolean algebras, post algebras, Boolean differential calculus, multivalued logic, fuzzy logic, and finite state machines. Prerequisite: CSE 451.

555 Automata Theory. (3) N Finite state machines, pushdown automata, linear bounded automata, Turing machines, register machines, rams, and rasps; relationships to computability and formal languages. Prerequisite: CSE 355.

556 Expert Systems. (3) S Knowledge acquisition and representation, rule-based systems, frame-based systems, validation of knowledge bases, inexact reasoning, and expert database systems. Prerequisite: CSE 471.

560 Software Project Management and Development II. (3) F, S Software project management, cost estimation, configuration management, and quality assurance. Advanced software engineering life cycle topics. Prerequisite: CSE 460.

563 Software Requirements and Specification. (3) F Examination of the definitional stage of software development; analysis of specification representations and techniques emphasizing important application issues. Prerequisite: CSE 460.

564 Software Design. (3) S Examination of software design issues and techniques. Includes a survey of design representations and a comparison of design methods. Prerequisite: CSE 460.

565 Software Validation. (3) F Software reliability models and measures, program testing theory, fault tolerant software, program verification, reliable software design and development, and regression testing. Prerequisite: CSE 460.

566 Software Maintenance. (3) S Survey of software maintenance problems, tools, metrics, and management approaches. Implications of software maintenance on software development. Prerequisite: CSE 460.

570 Advanced Computer Graphics I. (3) F Hidden surface algorithms, lighting models, and shading techniques. User interface design. Animation techniques. Fractals and stochastic models. Raster algorithms. Prerequisite: CSE 470.

571 Artificial Intelligence. (3) S Definitions of intelligence, computer problem solving, game playing, pattern recognition, theorem proving, and semantic information processing; evolutionary systems; heuristic programming. Prerequisite: CSE 471.

572 Pattern Recognition. (3) N Pattern classification by distance functions and likelihood functions, deterministic and statistical approaches to trainable pattern classifiers, and syntactic pattern recognition. Prerequisite: ECE 383 or STP 326.

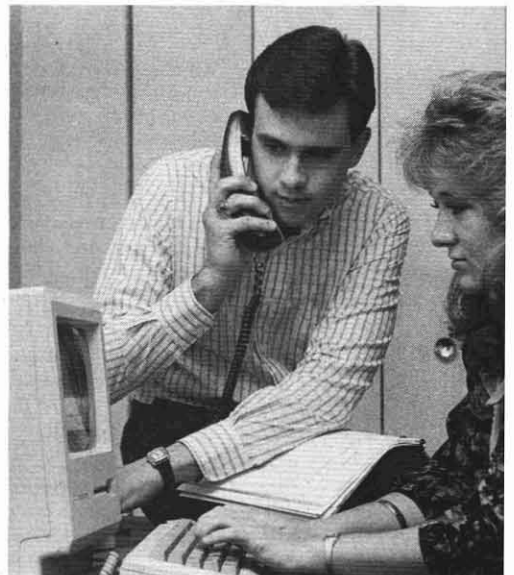
573 Advanced Computer Graphics II. (3) S Modeling of natural phenomena: terrain, clouds, fire, water, and trees. Particle systems, deformation of solids, antialiasing, and volume visualization. Lecture, lab. Prerequisite: CSE 470.

576 Topics in Natural Language Processing. (3) S Comparative parsing strategies, scoping and reference problems, non-first-order logical semantic representations, and discourse structure. Prerequisite: CSE 476 or instructor approval.

577 Advanced Computer-Aided Geometric Design I. (3) F General interpolation; review of curve interpolation and approximation; spline curves; visual smoothness of curves; parameterization of curves; introduction to surface interpolation and approximation. Prerequisites: CSE 470 and 477 or instructor approval.

578 Advanced Computer-Aided Geometric Design II. (3) S Coons patches and Bezier patches; triangular patches; arbitrarily located data methods; geometry processing of surfaces; higher dimensional surfaces. Prerequisites: CSE 470 and 477 or instructor approval.

Omnibus Courses: See page 40 for omnibus courses that may be offered.



Electrical Engineering

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REGENTS' PROFESSORS BALAN S. FERRY

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The professional activities of electrical engineers directly affect the lives of most of the world's population every day. They are responsible for the design and development of radio and television transmitters and receivers, telephone networks and switching systems, computer systems, and electric power generation and distribution. Within the broad scope of these systems, the electrical engineer is concerned with a challenging and diverse array of design and development problems.

Electrical engineers design miniature semiconductor integrated circuits that contain many thousands of elementary devices. They design systems for automatically controlling mechanical devices and a variety of processes. They are responsible for the design of satellite communication links as well as patient monitoring systems for hospitals. The development of the microprocessor has expanded the opportunities for electrical engineers to improve the design of familiar products since these devices are now incorporated in automobiles, consumer and office products,

entertainment systems, and a vast variety of test and measurement instruments and machine tools.

Students who earn a B.S.E. degree majoring in Electrical Engineering will be involved in a variety of electrical and electronic problems in the course of their careers. To ensure the necessary breadth of knowledge, the Electrical Engineering curriculum includes basic (core) engineering courses and courses in networks and electronic circuits, electromagnetic fields and waves, microprocessors, communication and control systems, solid state electronics, electrical power systems, and other specialty courses

ELECTRICAL ENGINEERING— B.S.E.

The curriculum in Electrical Engineering builds upon the base provided by the engineering core. Beyond the engineering core, the curriculum includes a number of required electrical engineering and technical elective courses. Approved technical elective courses serve to provide students with an opportunity either to broaden their background in electrical engineering or to study, in greater depth, technical subjects in which they have special interests. Successful completion of the curriculum leaves the student prepared to embark on a career in electrical engineering or to pursue advanced education in graduate school.

DEGREE REQUIREMENTS

Electrical Engineering Core

Students in Electrical Engineering fulfill the requirements of the engineering core by taking ECE 334 and 352 and EEE 225 or 226. No credit is given for ECE 333. Students may replace ECE 210 and 312 with PHY 321 and 322. Only ECE 313 may be deleted. The mathematics and basic science electives are met by taking the following courses:

		<i>Semester Hours</i>
MAT 342	Linear Algebra	3
MAT 362	Advanced Mathematics for Engineers and Scientists I	3
PHY 361	Introductory Modern Physics	3

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

		<i>Semester Hours</i>
EEE 120	Digital Design Fundamentals	3
EEE 302	Electrical Networks II	3
EEE 303	Signals and Systems	3
EEE 325	System Design with Microprocessors (Motorola) or EEE 326 System Design with Microprocessors (Intel) (3)	3
EEE 340	Electromagnetic Engineering I	3
EEE 341	Electromagnetic Engineering II	4
EEE 360	Energy Conversion and Transport	4
EEE 396	Professional Seminar	0
EEE 490	Senior Design Laboratory	3
Total		26

Technical Electives in Electrical Engineering

The program in Electrical Engineering requires a total of 23 hours of technical electives. To ensure breadth of knowledge, students *must* select from the courses indicated not less than three of the following five areas:

Area	Course
Communications	EEE 455
Control	EEE 480
Electronic Circuits	EEE 405 or 425 or 433
Power Systems	EEE 470 or 471 or 473
Solid State Electronics	EEE 436

Of the remaining technical electives, at least half must be electrical engineering (EEE) 400-level courses. With approval of the faculty advisor, computer science (CSE) 400 level courses may be used as an alternative to meet this requirement.

With faculty advisor approval, qualified students may choose technical electives from other courses in engineering, mathematics, and the sciences at or above the 300 level, including graduate courses. Students must have a GPA of not less than 3.00 and approval of the instructor to enroll in EEE graduate level courses. In addition, up to six semester hours of technical electives may be chosen from the approved list of courses from the College of Business.

**Electrical Engineering
Program of Study
Typical Four-Year Sequence**

Freshman Year		<i>Semester Hours</i>
First Semester		
CHM 114	General Chemistry for Engineers or CHM 116 General Chemistry (4)	4
ECE 105	Introduction to Languages of Engineering	3
ENG 101	First-Year Composition	3
MAT 290	Calculus I	5
PHY 121	University Physics I Mechanics	3
PHY 122	University Physics Laboratory I	1
Total		19
Second Semester		
ECE 106	Introduction to Computer Aided Engineering	3
EEE 120	Digital Design Fundamentals	3
ENG 102	First Year Composition	3
MAT 291	Calculus II	5
PHY 131	University Physics II Electricity and Magnetism	3
PHY 132	University Physics Laboratory II	1
Total		18
Sophomore Year		
First Semester		
ECE 210	Engineering Mechanics I: Statics	3
ECE 301	Electrical Networks I	4
EEE 225, 226	Assembly Language Programming	3
MAT 274	Elementary Differential Equations	3
MAT 342	Linear Algebra	3
Total		16
Second Semester		
ECE 312	Engineering Mechanics II: Dynamics	3
ECE 334	Electronic Devices and Instrumentation	4
EEE 302	Electrical Networks II	3
EEE 325, 326	System Design with Microprocessors	3
MAT 362	Advanced Mathematics for Engineers and Scientists I	3
General studies elective (HU or SB) ¹		3
Total		19
Junior Year		
First Semester		
ECE 352	Properties of Electronic Materials	3
ECN 111	Macroeconomics	3
EEE 303	Signals and Systems	3

EEE 340	Electromagnetic Engineering I	3
EEE 396	Professional Seminar	0
PHY 361	Introductory Modern Physics	3
Literacy and critical inquiry elective ^{1, 2}		3
Total		18
Second Semester		
ECE 340	Thermodynamics	3
EEE 341	Electromagnetic Engineering II	4
EEE 360	Energy Conversion and Transport	4
General studies elective (HU or SB) ¹		6
Total		17

Senior Year

First Semester		
EEE 490	Senior Design Laboratory	3
General studies elective (HU or SB) ¹		3
Technical electives		11
Total		17
Second Semester		
ECE 400	Engineering Communications	3
Technical electives		12
Total		15

¹ See pages 45–65 for the requirements and the approved list

² See page 240 for special requirements and selection of an L1 elective.

GRADUATION REQUIREMENTS

The attention of the student is directed to the retention and graduation requirements of the university and the School of Engineering. In addition to those requirements, a student must earn a grade of "C" or better in the mathematics and physics courses listed in the program of study. The student must also have an overall GPA of at least 2.00 for the following group of courses: ECE 301, 334, 352; all courses with an EEE prefix; all other courses used as technical electives.

SPECIAL PROGRAM

For those students interested in microelectronics manufacturing engineering, nuclear engineering science, and systems engineering, these options are available under Engineering Special Studies. See pages 273–278 for details and course requirements.

ELECTRICAL ENGINEERING

EEE 120 Digital Design Fundamentals. (3) F, S, SS	Number systems conversion methods, binary and complement arithmetic, boolean and switching algebra, circuit minimization, ROMs, PLAs, flipflops, synchronous sequential circuits, and register transfer design. Lecture/lab. Cross listed as CSE 120. Prerequisite: CSE 100 or ECE 105
225 Assembly Language Programming (Motorola). (3) F, S, SS	Assembly language programming register level computer organization, data structure and addressing modes, assemblers, and linkers. Motorola-based assignments. Cross listed as CSE 225. Prerequisite: CSE/EEE 120. <i>General studies N3.</i>
226 Assembly Language Programming (Intel). (3) F, S	Assembly language programming, register level computer organization, data structure and addressing modes, assemblers and linkers. Note based assignments. Cross listed as CSE 226. Prerequisites: CSE/EEE 120. <i>General studies N3.</i>
302 Electrical Networks II. (3) F, S, SS	Analysis of linear and nonlinear networks. Analytical and numerical methods. Prerequisite: ECE 301
303 Signals and Systems. (3) F, S, SS	Introduction to continuous and discrete time signal and system analysis, linear systems, Fourier, and z transforms. Prerequisite: EEE 302. Pre- or corequisite: MAT 342
325 System Design with Microprocessors (Motorola). (3) F, S, SS	CPU/Memory management/peripheral device interfaces and programming. Microcontrollers, standard system buses, serial and parallel I/O, direct memory access devices, and communications. Lecture/lab. Cross listed as CSE 325. Prerequisite: CSE/EEE 225
326 System Design with Microprocessors (Intel). (3) F, S	CPU memory management/peripheral device interfaces and programming. Microcontrollers, standard system buses, serial and parallel I/O, direct memory access devices, and communications. Lecture/lab. Cross listed as CSE 326. Prerequisite: CSE/EEE 226
340 Electromagnetic Engineering I. (3) F, S, SS	Static and time varying vector fields, boundary value problems; electric and magnetic materials. Maxwell's equations, boundary conditions. Prerequisites: MAT 362; PHY 131.
341 Electromagnetic Engineering II. (4) F, S	Second half of an introductory course in electromagnetic theory and its application in electrical engineering. Plane waves, lossless and lossy media, polarization; reflection and refraction; transmission line theory; waveguides; cavities, antennas and radiating systems. Lecture/lab. Prerequisites: ECE 105, 301. EEE 340
360 Energy Conversion and Transport. (4) F, S	Three phase circuits. Energy supply systems. Magnetic circuit analysis, synchronous generators, transformers, induction machines, and DC circuits. Load flow and short circuit calculations. Lecture/lab. Prerequisite: EEE 302.

396 Professional Seminar. (0) F, S

Topics of interest to upper division electrical engineers 1 hour lecture. Prerequisite: junior standing

405 Filter Design. (3) F

Principles of active and passive analog filter design frequency domain approximations sensitivity and synthesis of filters Prerequisite: EEE 303

406 Computer-Aided Design. (3) N

Principles and application of modern CAD techniques to solve engineering problems, independent project. Prerequisite: EEE 303 or equivalent

407 Digital Signal Processing. (4) F

Time and frequency domain analysis difference equations, z transform, FIR and IIR Digital Filter Design, Discrete Fourier Transform, FFT, and random sequences Lecture, lab Prerequisite: EEE 303 MAT 342

425 Digital Systems and Circuits. (4) F, S

Digital logic gate analysis, propagation delay times, figures of merit and noise margins. Application of MOS and bipolar logic families, including NMOS, CMOS standard and advanced TTL and ECL, regenerative logic circuits, memories, and VLSI circuits; computer simulations using PSPICE Lecture, lab Prerequisite: ECE 334

433 Analog Integrated Circuits. (3) S

Analysis design and applications of modern analog circuits using integrated bipolar and field effect transistor technologies Prerequisite: ECE 334.

434 Quantum Mechanics for Engineers. (3) F

Angular momentum wave packets, Schroedinger wave equation, probability, problems in one dimension principles of wave mechanics scattering, tunneling, central forces, angular momentum, hydrogen atom perturbation theory, variational techniques Prerequisite: EEE 340

435 Microelectronics. (3) S

Principles of solid state device fabrication techniques including thin film and integrated circuit fabrication principles. Lecture, lab. Prerequisite: EEE 436 or equivalent

436 Fundamentals of Solid State Devices. (3) F, S

Meta-semiconductor contacts, P-N junctions, light interacting devices, Schottky diodes bipolar and field effect transistors, planar and thin film integrated circuit (IC) devices. Prerequisite: ECE 352.

439 Semiconductor Facilities and Cleanroom Practices. (3) F

Microcontamination, controlled environments, cleanroom layout and systems, modeling, codes and legislation, ultrapure water production materials personnel and operations, hazard management advanced concepts Prerequisite: EEE 435 or instructor approval

443 Antennas. (3) S

Fundamental parameters; engineering principles and radiation integrals; linear wire antennas loops and arrays; numerical computations; measurements Prerequisite: EEE 341 or equivalent

445 Microwaves. (4) F

Waveguide theory for waveguiding systems microwave devices systems and energy sources, strip lines and microstrips, impedance matching transformers; measurements Lecture, lab. Prerequisite: EEE 341 or equivalent

448 Fiber Optics. (4) F

Principles of fiber optic communications Lectures, lab. Prerequisites: EEE 303 340

451 Error-Correcting Codes. (3) S

Application of modern algebra to the design of random error-detecting and error correcting block codes Prerequisite: CSE/EEE 120

454 Random Signal Theory I. (3) F, S

Application of statistical techniques to the representation and analysis of electrical signals and to communications systems analysis Prerequisite: EEE 303

455 Communication Systems. (4) F, S

Signal analysis techniques applied to the operation of electrical communication systems An introduction to and overview of modern digital and analog communications Lecture, lab Prerequisite: EEE 303

459 Data Communication Systems. (3) F

System characteristics Communications media. Communication codes Data validity checking Line protocols, terminals and system configurations Examples Prerequisite: EEE 303

460 Nuclear Concepts for the 21st Century. (3) F

Neutron interactions with matter Principles of neutron chain reacting systems Neutron diffusion and moderation. Heat removal from nuclear reactors Point reactor kinetics. Cross section NUC 460. Prerequisite: PHY 361

461 Health Physics Principles and Radiation Measurements. (3) N

Sources, characteristics, dosimetry shielding, and measurement techniques for natural and synthetic radiation. Philosophy of radiation protection. Emphasis on instrumentation, detectors, and environmental monitoring. Lecture, lab Cross-listed as NUC 461. Prerequisite: ECE 301.

462 Reactor Safety Analysis. (3) N

Power reactor safety and licensing methodologies. Reactor transient and accident analysis Time dependent solution to neutron diffusion equation. Use of industry codes to assess fission product buildup, emergency core cooling behavior reactivity, off-site releases and dose calculations Cross-listed as NUC 462 Prerequisite: EEE/NUC 460.

463 Electrical Power Plant. (3) F

Nuclear fossil and solar energy sources. Analysis and design of steam supply systems, electrical generating systems, and auxiliary systems Power plant efficiency, operation, and costs and analyses Cross-listed as NUC 463 Prerequisites: ECE 301 340

464 Nuclear Engineering Experiments. (3) N

Theory and applied concepts in reactor design, instrumentation electronics, and shielding Experimental measurements of nuclear parameters using subcritical reactors and fission neutron generator Fast and thermal activation analysis. Mossbauer spectrometry. Lecture, lab Cross-listed as NUC 464. Corequisite: EEE/NUC 460.

465 Radiation Dosimetry and Instrumentation. (3) F

Radiation dosimetry and instrumentation used at nuclear power plants. Calculation of external and internal radiation doses. Radiation biology. Shielding calculations Cross-listed as NUC 465 Prerequisite: EEE/NUC 461

470 Electric Power Devices. (3) F

Analysis of devices used for short circuit protection, including circuit breakers, relay cur-

rent and voltage transducers etc Protection against switching and lightning overvoltages. Insulation coordination. Prerequisite: EEE 360

471 Power System Analysis. (3) S

Review of transmission line parameter calculation Zero sequence impedance symmetrical components for fault analysis, short circuit calculation, review of power flow analysis, power system stability and power system control concepts. Prerequisite: EEE 360.

473 Electrical Machinery. (3) S

Operating principles, construction details, and design aspects of conventional DC and AC machines, transformers and machines used in computer disc drives, printers wrist watches, and automobiles Prerequisite: EEE 360

480 Feedback Systems. (4) F, S

Analysis and design of near feedback systems Frequency response and root locus techniques, series compensation, and state variable feedback Lecture, lab Prerequisite: EEE 303.

482 Introduction to State Space Methods. (3) F

Discrete and continuous systems in state space form controllability, stability, and pole placement Observability and observers. Prerequisites: EEE 303; MAT 342. Corequisite: EEE 480.

490 Senior Design Laboratory. (3) F, S

Project-oriented laboratory Each student must complete one or more design projects during the semester Lecture, lab. Prerequisites: ECE 334, EEE 303; senior status or instructor approval

506 Digital Spectral Analysis. (3) S

Principles and applications of digital spectral analysis, fast Fourier transform, random sequences, parametric, and non parametric methods for spectral estimation. Prerequisites: EEE 407 454

525 VLSI Design. (3) F, S

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

531 Semiconductor Device Theory I. (3) F

Transport and recombination theory, pn and Schottky barrier diodes bipolar and junction field effect transistors and MOS capacitors and transistors. Prerequisite: EEE 436 or equivalent

532 Semiconductor Device Theory II. (3) S

Advanced MOSFETs charge-coupled devices, solar cells photodetectors light-emitting diodes, microwave devices and modulation-doped structures Prerequisite: EEE 531.

533 MOS Integrated Circuit Engineering. (3) N

MOS device physics, integrated circuit fabrication, CMOS, analog and digital circuit design, simulation and layout and yield and reliability models Prerequisite: EEE 436 or equivalent

534 Semiconductor Transport. (3) F

Carrier transport in semiconductors. Hall effect high electric field Boltzmann equation, correlation functions, and carrier carrier interactions Prerequisite: EEE 436 or equivalent

535 Solar Cells. (3) F

Photovoltaic devices, including homojunctions and heterojunctions Photogeneration of carriers, spectral response, electrical characteristics, and efficiency Prerequisite: EEE 436 or equivalent

536 Semiconductor Characterization. 3 S Measurement techniques for semiconductor materials and devices. Electrical, optical, physical, and chemical characterization methods. Prerequisite: EEE 436 or equivalent

537 Semiconductor Optoelectronics I. (3 N) Electron states in semiconductors, quantum theory of radiation, absorption processes, radiative processes, nonradiative processes, photoluminescence, and photonic devices. Prerequisite: EEE 434

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

539 Introduction to Solid State Electronics. (3) S Crystal lattices, reciprocal lattices, quantum statistics, lattice dynamics, equilibrium, and nonequilibrium processes in semiconductors. Prerequisite: EEE 434

541 Electromagnetic Fields and Guided Waves. (3) F Polarization and magnetization of dielectric conductors, anisotropy, and semiconducting media; duality, uniqueness, and image theory; plane wave functions; waveguides, resonators, and surface guided waves. Prerequisite: EEE 341 or equivalent

542 Selected Microwave Devices. (3) N Use of ferrite, semiconductor, and piezoelectric materials in microwave systems. Prerequisites: ECE 352 and EEE 445 or equivalent

543 Antenna Analysis and Design. (3) F Impedances, broadband antennas, frequency independent antennas, miniaturization, aperture antennas, horns, reflectors, lens antennas, and continuous sources design techniques. Prerequisite: EEE 443 or equivalent

544 High Resolution Radar. (3) F Fundamentals; wideband coherent design waveforms, and processing, stepped frequency; synthetic aperture radar (SAR), inverse synthetic aperture radar (ISAR), imaging. Prerequisites: EEE 303 and 340 or equivalent

545 Microwave Circuit Design. (3) N Analysis and design of microwave attenuators, phase and quadrature phase power dividers, magic tee's, directional couplers, phase shifters, DC blocks, equalizers, etc. Prerequisite: EEE 445 or instructor approval

546 Advanced Fiber-Optics. (3) S Theory of propagation in fibers, frequency modulation of light, fiber optic heterodyne receivers, fiber optic sensors, and birefringent fibers. Prerequisite: EEE 448 or instructor approval

547 Microwave Solid State Circuit Design I. (3) N Application of semiconductor characteristics to practical design of microwave mixers, detectors, mixers, switches, attenuators, multiplexers, phase shifters, and amplifiers. Prerequisite: EEE 545 or instructor approval

548 Coherent Optics. (3) N Diffraction, lenses, optical processing, holography, electrooptics, and lasers. Prerequisite: EEE 341

549 Lasers. (3) N Theory and design of gas, solid, and semiconductor lasers. Prerequisite: EEE 448 or instructor approval

550 Transform Theory and Applications. (3) F Applications of complex variables to Fourier, Laplace, and z transforms. Oriented to applications in control, network communication, and near system theory. Prerequisite: EEE 303

551 Information and Coding Theory. (3) N Fundamental theorems of information theory for sources and channels; convolutional and burst codes. Prerequisites: EEE 451, 454

552 Coherent Communications. (3) N Systems analysis and design of telecommunication systems using phase-locked loops. Prerequisite: EEE 454

555 Random Signal Theory II. (3) S Processing of signals in the presence of noise. Random signals, correlation, frequency spectra, estimation, filtering, noise prediction, and transients. Prerequisite: EEE 454

556 Detection and Estimation Theory. (3) N Combination of the classical techniques of statistical inference and the random process characterization of communication, radar, and other modern data processing systems. Prerequisites: EEE 454, 455

558 Modulation Theory. (3) N Noise performance of analog and digital modulation systems. Emphasis on modern digital techniques in terrestrial and satellite communication systems. Prerequisites: EEE 454, 455

566 Nuclear Instrumentation. (3) N Design and analysis of measuring systems for nuclear sciences applications and research. Laboratory experiments using computerized multichannel analyzer systems, whole body counting systems, and computerized tomography. Lecture lab. Cross-listed as NUC 566. Prerequisite: EEE/NUC 465 or instructor approval

567 Radiation Shielding and Transport. (3) F Shielding for radiation therapy, diagnostic radiology, cyclotrons, and nuclear reactors. Monte Carlo and empirical computational methods, regulations, and design problems. Cross-listed as BME/NUC 567. Prerequisite: BME 465 or EEE/NUC 465

569 Radiochemistry and Advanced Nuclear Instrumentation. (3) N Advanced concepts in environmental and power plant radiochemistry. Chemical separations for iodine, strontium, radium, and uranium. Advanced detection concepts in alpha, gamma spectrometry and quench calibration. Lecture lab. Cross-listed as NUC 569. Prerequisite: BME 465 or EEE/NUC 465

571 Power System Transients. (3) N Analysis of transient currents and voltages generated by disturbances in power networks. EMTP method, traveling waves, transients in transformers and generators. Protection against transients. Prerequisite: EEE 471

572 Power Electronics. (3) N Analysis of device operation, including thyristors, gate turn-off thyristors, and transistors. Design of rectifier and inverter circuits. Applications such as variable speed drives, HVDC motor control, and uninterruptible power supplies. Prerequisite: EEE 471

573 Power System Control. (3) N Concepts of economic and secure operation of power systems, load frequency control,

economic dispatch, unit commitment, state estimation, and contingency analysis. Prerequisite: EEE 471

574 Computer Solution of Power Systems. (3) N Algorithms for digital computation for power flow, fault, and stability analysis. Sparse matrix and vector programming methods, optimization, and stochastic methods. Prerequisite: EEE 471

577 Power System Planning. (3) F Power flow and transient stability analysis, load forecast methods, and reliability concepts. Transmission and planning aspects of load probability and production cost analysis, and optimal network and generation expansion. Prerequisite: EEE 470

579 Power Transmission and Distribution. (3) S High voltage transmission line design, such as conductors, corona, and R and TV noise. DC transmission, distribution system analysis, nonlinear load characteristics, feeder voltage drop, and capacitor applications. Prerequisite: EEE 471

581 Random Processes in Control Systems. (3) N Statistical filtering, estimation, and control, with emphasis on the Kalman filter and its applications and computational problems. Prerequisites: EEE 454, 482, 550

582 Linear System Theory. (3) S Controlability, observability, and realization theory for multivariable continuous time systems. Stabilization and asymptotic state estimation. Disturbance decoupling, noninteracting control. Prerequisite: EEE 482

585 Digital Control Systems. (3) N 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 482, 550

586 Nonlinear Control Systems. (3) N Stability theory, nonlinear phase plane, describing function, Lyapunov's method, and frequency domain criteria for continuous and discrete, non-linear and time-varying systems. Prerequisite: EEE 482

587 Optimal Control Systems. (3) N Application of calculus of variations, Pontryagin's principle, and dynamic programming to control problems. Computational techniques for solving optimal control problems. Prerequisite: EEE 482

631 Heterojunctions and Superlattices. (3) F Principles of heterojunctions and quantum well structures, bandline-ups, optical, and electrical properties. Introduction to heterostructure devices

641 Advanced Electromagnetic Field Theory. (3) S Cylindrical wave functions, waveguides, and resonators; spherical wave functions and resonators; integral equations; scattering and radiation; perturbation and variational methods. Prerequisite: EEE 541 or equivalent

643 Advanced Topics in Electromagnetic Radiation. (3) N High frequency asymptotic techniques, geometrical and physical theories of diffraction (GTD and PTD), moment method, MM, radar cross section, RCS prediction, Fourier transforms, radiation, and synthesis methods. Prerequisite: EEE 543

645 Microwave Filter Design. (3) N
Analysis and design of microwave low pass, high pass, band pass, and band stop filters and microwave diodes and transistors: analysis of Pre-requisite: EEE 545 or instructor approval

647 Microwave Solid State Circuit Design II. (3) N
Practical design of microwave free running and voltage controlled oscillators using Gunn and Impatt diodes and transistors: analysis of noise characteristics of the oscillator. Prerequisites: EEE 545, 547.

731 Small MOS Devices. (3) S
Subthreshold current threshold voltage modulation scaling, and other small size materials. Prerequisite: EEE 532.

732 Advanced Bipolar Devices and Circuits. (3) F
Critical examination of new bipolar device and circuit technologies. Performance tradeoffs scaling effects, and modeling techniques. Prerequisite: EEE 531.

770 Advanced Topics in Power Systems. (3) N
Power system problems of current interest approached at an advanced technical level, for mature students. Prerequisites: EEE 577 and 579 or equivalent instructor approval

Omnibus Courses: See page 40 for omnibus courses that may be offered

Industrial and Management Systems Engineering

Philip M. Wolfe
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PROFESSORS

BAILEY BEDWORTH,
MONTGOMERY, SMITH, WOLFE

ASSOCIATE PROFESSORS

ANDERSON COCHRAN, DEAN,
ELLIOTT, KEATS, MACKULAK,
MOOR, ROLLIER, SHUNK

ASSISTANT PROFESSORS

BEAUMARIAGE, HUBELE, NUNO,
ROBERTS, RUCKER

PROFESSORS EMERITI

HOYT, KNIGHT, YOUNG

The industrial engineer (IE) provides leadership for American organizations in productivity improvement and in reestablishing competitiveness in the domestic and international market places. This gives IE's a wide range of interests and responsibilities. In a manufacturing enterprise, for example, the common goal of American industry (and the IE) is both to modernize and

migrate the organization toward the concept of the factory of the future (FOF).

Information technologies are of major interest to the industrial engineer. Information technology makes it possible to integrate people, material, machines, money, and other resources into productive enterprises. Information systems including networks, database models, and computer hardware and software that tie people and resources together symbolize the essence of "integration" from a systems perspective.

Technology integration includes the integration of mechanical, electrical, chemical, structural, and biological systems to create synergistic higher-level systems and subsystems. Other disciplines tend to take vertical cuts deep into their areas of specialty while IEs take horizontal cuts across multiple areas of technology.

A distinguishing feature of industrial engineering is the emphasis on people. In fact, industrial engineering is often referred to as the "people-oriented profession." It is a primary function of the IE to integrate people and technology-oriented systems. IEs are active in the fields of human factors and ergonomics. With the development of the field of artificial intelligence and expert systems, the IE is being called upon to lead the movement from muscle based work to knowledge based work. *Industrial engineering is the only engineering discipline offering course work in quality assurance, so critical in today's competitive environment.*

The IE is not only the developer of people and technology-integrated systems but also a prime candidate for all levels of management, especially those in high tech organizations, because of the IE's background in technology integration, organizational theory, management practice, and engineering economics. This is evidenced by the fact that more than half of all practicing IEs are in some level of management.

The demand for IEs is growing in direct proportion to the exponential increase in integration, modernization, and automation activities. It has been predicted that the demand growth rate for industrial engineers will be considerably higher than average for the foreseeable future.

INDUSTRIAL ENGINEERING— B.S.E.

Degree Requirements

The following courses are required as a part of the engineering core, mathematics requirement and the microcomputer elective (only ECE 313 Introduction to Deformable Solids may be deleted from the engineering core):

			<i>Semester Hours</i>
ECE	383	Probability and Statistics for Engineers	2
IEE	463	Computer Aided Manufacturing and Control	3

In addition, the following courses are required for the Industrial Engineering major:

			<i>Semester Hours</i>
ASE	485	Engineering Statistics	3
IEE	205	Microcomputer Applications in Industrial Engineering	3
IEE	300	Economic Analysis for Engineers	3
IEE	305	Information Engineering	3
IEE	367	Methods Engineering and Facilities Design	4
IEE	374	Quality Control	3
IEE	431	Engineering Administration ..	3
IEE	461	Integrated Production Control	3
IEE	475	Introduction to Simulation	3
IEE	476	Operations Research Techniques/Applications	4
IEE	488	Industrial Engineering Analysis	3
IEE	490	Project in Design and Development	3
MET	343	Material Processes	4
		Area of emphasis (technical electives) ..	10
Total		.....	52

Technical Electives in Industrial Engineering

In consultation with an advisor, technical electives may be selected from one or more of the following areas. A maximum of two courses are allowed outside the School of Engineering. Graduate courses may be taken for undergraduate credit, with department chair approval, provided the student has a GPA greater than or equal to 3.00.

Areas include communication/people skills, computer skills, integration skills, management skills, manufacturing skills, quality skills, and quantitative skills. See the *Manual of Undergraduate Study* in the Industrial and Management Systems Engineering office for specifics.

With departmental approval, technical electives may also be chosen from other courses in engineering, mathe

matics, the sciences, and business administration at or above the 300 level. A minimum of six hours of technical electives must be taken from this department.

**Industrial Engineering
Program of Study
Typical Four-Year Sequence
Freshman Year**

	<i>Semester Hours</i>
First Semester	
CHM 114 General Chemistry for Engineers	4
ECE 105 Introduction to Languages of Engineering	3
ENG 101 First Year Composition	3
MAT 270 Calculus with Analytic Geometry I	4
General studies elective (HU or SB) ¹	3
Total	17

Second Semester	
ECE 106 Introduction to Computer Aided Engineering	3
ENG 102 First Year Composition	3
MAT 271 Calculus with Analytic Geometry II	4
PHY 121 University Physics I Mechanics	3
PHY 122 University Physics Laboratory I	1
General studies elective (HU or SB) ²	4
Total	18

Sophomore Year

First Semester	
ECN 111 Macroeconomic Principles or ECN 112 Macroeconomic Principles (3)	3
IEE 300 Economic Analysis for Engineers	3
MAT 242 Elementary Linear Algebra	2
MAT 272 Calculus with Analytic Geometry III	4
PHY 131 University Physics II: Electricity and Magnetism	3
PHY 132 University Physics Laboratory II	1
General studies elective (HU or SB) ²	2
Total	18

Second Semester	
ECE 210 Engineering Mechanics I: Statics	3
ECE 383 Probability and Statistics for Engineers	2
IEE 205 Microcomputer Applications in Industrial Engineering	3
MAT 274 Elementary Differential Equations	3
Basic science elective ⁴	3
Literacy and critical inquiry elective ^{2 3}	3
Total	17

Junior Year

First Semester	
ASE 485 Engineering Statistics	3
ECE 312 Engineering Mechanics II: Dynamics	3
IEE 367 Methods Engineering and Facility Design	4
IEE 374 Quality Control	3
General studies elective (HU or SB) ²	3
Technical elective	3
Total	19

Second Semester	
ECE 301 Electrical Networks	4
ECE 340 Thermodynamics	3
ECE 350 Structure and Properties of Materials	3
IEE 305 Information Engineering	3
IEE 488 Industrial Engineering Analysis	3
Technical elective	2
Total	18

Senior Year

First Semester	
ECE 333 Electrical Instrumentation	3
IEE 431 Engineering Administration	3
IEE 461 Integrated Production Control	3
IEE 475 Introduction to Simulation	3
MET 343 Materials Processing	4
Technical elective	2
Total	18

Second Semester	
ECE 400 Engineering Communications	3
IEE 463 Computer Aided Manufacturing and Control	3
IEE 476 Operations Research Techniques/Applications	4
IEE 490 Project in Design and Development	3
Technical electives	3
Total	16

Degree requirements: 133 semester hours minimum plus English proficiency

- ¹ Students who have taken no high school chemistry should take CHM 113 and 116.
- ² See pages 45-65 for the requirements and the approved list.
- ³ See page 240 for special requirements and selection of an L1 elective.
- ⁴ Must be an earth science or life science course; if physics or chemistry, the course must be of a more advanced level than CHM 114 or 116 or PHY 131.

Manufacturing Engineering

Manufacturing engineering is concerned with the application of the principles of science to increase productivity in industry. This involves the design of systems that allow for the best utilization of man, machines, material,

and money. Modern manufacturing engineering is concerned with the application of technology, including computers, robots, graphics, mathematical and digital models, information and database systems, microtechnology, and systems theory.

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

The following courses are required as part of the engineering core, mathematics requirement and the microcomputer elective (only ECE 333 Electrical Instrumentation may be deleted from the engineering core):

	<i>Semester Hours</i>
ECE 350 Structure and Properties of Materials	3
ECE 383 Probability and Statistics for Engineers	2
IEE 463 Computer Aided Manufacturing and Control	3
The basic science elective may be selected from BIO 181, CHM 331, GLG 100, PHY 361, and ZOL 201.	
In addition, the following courses are required:	
	<i>Semester Hours</i>
IEE 205 Microcomputer Applications in Industrial Engineering	3
IEE 300 Economic Analysis for Engineers	3
IEE 305 Information Engineering	3
IEE 374 Quality Control	3
IEE 431 Engineering Administration	3
IEE 464 Concurrent Engineering Design	3
IEE 490 Project in Design and Development	3
MAE 317 Dynamic Systems and Control	4
MET 331 Design for Manufacturing I	3
MET 343 Material Processes	4
MET 438 Design for Manufacturing II	4
MET 443 N/C Computer Programming	3
MET 451 Introduction to Robotics	3
Technical electives*	10
Total	52

* Two courses of engineering science and one course of engineering design content required.

INDUSTRIAL AND MANAGEMENT SYSTEMS ENGINEERING

IEE 205 Microcomputer Applications in Industrial Engineering. (3) F, S

Concepts related to development of operational capability in the use of microcomputer hardware, software and networking as related to industrial engineering applications. Prerequisite: ECE 105 *General studies N3*

300 Economic Analysis for Engineers. (3) F, S

Economic evaluation of alternatives for engineering decisions emphasizing the time value of money. Prerequisite: MAT 270

305 Information Systems Engineering. (3) F

Emphasis on systems analysis design and implementation of information systems using fourth generation languages and a relational database structures. Prerequisite: EE 205

367 Methods Engineering and Facilities Design. (4) F

Analysis and design of work systems; productivity; motion and time study techniques, human factors. Analysis and design of facilities for automated and machine systems, emphasis on process design material handling, layout design, and facilities location. Lecture lab. Prerequisites: IEE 300, 205 (or equivalent).

374 Quality Control. (3) F

In depth analysis of control chart and other statistical process control techniques. Organization and managerial aspects of quality assurance. Attribute and variable acceptance sampling plans. Prerequisite: ECE 383

411 Engineering Economy. (3) N

Equipment replacement analysis treatment of inflation cash flow studies and consideration of risk and uncertainty. Prerequisite: EE 300

422 Information Systems Design. (3) F

Emphasis on the application of system analysis and design to information systems. Microprocessor MIS project required. Prerequisite: EE 205 or equivalent

431 Engineering Administration. (3) F

Engineering organization and administration; introduction to decision making quantitative and qualitative approaches to management and engineering administration

437 Human Factors Engineering. (3) F

Study of people at work designing for human performance effectiveness and productivity. Considerations of human physiology and psychological factors. Prerequisite: EE 367.

461 Integrated Production Control. (3) F

Product control techniques for the planning, analysis, control, and evaluation of operating systems. Time series forecasting, network planning, scheduling and control. Prerequisites: ECE 383 EE 205 or equivalent

463 Computer-Aided Manufacturing and Control. (3) F, S

Emphasis on computer control in manufacturing; real time concepts CIM, NC group technology and process planning and robotics. Prerequisite: IEE 205 or equivalent. *General studies N3*.

464 Concurrent Engineering. (3) S

Concurrent engineering refers to simultaneous consideration of product, manufacturing process and service issues in product design. The course covers issues and methods to solve this more complex design problem. Prerequisites: ECE 106; EE 205 or equivalent.

475 Introduction to Simulation. (3) F, S

Use of simulation in the analysis and design of network and discrete systems. Methods for using a simulation language. Introduction to statistical aspects of simulation. Prerequisites: ECE 383, IEE 205 or equivalent. *General studies N3*.

476 Operations Research Techniques Applications. (4) F, S

Topics include linear programming network optimization dynamic programming, Markov processes, and queueing models. Emphasis on the design and development of models for solving decision problems in industrial systems. Prerequisites: ECE 383 MAT 242. *General studies N2*

488 Industrial Engineering Analysis. (3) S

Labor material and overhead cost analysis, parametric cost estimation risk analysis inventory budgeting insurance of estimates quality cost systems, and feedback cost analysis, including effects on engineering design, reliability maintainability, serviceability, testability, and availability. Prerequisites: ECE 383; EE 300

490 Project in Design and Development. (3) F, S

Individual project in creative design and synthesis. Prerequisite: senior standing

501 Foundations of Industrial Engineering I. (3) N

Techniques for the analysis and design of machine systems. Emphasis on work planning methods measurements material handling and facility design. Not available for E graduate credit.

502 Foundations of Industrial Engineering II. (3) N

Introduction to quantitative production control techniques, including planning forecasting, inventory control and MRP, and scheduling. Influence of CAD CAM and automation on production control process. Not available for E graduate credit. Prerequisite: ECE 383 or 500

503 Economic Analysis for Engineers. (3) F, S

Economic evaluation of alternatives for engineering decisions emphasizing the time value of money. Not available for E graduate credit. Prerequisite: MAT 270

504 Math Tools Industrial Engineers. (3) F, S

Introduction to and extension of fundamental mathematical techniques. Extensive use of a comprehensive, computer based, mathematical environment to both explore and verify mathematical theorems and problems, including algebra probability statistics optimization transform theory, and logic.

510 Measurement of Productivity. (3) S, 93

The engineering economic audit and its use with applications to break even analysis, variable budget control cost analysis, and product pricing. Prerequisites: ECE 383 or 500 IEE 205 or equivalent

511 Analysis of Decision Processes. (3) S

Methods of making decisions in complex environments and statistical decision theory effects of risk, uncertainty and strategy on engineering and managerial decisions. Prerequisite: ECE 383 or 500

520 Ergonomics Design. (3) S

Human physiological and psychological factors in the design of work environments and in the employment of people in machine

systems. Open-shop lab assignments in addition to class work. Prerequisite: IEE 437 or 547.

531 Topics in Engineering Administration. (3) S, 94

Consideration given to philosophical psychological, political and social implications of administrative decisions. Prerequisite: IEE 431 or 541

532 Management of Technology. (3) F

Topics include designing a technical strategy technology forecasting interfacing marketing engineering and manufacturing designing and managing innovation systems; creativity, application of basic management principles to technology management. Prerequisite: EE 431 or instructor approval.

533 Scheduling and Network Analysis Models. (3) S, 94

Application of scheduling and sequencing algorithms deterministic and stochastic network analysis and flow algorithms. Prerequisites: ECE 383 or 500; EE 476 or 546

540 Engineering Economy. (3) F, S

Equipment replacement analysis, treatment of inflation cash flow studies, and consideration of risk and uncertainty. Open only to students without previous credit for IEE 411. Prerequisite: EE 300 or 503

541 Engineering Administration. (3) F

Engineering organization and administration introduction to decisions on making quantitative and qualitative approaches to management and engineering administration. Open only to students without previous credit for IEE 431

542 Information System Design. (3) F, SS

Emphasis on the application of system analysis and design to information systems. Microprocessor MIS project required. Open only to students without previous credit for IEE 422. Prerequisite: IEE 205 or equivalent

543 Computer-Aided Manufacturing and Control. (3) F, S

Emphasis on computer control in manufacturing real time concepts CIM, NC, group technology and process planning, and robotics. Open only to students without previous credit for EE 463. Prerequisite: IEE 205 or equivalent

544 Concurrent Engineering. (3) S

Concurrent engineering refers to simultaneous consideration of product, manufacturing process, and service issues in product design. The course covers issues and methods to solve this more complex design problem. Open only to students without previous credit for EE 464. Prerequisites: ECE 106, IEE 205 or equivalent

545 Introduction to Simulation. (3) F, S

Use of simulation in the analysis and design of network and discrete systems. Methods for using a simulation language. Introduction to statistical aspects of simulation. Open only to students without previous credit for EE 475. Prerequisites: ECE 383 or 500, EE 205 or equivalent.

546 Operations Research Techniques Applications. (4) F, S

Topics include linear programming network optimization dynamic programming, Markov processes, and queueing models. Emphasis on the design and development of models for solving decision problems in industrial systems. Open only to students without previous credit for IEE 476. Prerequisites: ECE 383 or 500 MAT 242

547 Human Factors Engineering. (3) F
Study of people at work; designing for human performance effectiveness and productivity. Considerations of human physiology and psychological factors. Open only to students without previous credit for EE 437. Prerequisite: EE 367 or equivalent.

548 Industrial Engineering Analysis. (3) S
Labor material and overhead cost analysis, parametric cost estimation, risk analysis involving budget limitations, assurance of estimates, quality cost systems, and life cycle analysis, including effects on engineering design, reliability, maintainability, serviceability, testability, and availability. Open only to students without previous credit for EE 488. Prerequisites: ECE 383 or 500; IEE 300 or 503.

560 Database Concepts for Industrial Management Systems. (3) S

Application of database concepts to industrial systems problems. Topics include conceptual modeling, data structures, database software, and perspectives from expert and knowledge base systems. Prerequisites: ECE 383 or 500; EE 422 or 542.

561 Production Control Information Systems. (3) F

Development of information system designs for production control. Topics include MRP I, MRP II, scheduling, sequencing, and inventory control. Only the design concepts are covered. Prerequisites: ASE 485 or 500; EE 461; MAT 242.

563 Systems Analysis for Distributed Systems. (3) S

Analysis and design of distributed systems for computer-integrated manufacturing and information processing. Concepts of host-driven microprocessors to collect, store, and communicate data. Prerequisites: ECE 383 or 500; IEE 422 or 542.

564 Planning for Computer-Integrated Manufacturing. (3) F

Theory and use of DEF methodology in planning for flexible manufacturing, robotics, and real-time control. Simulation concepts applied to computer-integrated manufacturing planning. Prerequisite: IEE 463 or 543.

565 Computer-Integrated Manufacturing Research. (3) S

Determination and evaluation of research areas in computer-integrated manufacturing, including real-time software, manufacturing information systems, flexible and integrated manufacturing systems, robotics, and computer graphics. Prerequisite: IEE 564.

566 Simulation in Computer-Integrated Manufacturing Planning. (3) S

Use of simulation in the planning of computer-integrated manufacturing planning related to robotics, flexible, and integrated manufacturing systems. Use of computer graphics combined with simulation analysis for CIM decision support. Prerequisite: EE 475 or 545.

567 System Simulation. (3) S
Use of simulation in the analysis and design of systems involving continuous and discrete processes: simulation languages, statistical aspects of simulation. Prerequisite: EE 475 or 545.

569 Advanced Statistical Methods. (3) F '92
Application of statistical inference procedures, based on ranks, to engineering problems. Efficient alternatives to classical statistical inference constrained by normality assumptions. Prerequisite: ASE 485 or 500.

570 Advanced Quality Control. (3) F
Economic-based acceptance sampling, multiple attribute acceptance sampling, narrow limit gauging, inspector error and attributes acceptance sampling, principles of quality management, and selected topics from current literature. Prerequisites: ASE 485 or 500; IEE 374.

571 Quality Management. (3) F
Total quality concepts, quality strategies, quality and competitive position, quality costs, vendor relations, the quality manual, and quality in the services. Prerequisite: IEE 431 or 541.

572 Design of Engineering Experiments. (3) F, S

Analysis of variance and experimental design. Topics include general design methodology, incomplete blocks, confounding, fractional replication, and response surface methodology. Prerequisite: ASE 485 or 500.

573 Reliability Engineering. (3) S
Topics include the nature of reliability, time to failure densities, especially the exponential and Weibull series parallel standby systems, complex system reliability, Bayesian reliability analysis, and sequential reliability tests. Prerequisite: ECE 383 or 500.

574 Applied Deterministic Operations Research Models. (3) F

Formulation, solution, analysis, and application of deterministic models in operations research, including those of linear programming, integer programming, and nonlinear programming. Prerequisite: EE 476 or 546.

575 Applied Stochastic Operations Research Models. (3) S

Application of stochastic models, including inventory theory, queueing theory, Markov processes, stochastic programming, and renewal theory. Prerequisite: ASE 485 or 500.

576 Applications of Operations Research. (3) N

Case studies of application of linear and nonlinear models and general types of search techniques. Prerequisite: IEE 574 or instructor approval.

577 Decision and Expert Systems Methodology. (3) F

Systems approach to the analysis, design, and implementation of decisions on support systems. Emphasis on development of data bases, mode bases, dialogues, and systems architecture as well as systems effectiveness. Introduction to expert systems as decisions are included. Term project required. Prerequisite: EE 422 or 542.

579 Time Series Analysis and Forecasting. (3) F

Forecasting time series by the Box-Jenkins and exponential smoothing techniques; existing digital computer programs are utilized to augment the theory. Prerequisites: ASE 485 or 500; EE 461.

582 Response Surfaces and Process Optimization. (3) S

An introduction to response surface methodology and its applications. Topics include steepest ascent, canonical analysis, designs, and optimization criteria. Prerequisite: IEE 572.

678 Advanced Decision Theory. (3) N
Advanced decision theory techniques for industrial systems. Topics include conjugate families of distributions, value theory, decisions with multiple objectives, and goal programming. Prerequisite: IEE 511.

681 Reliability, Availability, and Serviceability. 3 N

Includes organizing for RAS hardware and software, RAS integrity and fault tolerant design, maintenance design and maintenance strategy, Markov models for RAS fault free analysis, and military standards for RAS. Prerequisite: ECE 383 or 500.

Omnibus Courses: See page 40 for omnibus courses that may be offered.

Mechanical and Aerospace Engineering

Don L. Boyer
Chair
(ECG 346) 602 965-3291

PROFESSORS

BEAKLEY, BICKFORD, BOYER,
S. CHEN, DAVENSON EVANS,
FLORSCHUETZ HIRLEMAN,
JACOBSON, JANKOWSKI,
KRAJCI NOV C, LOGAN, METZGER,
ROY, SARIC, SCHMIDT, SO, TONG,
WALLACE, WOOD YAO

ASSOCIATE PROFESSORS

FERNANDO, KUO, LAANANEN, LIU,
PECK, RANKIN, REED, SHAH, WIE

ASSISTANT PROFESSORS

BLECHSCHMIDT, CHATTO PADHYAY,
K. CHEN, GARRETT, HENDERSON,
KOURIS, MAJUMDAR McNEILL,
MIGNOLET, NATSIAVANS, WELLS

PROFESSORS EMERITI

ALLEN, AVERY, D TSWORTH, FRY,
KAUFMAN, RICE SHAW,
THOMPSON, TURNBOW,
WILCOX, WOOLDRIDGE

The Department of Mechanical and Aerospace Engineering is the administrative home for two undergraduate majors: Aerospace Engineering and Mechanical Engineering.

Both majors build on the broad exposure to the engineering, chemical, and physical sciences and the mathematics embodied in the general studies and engineering core courses required of all engineering students.

The *Aerospace Engineering* major provides students an education in technological areas critical to the design and development of aerospace vehicles and systems. Aerospace Engineering graduates are typically employed at government laboratories (e.g., NASA)

and in a wide range of aerospace industries. The *Mechanical Engineering* major is perhaps one of the most broadly applicable programs in engineering, providing education for a wide variety of employment opportunities.

The two majors, discussed in more detail below, can serve as entry points to immediate professional employment or to graduate study. The emphasis in all fields is on development of fundamental knowledge that will have long lasting utility in our rapidly changing technical society. Employers' desire for this emphasis is a strong point in favor of these choices of curricula over technology or special programs that emphasize primarily current applications or specific industries.

DEGREE REQUIREMENTS

All degree programs in the department require that students attain a minimum GPA of 2.00 in the engineering core and major in order to be eligible for graduation. Also, the department may require additional or remedial work for those students who have demonstrated a trend of academic difficulty.

Engineering Core Options

Among the options listed on page 241 as part of the engineering core requirements, students in the Department of Mechanical and Aerospace Engineering are required to select the following:

		<i>Semester Hours</i>
ECE 210	Engineering Mechanics I Statics	3
ECE 312	Engineering Mechanics II: Dynamics	3
ECE 313	Introduction to Deformable Solids	3
ECE 340	Thermodynamics	3
ECE 350	Structure and Properties of Materials	3
MAE 305	Measurements and Microcomputers	4

AEROSPACE ENGINEERING— B.S.E.

The primary concern of aerospace engineers is the design and development of a wide variety of aircraft and space vehicles and systems. The current challenges to the aerospace engineer include the design of a new generation of high efficiency transport aircraft, the development of the next generation of space transports, and the de-

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

The undergraduate curriculum includes the study of flight mechanics, aerospace structures and materials, aerodynamics and propulsion. These subjects provide the foundation necessary for design of aircraft and space vehicles.

Aerospace Engineering Major

Aerospace Engineering students are required to select the following courses in the engineering core:

		<i>Semester Hours</i>
ECE 386	Partial Differential Equations for Engineers.	2
MAT 242	Elementary Linear Algebra	3
PHY 361	Introductory Modern Physics	3

The Aerospace Engineering major consists of the following courses:

		<i>Semester Hours</i>
MAE 317	Dynamic Systems and Control	4
MAE 361	Aerodynamics I	3
MAE 413	Spacecraft Dynamics and Control	3
MAE 415	Vibration Analysis	4
MAE 425	Aerospace Structures I.	3
MAE 426	Aerospace Structures II	4
MAE 441	Design Theory and Techniques	3
MAE 460	Gas Dynamics	3
MAE 461	Aerodynamics II	3
MAE 462	Dynamics of Flight	3
MAE 463	Propulsion	3
MAE 464	Aerospace Laboratory	2
MAE 467	Aircraft Performance	3
MAE 468	Aerospace Systems Design	3
	Area of emphasis (technical electives)	6
Total		50

Aerospace Engineering Areas of Emphasis

Technical electives may be selected from among any of the courses listed below or from courses listed under the Mechanical Engineering areas of emphasis. The courses are grouped so that the student may select an elective pack

age of closely related courses. A student may, with prior approval of the advisor and department, select a general area and a corresponding set of courses not listed below that would support a career objective not covered by the following categories.

Aerodynamics. MAE 434, 466, 471, 490; MAT 466.

Aerospace Materials. ECE 383; MAE 455; MSE 355, 420, 440, 441, 450, 470.

Aerospace Structures. ECE 383; MAE 404, 455, 490.

Computer Methods. ASE 485; CSE 310, 320, 422, 428; ECE 383; IEE 463, 464, 475; MAE 403, 404, 406, 471, 541; MAT 464, 465, 466.

Design. MAE 341, 403, 404, 406, 435, 442, 446, 455, 466, 490; MSE 440, 441.

Mechanical. Any courses listed under Mechanical Engineering Areas of Emphasis.

Propulsion. MAE 382, 434, 436, 465, 489, 490.

System Dynamics and Control. CSE 428; ECE 383; EEE 480, 482; MAE 417, 447, 490.

Aerospace Engineering Program of Study Typical Four-Year Sequence

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

Program of Study Typical Four-Year Sequence Freshman Year

		<i>Semester Hours</i>
First Semester		
CHM 114	General Chemistry for Engineers or CHM 116 General Chemistry (4)	4
ECE 105	Introduction to Languages of Engineering	3
ENG 101	First-Year Composition	3
MAT 290	Calculus I	5
	General studies elective (HU or SB) ¹	3
Total		18
Second Semester		
ECE 106	Introduction to Computer Aided Engineering	3
ENG 102	First Year Composition	3
MAT 291	Calculus II	5

PHY 121	University Physics I: Mechanics	3
PHY 122	University Physics Laboratory I	1
	General studies elective (HU or SB) ¹ ..	3
Total		18

Sophomore Year

First Semester

ECE 210	Engineering Mechanics I Statics	3
MAT 242	Elementary Linear Algebra ...	3
MAT 274	Elementary Differential Equations	3
PHY 131	University Physics II: Elec tricity and Magnetism	3
PHY 132	University Physics Laboratory II	1
	Literacy and critical inquiry elective ^{1 2} ..	3
Total		16

Second Semester

ECE 301	Electrical Networks I	4
ECE 312	Engineering Mechanics II: Dynamics	3
ECE 313	Introduction to Deformable Solids	3
ECE 340	Thermodynamics	3
ECE 350	Structure and Properties of Materials	3
ECE 386	Partial Differential Equations for Engineers	2
Total		18

Junior Year

		<i>Semester Hours</i>
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First Semester

MAE 305	Measurements and Microcomputers	4
MAE 361	Aerodynamics I	3
MAE 413	Spacecraft Dynamics and Control	3
MAE 425	Aerospace Structures I ..	3
PHY 361	Introductory Modern Physics	3
	General studies elective (HU or SB) ¹ ..	3
Total		19

Second Semester

MAE 317	Dynamic Systems and Control	4
MAE 426	Aerospace Structures II	4
MAE 441	Design Theory and Techniques	3
MAE 460	Gas Dynamics	3
MAE 467	Aircraft Performance	3
Total		17

Senior Year

First Semester

MAE 415	Vibration Analysis ..	4
MAE 461	Aerodynamics II	3
MAE 462	Dynamics of Flight	3
MAE 463	Propulsion ..	3
	General studies elective (HU or SB)	3
Total		16

Second Semester

ECE 400	Engineering Communications	3
MAE 464	Aerospace Laboratory ..	2
MAE 468	Aerospace Systems Design .	3
	General studies elective (HU or SB) ¹ ..	3
	Technical electives	6
Total		17

¹ See pages 45–65 for the specific requirements and the approved list.

² See page 240 for special requirements and selection of an L1 elective.

**MECHANICAL ENGINEERING—
B.S.E.**

Mechanical engineering is a creative discipline that draws upon a number of basic sciences to design the devices, machines, processes, and systems that involve mechanical work and its conversion from and into other forms. It includes: the conversion of thermal, chemical, and nuclear energy into mechanical energy through various engines and power plants; the transport of energy via devices like heat exchangers, pipelines, gears, and linkages; the use of energy to perform a variety of tasks for the benefit of society, such as in transportation vehicles of all types, manufacturing tools and equipment, and household appliances. Further more, since all manufactured products must be constructed of solid materials and because most products contain parts that transmit forces, Mechanical Engineering is involved in the structural integrity and materials selection of almost every product on the market.

Mechanical engineers are employed in virtually every kind of industry. They are involved with seeking new knowledge through research, with doing creative design and development, and with the construction, control, management, and sales of the devices and systems needed by society. There fore, a major strength of a mechanical engineering education is the flexibility it provides in future employment opportunities for its graduates.

The undergraduate curriculum includes the study of: the principles governing the use of energy; the principles of design, instruments and control devices; the application of these studies to the creative solution of practical, modern problems.

Mechanical Engineering Major

Mechanical Engineering students are required to select the following in the engineering core:

		<i>Semester Hours</i>
ECE 386	Partial Differential Equations for Engineers	2
MAT 242	Elementary Linear Algebra ...	2
PHY 361	Introductory Modern Physics ..	3

The Mechanical Engineering major consists of the following courses:

		<i>Semester Hours</i>
ECE 384	Numerical Analysis for Engineers I	2
MAE 317	Dynamic Systems and Control ..	4
MAE 371	Fluid Mechanics ..	3
MAE 372	Fluid Mechanics ..	4
MAE 382	Thermodynamics	3
MAE 388	Heat Transfer	3
MAE 415	Vibration Analysis	4
MAE 422	Mechanics of Materials	4
MAE 441	Design Theory and Techniques ..	3
MAE 442	Mechanical Systems Design ..	3
	or MAE 446 Thermal Systems Design (3)	
MAE 443	Engineering Design ..	3
MAE 490	Projects in Design and Development	2
MAE 491	Experimental Mechanical Engineering	3
	Area of emphasis (technical electives)	10
Total		51

**Mechanical Engineering Areas of
Emphasis**

Technical electives may be selected from among any of the courses listed below or from courses listed under the Aerospace Engineering areas of emphasis. The courses are grouped so that the student may select an elective package of closely related courses. With prior approval of the advisor and department, a student may select a general area and a corresponding set of courses not listed below that would support a career objective not covered by the following categories.

Aerospace. Any courses listed under Aerospace Engineering areas of emphasis.

Biomechanical. BME 411, 412, 416, 419, 517 (recommended); EEE 302, 434.

Computer Methods. ASE 485; CSE 310, 422, 428; ECE 383; IEE 463, 464, 475; MAE 403, 404, 406, 471, 541; MAT 464, 465, 466.

Control and Dynamic Systems. CSE 428; ECE 383; EEE 360; IEE 463; MAE 413, 417, 462, 467.

Design. MAE 341, 351, 403, 404, 406, 417, 434, 435, 438, 442, 446, 447.

Energy Systems. EEE 360; MAE 430, 434, 435, 436, 437, 438, 446.

Engineering Mechanics MAE 341, 402, 404, 413, 426, 442, 460, 461, 471; MAT 464, 466

Manufacturing. CSE 428; IEE 300, 374, 411, 461, 463; MAE 341, 351, 403, 404, 442, 447, 455; MSE 355, 420, 431, 440.

Stress Analysis, Failure Prevention, and Materials ECE 383; MAE 341, 404, 426, 447, 455; MSE 355, 420, 431, 440, 450.

Thermosciences MAE 336, 430, 434, 435, 436, 437, 446, 460, 463, 471.

Mechanical Engineering Program of Study Typical Four-Year Sequence

Freshman Year	
First Semester	Semester Hours
CHM 114 General Chemistry for Engineers or CHM 116 General Chemistry (4)	4
ECE 105 Introduction to Languages of Engineering	3
ENG 101 First Year Composition	3
MAT 290 Calculus I	5
General studies elective (HU or SB) ¹	3
Total	18
Second Semester	
ECE 106 Introduction to Computer Aided Engineering	3
ENG 102 First Year Composition	3
MAT 291 Calculus II	5
PHY 121 University Physics I: Mechanics	3
PHY 122 University Physics Laboratory I	1
General studies elective (HU or SB) ¹	3
Total	18
Sophomore Year	
First Semester	
ECE 210 Engineering Mechanics I Statics	3
MAT 242 Elementary Linear Algebra	2
MAT 274 Elementary Differential Equations	3
PHY 131 University Physics II. Electricity and Magnetism	3
PHY 132 University Physics Laboratory II	1
General studies elective (HU or SB)	3
Literacy and critical inquiry elective ^{1, 2}	3
Total	18

Second Semester	
ECE 301 Electrical Networks I	4
ECE 312 Engineering Mechanics II Dynamics	3
ECE 313 Introduction to Deformable Solids	3
ECE 340 Thermodynamics	3
ECE 350 Structure and Properties of Materials	3
ECE 386 Partial Differential Equations for Engineers	2
Total	18

Junior Year

First Semester	
ECE 384 Numerical Analysis for Engineers I	2
MAE 305 Measurements and Microcomputers	4
MAE 371 Fluid Mechanics	3
MAE 382 Thermodynamics	3
MAE 422 Mechanics of Materials	4
PHY 361 Introductory Modern Physics	3
Total	19
Second Semester	
MAE 317 Dynamic Systems and Control	4
MAE 372 Fluid Mechanics	4
MAE 388 Heat Transfer	3
MAE 441 Design Theory and Techniques	3
General studies elective (HU or SB) ¹	3
Total	17

Senior Year

First Semester	
MAE 415 Vibration Analysis	4
MAE 442 Mechanical Systems Design or MAE 446 Thermal Systems Design (3)	3
MAE 491 Experimental Mechanical Engineering	3
Technical electives	6
Total	16
Second Semester	
ECE 400 Engineering Communications	3
MAE 443 Engineering Design	3
MAE 490 Projects in Design and Development	2
General studies elective (HU or SB) ¹	3
Technical electives	4
Total	15

¹ See pages 45–65 for the requirements and the approved list.
² See page 240 for special requirements and selection of an L1 elective.

SPECIAL PROGRAMS

An engineering mechanics option is available under the Engineering Special Studies. See pages 273–278 for details and course requirements.

MECHANICAL AND AEROSPACE ENGINEERING

MAE 305 Measurements and Microcomputers. (4) F, S

Science of measurements, microcomputer architecture and fundamentals, and interfacing microcomputers to laboratory experiments, sensors, and data acquisition. Lecture/lab. Prerequisite: ECE 301.

317 Dynamic Systems and Control. (4) F, S Modeling and representations of dynamic physical systems including transfer functions, block diagrams and state equations. Transient response. Principles of feedback control and linear system analysis, including root locus and frequency response. Lecture/lab. Prerequisites: ECE 301, 312. Pre- or corequisite: ECE 386.

336 Air Conditioning and Refrigeration. (3) F

Refrigeration cycles, refrigerant properties, heating, and cooling loads; psychrometry and purification temperature and humidity control. Prerequisites: MAE 382 or MET 432 or instructor approval.

341 Mechanism Analysis and Design. (3) F Positions, velocities and accelerations of machine parts: cams, gears, flexible connectors and rolling contact, introduction to synthesis. Prerequisite: ECE 312.

351 Manufacturing Processes Survey. (3) F, S

Production techniques and equipment: Casting and molding, pressure forming, material removal joining and assembly processes, automation, and material handling. Lecture/recitation. Prerequisite: ECE 350.

361 Aerodynamics I. (3) F, S Fluid statics, conservation principles: stream function, velocity potential, vorticity, inviscid flow, Kutta-Joukowski thin-airfoil theory and panel methods. Prerequisites: ECE 312, 340.

371 Fluid Mechanics. (3) F, S Introductory concepts of fluid motions: fluid statics; control volume forms of basic principles: introduction to local principles. Prerequisites: ECE 312, 340.

372 Fluid Mechanics. (4) F, S Application of basic principles of fluid mechanics to problems in viscous and compressible flow. Lab experimentation, demonstrations. Prerequisites: ECE 384, 386; MAE 371.

382 Thermodynamics. (3) F, S Applied thermodynamics, gas mixtures, psychrometrics: property relationships, power and refrigeration cycles, and reactive systems. Prerequisite: ECE 340.

388 Heat Transfer. (3) F, S Steady and unsteady heat conduction including numerical solutions; thermal boundary layer concepts and applications to free and forced convection. Thermal radiation concepts. Prerequisite: MAE 371.

402 Introduction to Continuum Mechanics. (3) S

Application of the principles of continuum mechanics to such fields as flow in porous media, biomechanics, electromagnetic continua, and magneto fluid mechanics. Prerequisite: ECE 313, MAE 361 or 371; MAT 242

403 CAD Systems Development. (3) S

Design and implementation of CAD System user interface design, computer graphics, data structures, and extensive code development. Prerequisites: ECE 105 or equivalent junior or standing in program.

404 Finite Elements in Engineering. (3) S
Introduction to ideas and methodology of finite element analysis. Applications to solid mechanics, heat transfer, fluid mechanics, and vibrations. Prerequisites: ECE 313; MAT 242

406 CAD/CAM Applications in MAE. (3) F
Solution of engineering problems with the aid of state-of-the-art software tools in solid modeling, engineering analysis, and manufacturing; selection of modeling parameters, reliability tests on software. Prerequisite: instructor approval.

413 Spacecraft Dynamics and Control. (3) F, S

Kinematics of particles and rigid bodies. Euler's moment equations, satellite orbits and maneuvers, and spacecraft attitude dynamics and control. Prerequisites: ECE 312, MAT 242.

415 Vibration Analysis. (4) F, S

Free and forced response of single and multiple degree of freedom systems, continuous systems, applications in mechanical and aerospace systems, numerical methods. Lecture, lab. Prerequisites: ECE 312, MAE 305, 422, MAT 242 or 342

417 Control System Design. (3) S

Tools and methods of control system design and compensation including simulation, response optimization, frequency domain techniques, state variable feedback, and sensitivity analysis. Introduction to nonlinear and discrete time systems. Prerequisite: MAE 317

422 Mechanics of Materials. 4 F, S

Failure theories, energy methods, finite element methods, plates, torsion of noncircular members, unsymmetrical bending, shear center, and beam column. Lecture/lab. Prerequisites: ECE 313, MAT 242. Pre- or corequisite: ECE 386

425 Aerospace Structures I. (3) F, S

Stability, energy methods, torsion, curved bars, finite elements, circular plates, and unsymmetrical bending. Prerequisites: ECE 313; MAT 242

426 Aerospace Structures II. (4) F, S

Flight vehicle loads, semi-monocoque structures, buckling, fatigue, aerospace materials, composites, joints, and finite element applications. Lecture/lab. Prerequisite: MAE 425

430 Introduction to Nuclear Engineering.

(3) F
Neutron interactions with matter. Principles of neutron chain reaction systems. Neutron diffusion and moderation. Heat removal from nuclear reactors. Point reactor kinetics. Prerequisite: PHY 361.

434 Internal Combustion Engines. (3) S

Performance characteristics, combustion in carburetor and fuel injection, and the cooling and control of internal combustion engines. Computer modeling. Lab. Prerequisite: MAE 382.

435 Turbomachinery. (3) S

Design and performance of turbomachines including steam, gas, and hydraulic turbines, centrifugal pumps, compressors, fans, and blowers. Corequisite: MAE 372 or 461

436 Combustion. (3) N

Thermochemical and reaction rate processes, combustion of gaseous and condensed phase fuels. Applications to propulsion and heating systems. Potpourri format. Prerequisite: MAE 382

437 Direct Energy Conversion. (3) N

Unconventional methods of energy conversion: fuel cell, thermoelectrics, thermionics, photovoltaics, and magnetohydrodynamics. Prerequisites: ECE 340, 350

438 Solar Energy. (3) S

Solar radiation and instrumentation, design and testing of collectors, performance analysis of systems, thermal storage, photovoltaics, materials, and economic analysis. Prerequisites: MAE 382, 388

441 Design Theory and Techniques. (3) F, S

The design process, including problem definition, conceptual design, form and function decisions on making materials selection, manufacturability, modes of failure, fatigue, professional, social, and ethics. Prerequisites: ECE 106, 350, MAE 422 or 425

442 Mechanical Systems Design. (3) F, S

Application of design principles and techniques to the synthesis of modeling, and optimization of mechanical, electromechanical, and hydraulic systems. Prerequisite: MAE 441

443 Engineering Design. (3) F, S

Group projects to design engineering components and systems. Problem definition, definition, modeling, and analysis decisions on making and documentation activities emphasized. 6 hours lab. Prerequisite: MAE 442 or 446.

446 Thermal Systems Design. (3) F

Application of engineering principles and techniques to the modeling and analysis of thermal systems and components. Optimization techniques are presented and their use demonstrated. Prerequisite: MAE 441.

447 Robotics and Its Influence on Design.

(3) S
Robot applications, configurations, singular positions, and work space; modes of control versus programming exercises, design of parts for assembly. Prerequisite: MAE 317.

455 Polymers and Composites. (3) F

Relationship between chemistry, structure and properties of engineering polymers. Design, properties and behavior of fiber composite systems. Cross-listed as MSE 470. Prerequisite: ECE 350

460 Gas Dynamics. (3) F, S

Compressible flow at subsonic and supersonic speeds; duct flow, normal and oblique shocks, perturbation theory, and wind tunnel design. Prerequisite: MAE 361 or 371

461 Aerodynamics II. (3) F, S

Transonic/hypersonic flows, wing theory, Navier-Stokes laminar turbulent shear flows, pressure drop in tubes, separation, drag, viscous/inviscid interaction, and wing design. Prerequisite: MAE 460

462 Dynamics of Flight. (3) F, S

Aerodynamic forces and moments, static stability and control, equations of motion, stability derivatives, and lateral and longitudinal motion and control. Prerequisites: MAE 413, 467

463 Propulsion. (3) F, S

Application of gas dynamics and thermodynamics to air-breathing engines and rockets, emphasis on turbojet, turbofan, and turbo-prop engines. Corequisite: MAE 460

464 Aerospace Laboratory. (2) F, S

Measurements of aerodynamic parameters in both subsonic and supersonic flows, flow over airfoils and bodies of revolution, flow visualization. Computer-aided data acquisition and processing. Lecture/lab. Prerequisites: MAE 305, 460. Pre- or corequisite: MAE 461

465 Rocket Propulsion. (3) S

Rocket flight performance, nozzle design, combustion of liquid and solid propellants; component design, advanced propulsion systems, interplanetary missions testing. Prerequisite: MAE 460

466 Rotary Wing Aerodynamics and Performance. (3) F, S

Introduction to helicopter and propeller analysis techniques. Momentum, blade element and vortex methods. Hover and forward flight. Ground effect, autorotation, and compressibility effects. Prerequisites: ECE 386, MAE 361 or instructor approval

467 Aircraft Performance. (3) F, S

Technical aspects of flight, integrating aerodynamic principles relating to lift, drag, and thrust with power operating characteristics; performance of an airplane analyzed as a system. Prerequisite: MAE 361. Pre- or corequisite: MAE 441

468 Aerospace Systems Design. (3) F, S

Group projects related to aerospace vehicle design, working from mission definition and continuing through preliminary design decisions on making and communication activities emphasized. Prerequisites: MAE 426, 441, 462.

471 Computational Fluid Dynamics. (3) F

Numerical solutions for selected problems in fluid mechanics. Prerequisite: MAE 372 or 461

489 Thermophysics. (3) F

Basic principles of heat transfer and their application to aerospace systems; propulsion devices, spacecraft thermal control, and waste heat rejection systems. Prerequisite: ECE 340

490 Projects in Design and Development.

(2) F, S
Capstone projects, fundamental or applied aspects of engineering. Prerequisites for Mechanical Engineering majors: MAE 441, 491. Prerequisite for Engineering Spec. Studies engineering mechanics majors: MAE 422.

491 Experimental Mechanical Engineering.

(3) F, S
Experimental and analytical studies of phenomena and performance of fluid flow, heat transfer, thermodynamics, refrigeration, and mechanical power systems. 6 hours lab. Prerequisites: MAE 305, 372, 382, 388

498 Pro-Seminar. 1, 3 N

Special topics for advanced students. Application of the engineering disciplines to design and analysis of modern technical devices and systems. Prerequisite: instructor approval.

504 Laser Diagnostics. (3) S

Fundamentals of optics and their interaction with matter. Laser sources, laser spectroscopy, velocimetry, particle sizing, and surface characterization.

505 Perturbation Methods in Mechanics. (3) N

Non near oscillations, strained coordinates, renormalization multiple scales, boundary layers, matched asymptotic expansions, turning point problems, and WKBJ method

506 Advanced System Modeling, Dynamics, and Control. (3) S

Lumped parameter modeling of physical systems with examples. State variable representations and dynamic response. Introduction to modern control. Prerequisite: ASE 582 or MAT 442.

507 Optimal Control Theory and Application. (3) F

Optimal control of physical systems. Calculus of variations. Pontryagin's principle, minimum time fuel problems, near quadratic regulator, and numerical methods. Prerequisite: MAE 506.

508 Dynamics and Control of Aerospace Vehicles. (3) F

Dynamic modeling, guidance and feedback control of atmospheric flight vehicles. Attitude dynamics and trajectory guidance, modal analysis, feedback compensation, single and multiple systems. Prerequisites: MAE 462, 506.

509 Robust Multivariable Control. (3) S

Characterization of uncertainty in feedback systems, robustness analysis, synthesis techniques, multivariable Nyquist criteria, computer aided analysis and design. Prerequisites: MAE 417, 506.

510 Dynamics and Vibrations. (3) F

Lagrange's and Hamilton's equations, rigid body dynamics, gyroscopic motion, and small oscillation theory.

511 Acoustics. (3) F

Principles underlying the generation, transmission, and reception of acoustic waves. Applications to noise control, architectural acoustics, random vibrations, and acoustic fatigue.

512 Random Vibrations. (3) S

Review of probability theory, random processes, stationarity, power spectrum, white noise process, random response of single and multiple DOF systems, and Markov processes simulation. Prerequisite: MAE 510 or instructor approval.

515 Structural Dynamics. (3) S

Free vibration and forced response of discrete and continuous systems, exact and approximate methods of solution, finite element modeling, and computational techniques. Prerequisite: MAE 510 or instructor approval.

517 Nonlinear Oscillations. (3) F

Existence, stability, and bifurcation of solutions of non-linear dynamical systems. Methods of analysis of regular and chaotic responses. Prerequisite: MAE 510 or instructor approval.

518 Dynamics of Rotor-Bearing Systems. (3) S

Natural whirl frequency, critical speed and response analysis of rigid and flexible rotor systems. Bearing influence and representation. Stability analysis. Methods of balancing.

520 Solid Mechanics. (3) F

Introduction to tensors: kinematics, kinetics and constitutive assumptions leading to elastic, plastic, and viscoelastic behavior. Applications

522 Variational Principles of Mechanics. (3) S

Virtual work, stationary, and complementary potential energies. Hamilton's principle. Application of these and direct methods to vibrational elasticity, and stability. Prerequisite: MAE 520 or equivalent.

523 Theory of Plates and Shells. (3) F

Linear and non-linear theories of plates. Membrane and bending theories of shells. Shear of revolution. Prerequisite: MAE 520.

524 Theory of Elasticity. (3) S

Formulation and solution of 2- and 3-dimensional boundary value problems. Prerequisite: MAE 520.

527 Finite Element Methods in Engineering Science. (3) F

Discretization, interpolation, element matrices, assembly, and computer implementation. Application to solid and fluid mechanics, heat transfer, and time dependent problems. Prerequisite: ASE 582.

529 Theory of Elastic Stability. (3) S

Stability of discrete and continuous mechanical systems. Stability of conservative and non-conservative systems. Dynamic instability. Prerequisite: MAE 523.

536 Combustion. (3) N

Thermodynamic, chemical kinetics of combustion. Explosion and ignition theories. Reactive gas dynamics. Structure, propagation and stability of flames. Experimental methods. Prerequisite: MAE 436 or instructor approval.

537 Direct Energy Conversion. (3) N

Advanced selected topics in direct energy conversion, theory, design, and applications. Cross-listed as MSE 533. Prerequisite: MAE 581.

541 CAD Tools for Engineers. (3) F

Elements of computer techniques required to develop CAD software. Data structures, indexing, lists, trees and graphs. Computer graphics, 2D and 3D, mensuration, algorithms and user interface techniques.

542 Geometric Modeling in CAD/CAM. (3) S

Geometric and solid modeling, curve and surface design. CAD database architectures and integration of solid modeling into engineering processes. Prerequisite: MAE 541 or instructor approval.

544 Mechanical Design and Failure Prevention. (3) F

Modes of mechanical failure. Application of principles of elasticity and plasticity in multiaxial state of stress to design synthesis, failure theories, fatigue, creep; impact. Prerequisite: MAE 443.

546 CAD/CAM Applications in MAE. (3) F

Solution of engineering problems with the aid of state-of-the-art software tools in solid modeling, engineering analysis, and manufacturing selection of mode parameters. Reliability tests on software. Open only to students without previous credit for MAE 406 or with instructor approval.

547 Mechanical Design and Control of Robots. (3) N

Homogeneous transformations, 3-dimensional kinematics, geometry of motion, forward and inverse kinematics, workspace and motion trajectories, dynamics control and static forces.

548 Mechanism Synthesis and Analysis. (3) S

Algebraic and graphical methods for exact and approximate synthesis of cam, gear and linkage mechanisms. Design optimization methods of planar motion analysis; characteristics of plane motion spatial kinematics.

557 Mechanics of Composite Materials. (3) S

Analysis of composite materials and applications. Micromechanics and macromechanics behavior. Classical lamination theory developed with investigation of bending-extension coupling.

560 Propulsion Systems. (3) N

Design of air-breathing gas turbine engines for aircraft propulsion; mission analysis; cycle analysis, engine sizing, component design.

561 Computational Aerodynamics. (3) S

Finite difference and finite-volume techniques for solving the subsonic, transonic, and supersonic flow equations. The method of characteristics. Numerical grid generation techniques. Prerequisite: MAE 571 or instructor approval.

562 Transonic Flow. (3) F

Transonic flow, nonlinear small disturbance equations and mixed flow with shock waves. Analytical and numerical treatments for airfoils. Applications to wings, bodies and turbomachinery. Prerequisite: MAE 460 or 461.

563 Unsteady Aerodynamics. (3) S

Unsteady incompressible and compressible flow. Wings and bodies, oscillatory and transient motions. Kernel function approach and panel methods. Aerospace applications. Prerequisite: MAE 460 (or 461), 562.

564 Advanced Aerodynamics. (3) F

Perturbation method. Linearized subsonic and supersonic flows. Thin wing/sender body theories. Lifting surface theory. Panel method computation. Prerequisite: MAE 460 or 461.

565 Turbomachinery. (3) N

Design and performance of turbomachines, including turbines, compressors, pumps, fans, and blowers.

571 Fluid Mechanics. (3) F

Basic kinematic, dynamic and thermodynamic equations of the fluid continuum and their application to basic fluid models.

572 Inviscid Fluid Flow. (3) S

Mechanics of fluids for flows in which the effects of viscosity may be ignored. Potential flow theory, waves, and inviscid compressible flows. Prerequisite: MAE 571.

573 Viscous Fluid Flow. (3) F

Mechanics of fluids for flows in which the effects of viscosity are significant. Exact and approximate solutions of the Navier-Stokes system, laminar flow at low and high Reynolds number. Prerequisite: MAE 571.

574 Viscous, Compressible Fluid Flow. (3) N

Mechanics of fluids for flows in which the effects of compressibility and viscosity are significant. Compressible boundary layers, free shear layers, shock waves and internal flows. Prerequisite: MAE 572.

575 Turbulent Shear Flows. (3) F

Homogeneous, isotropic, and wall turbulence. Experimental results. Introduction to turbulent flow calculations. Prerequisite: MAE 571.

577 Turbulent Flow Modeling. (3) S
Reynolds equations and turbulence. Modeling of simple and complex turbulent flows. Calculations of internal and external flows, and application to engineering problems. Prerequisite: MAE 571.

581 Thermodynamics. (3) F
Basic concepts and laws of classical equilibrium thermodynamics. Applications to engineering systems.

582 Statistical Thermodynamics. (3) N
Kinetic and quantum theory. Statistical mechanics; ensemble theory. Structure and thermodynamics of non-interacting and interacting particles. Boltzmann integral. Differentiation equation. Cross-listed as MSE 531. Prerequisite: MAE 581.

585 Conduction Heat Transfer. (3) F
Basic equations and concepts of conduction heat transfer. Mathematical formulation and solution (analytical and numerical) of steady and unsteady, one- and multidimensional heat conduction and phase change problems. Prerequisites: ECE 386; MAE 388.

586 Convection Heat Transfer. (3) S
Basic concepts and governing equations. Analysis of laminar and turbulent heat transfer for internal and external flows. Natural and mixed convection. Prerequisite: MAE 388.

587 Radiation Heat Transfer. (3) F
Advanced concepts and solution methods for radiation heat transfer including exchange of thermal radiation between surfaces, radiation in absorbing, emitting, and scattering media and radiation combined with conduction and convection. Prerequisite: MAE 388.

588 Two-Phase Flows and Boiling Heat Transfer. (3) S
Pool and flow boiling heat transfer, condensation heat transfer, various models of vapor-liquid mixture flows, gas-solid mixture flows, and experimental measurement techniques.

589 Heat Transfer. (3) F
Basic concepts; physical and mathematical models for heat transfer. Applications to conduction, convection, radiation, and combined mode heat transfer. Prerequisite: MAE 388.

594 Graduate Research Conference. (1) F, S
Topics in contemporary research. Required every semester of a departmental graduate student registered for 9 or more semester hours. Not for degree credit.

598 Special Topics. (1-3) F, S
Special topics courses, including the following, which are regularly offered, are open to qualified students:

- Boundary Layer Stability
- Polymers and Composites
- Hydrodynamic Stability
- Advanced Spacecraft Control
- Past City
- Aeroelasticity
- Aerospace Vehicle Guidance and Control

Omnibus Courses: See page 40 for omnibus courses that may be offered.

Programs in Engineering Special and Interdisciplinary Studies

George C. Beakley Jr.
Director

The degree programs described in the "Programs in Engineering Special and Interdisciplinary Studies" table on page 274 are administered by the Office of the Dean of the College of Engineering and Applied Sciences.

Descriptions of these majors and options, with their respective program requirements, can be found on the pages indicated in the table.

PURPOSE

The majors of Engineering Special Studies and of Engineering Interdisciplinary Studies accommodate students whose educational objectives require more intensity of concentration on a particular subject or more curricular flexibility within an engineering discipline than the traditional departmental majors generally permit. These majors are School of Engineering programs. Unlike the departmental major areas, however, there is not a separate faculty. The faculty teaching and advising in these programs are from the School of Engineering.

For many students, engineering studies form the basis of preparation for professional engineering work where proficiency in the application of science and the physical and social technologies is brought to bear on problems of a large scope. The necessary breadth that these students seek often is not obtainable in traditional engineering fields. Rather, specially 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 (B.S.E.) degree with a major in Engineering Special Studies and (2) the Bachelor of Science (B.S.) degree with a major in Engineering Interdisciplinary Studies.

The B.S.E. in Engineering Special Studies is designed primarily for students intending to pursue engineering

careers at a professional level in industry or graduate studies. The B.S. in Engineering Interdisciplinary Studies accommodates those students who desire the integrity of an engineering education but who plan to enter professions other than engineering or particularly to serve society in socially relevant activities. Both are developed beyond the general studies and the engineering core.

The curricula leading to both the B.S.E. and the B.S. degrees have been accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).

ENGINEERING SPECIAL STUDIES—B.S.E.

Engineering Mechanics. The curriculum of the engineering mechanics option is intended for individuals interested in pursuing a more basic and theoretical education than is provided by typical curricula in aerospace, civil, or mechanical engineering. This curriculum is particularly suited for individuals whose goals are an increased depth of understanding in the fundamentals of mechanics and the pursuit of an advanced engineering degree, with the ultimate career goal of an academic or research position. Thus, it is strongly recommended that a GPA of at least 3.00 be maintained by all engineering mechanics students.

The engineering mechanics option is based on increased course work in mathematics and the broad field of engineering mechanics, the latter of which includes three interrelated areas: dynamics, fluid mechanics, and solid mechanics. Each of these areas is related to a variety of important and challenging technological problems. Examples include vibration control in space vehicles at launch, optimal design of composite structures, crystal growing in a microgravity environment, fluid transition to turbulence on swept wings, and computer-aided modeling of structures ranging from surgical implants to space satellites. The fundamental emphasis of the engineering mechanics program provides the flexibility and understanding that is required to cope with rapidly occurring changes in technology and the needs of society.

Programs in Engineering Special and Interdisciplinary Studies

Degree	Major	Option	Description
B.S.E	Engineering Special Studies	Engineering Mechanics	Pages 273 274
		Manufacturing Engineering	Pages 265 267
		Microelectronics	Page 274-275
		Manufacturing Engineering	
		Nuclear Engineering Science	Pages 275 276
		Pre medical Engineering Systems	Pages 276-277
		Engineering	Page 277
B.S.	Engineering Interdisciplinary Studies	Geological Engineering	Page 278

This option is administered by the Department of Mechanical and Aerospace Engineering.

Refer to page 240, engineering core section. No course may be deleted and engineering mechanics students are required to select the following electives in the engineering core:

	<i>Semester Hours</i>
ECE 384 Numerical Analysis for Engineers I	2
ECE 386 Partial Differential Equations for Engineers	2
MAE 305 Measurements and Microcomputers	4
PHY 361 Introductory Modern Physics ¹	3

In addition, the following courses are required:

	<i>Semester Hours</i>
MAE 371 Fluid Mechanics	3
MAE 372 Fluid Mechanics	4
MAE 388 Heat Transfer	3
MAE 402 Introduction to Continuum Mechanics	3
MAE 404 Finite Elements in Engineering	3
MAE 413 Spacecraft Dynamics and Control	3
MAE 415 Vibration Analysis	4
MAE 422 Mechanics of Materials	4
MAE 441 Design Theory and Techniques	3
MAE 490 Projects in Design and Development	2
MAT 342 Linear Algebra	3
MAT 371 Advanced Calculus I or MAT 460 Applied Real Analysis (3)	3

MSE 440 Mechanical Properties of Solids	3
Area of emphasis (technical electives) ²	6-7
Total	47-48

Basic science elective.
² Must include two courses of engineering design type content.

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

- Biomechanics.* BME 411, 412, 416, 419; EEE 434; MAE 341.
- Dynamics.* MAE 462, 505, 510, 511, 512, 515, 517, 518.
- Engineering Mathematics* ASE 485, 582, 586; ECE 383, 385; MAT 371, 460, 461, 462; STP 421.
- Fluid Mechanics.* MAE 435, 460, 463, 471, 571.
- Solid Mechanics.* MAE 426, 520, 522, 523, 524, 529.

Engineering Mechanics Program of Study Typical Last Two-Year Sequence Junior Year

	<i>Semester Hours</i>
First Semester	
ECE 333 Electrical Instrumentation or ECE 334 Electronic Devices and Instrumentation (4)	3

MAE 371 Fluid Mechanics	3
MAT 371 Advanced Calculus I or MAT 460 Applied Real Analysis (3)	3
MSE 440 Mechanical Properties of Solids	3
PHY 361 Introductory Modern Physics	3
General studies elective HU or SB *	3
Total	18

Second Semester

ECE 384 Numerical Analysis for Engineers I	2
MAE 305 Measurements and Microcomputers	4
MAE 372 Fluid Mechanics	4
MAE 413 Spacecraft Dynamics and Control	3
MAE 422 Mechanics of Materials	4
Total	17

Senior Year

First Semester

MAE 388 Heat Transfer	3
MAE 402 Introduction to Continuum Mechanics	3
MAE 404 Finite Elements in Engineering	3
MAE 415 Vibration Analysis	4
MAE 441 Design Theory and Techniques	3
Total	16

Second Semester

ECE 400 Engineering Communications	3
MAE 490 Projects in Design and Development	2
General studies elective HU or SB)*	3
Technical electives	7
Total	15

* See pages 45-65 for the requirements and the approved list

Manufacturing Engineering. This option is administered by the Department of Industrial and Management Systems Engineering (see pages 265 266)

Microelectronics Manufacturing Engineering. This engineering special studies option has been established to prepare a student for a challenging and rewarding career as a microelectronics manufacturing engineer and is administered by the Department of Electrical Engineering.

The successful demonstration of the first integrated electronic circuit in 1958 led to the creation of a new industry to manufacture these remarkable electronic devices. Today, microelectronic circuits are essential components

in products that range from inexpensive, mass produced consumer goods to extremely sophisticated limited-production electronic systems.

Microelectronics manufacturing engineers are vitally important participants in every project to develop commercially viable microelectronic products from design prototypes. Their professional participation begins with the design of the production product and continues through all phases of the manufacturing process until the completed product is delivered to the purchaser. Typical responsibilities include device design and evaluation, process design and characterization, equipment procurement and acceptance, quality control, production schedules, resource allocation, and engineering support of production personnel in the manufacturing facility.

Because the responsibilities of a microelectronics manufacturing engineer are so diverse, an interdisciplinary undergraduate program that provides concurrent education in several engineering disciplines, mathematics, and the physical sciences is essential to prepare a student for a career in microelectronics manufacturing engineering. This engineering special studies option provides the necessary concurrent education within the context of a curriculum that meets all ABET accreditation criteria.

The following courses are required as part of the engineering core and mathematics electives:

		<i>Semester Hours</i>
CHM	441	General Physical Chemistry ..3
CSE/EEE	225	Assembly Language Programming (Motorola) .. . . . .3 or CSE/EEE 226 Assembly Language Programming (Intel) (3)
ECE	334	Electronic Devices and Instrumentation .. . . . .4
ECE	352	Properties of Electronic Materials3
ECE	383	Probability and Statistics for Engineers2
MAT	242	Elementary Linear Algebra ...2
PHY	241	University Physics III. Thermodynamics, Optics, and Wave Phenomena3

Only ECE 313 Introduction to Deformable Solids may be deleted from the engineering core.

In addition, the following courses are required:

			<i>Semester Hours</i>
CHE	461	Process Control .. . . . .3	
CHM	331	General Organic Chemistry . 3 or PHY 361 Introductory Modern Physics 3)	
CSE/EEE	120	Digital Design Fundamentals .. . . . .3	
CSE/EEE	325	System Design with Microprocessor (Motorola) .. . . . .3 or CSE/EEE 326 System Design with Microprocessor (Intel) (3)	
EEE	302	Electrical Networks II .. . . .3	
EEE	435	Microelectronics .. . . . .3 or UET 416 Monolithic Integrated Circuit Technology (3)	
EEE	436	Fundamentals of Solid State Devices3	
EEE	439	Semiconductor Facilities and Clean Room Practices ... 3	
IEE	300	Economic Analysis for Engineers3	
IEE	374	Quality Control .. . . . .3 or MET 401 Statistical Process Control (3)	
IEE	463	Computer Aided Manufacturing and Control3 or MET 416 Applied Computer Integrated Manufacturing (3)	
UET	432	Semiconductor Packaging and Heat Transfer .. . . .3	
UET	437	Integrated Circuit Testing ... 3	
		One of the following senior design projects .. . . . .3	
ASE	490	Project in Design and Development 3)	
CHE	490	Chemical Engineering Projects (3)	
EEE	490	Senior Design Laboratory (3)	
IEE	490	Project in Design and Development (3)	
MSE	490	Capstone Design Project (3)	
UET	415	Electronic Manufacturing Engineering Principles (3)	
		Technical electives .. . . . .9	
		Total .. . . . .51	

Nuclear Engineering Science. The curriculum of the nuclear engineering science option encourages an individualized program based on the student's own career interests and objectives.

The program provides a strong foundation in basic engineering, nuclear, and radiation health physics concepts.

Electives are generally taken during the junior and senior years and must be approved by a designated faculty advisor.

The electives should focus on a technical or environmental area associated with (1) the discovery, development, or utilization of energy or (2) the materials or products that use, release, or may be affected by radiation.

Individual elective programs may also be aligned with a traditional discipline such as chemical, civil, electrical, and mechanical engineering. They may be tailored toward specific energy resources such as those associated with fission, fusion, solar, geothermal, fossil fuels, or synthetic fuels such as oil shale. They may be structured for specific high demand areas such as radiation health physics, power systems engineering, corrosion and radiation effects on materials, radiation damage to electronics, computer aided operation and accident analysis at power generation facilities, and designing better man machine interfaces. Finally, there are opportunities to pursue selected areas such as waste disposal, radiation effects on electronics in space, biomedical applications, nuclear applications in forensics, low level radiation measurements of our natural radiation environment, and anomalies from trace amounts of natural radioactivity in computer microprocessing circuits.

Motivated students who have demonstrated scholastic excellence are encouraged to participate in summer research programs at national laboratories or with an industry or in the ASU Nuclear Sciences summer exchange programs at national laboratories or at overseas facilities in Australia, Austria, France, Israel, Japan, and Switzerland. In addition, students may elect an independent study or senior research project. The exercise provides an opportunity to assemble and apply the newly acquired engineering knowledge and laboratory skills to an in depth investigation of a real world problem.

The following courses are required as a part of the engineering core (only ECE 313 Introduction to Deformable Solids may be deleted):

			<i>Semester Hours</i>
ECE	312	Engineering Mechanics II: Dynamics .. . . . .3	
ECE	333	Electrical Instrumentation3 or ECE 334 Electronic Devices and Instrumentation (4)	
ECE	340	Thermodynamics3	
ECE	350	Structure and Properties of Materials .. . . . .3 or ECE 352 Properties of Electronic Materials (3)	
MAE	305	Measurements and Microcomputers .. . . . .4 or CHE 461 Process Control (3)	

The mathematics and basic science electives are met by taking the following courses:

	<i>Semester Hours</i>
MAT 342 Linear Algebra	3
MAT 362 Advanced Mathematics for Engineers and Scientists I	3
PHY 361 Introductory Modern Physics	3

In addition, the following courses are required:

	<i>Semester Hours</i>
ECE 384 Numerical Analysis for Engineers I	2
EEE 490 Senior Design Laboratory	3
EEE/NUC 460 Nuclear Concepts for the 21st Century	3
or MAE 430 Introduction to Nuclear Engineering (3)	
EEE/NUC 461 Health Physics Principles and Radiation Measurements	3
EEE/NUC 462 Reactor Safety Analysis	3
EEE/NUC 463 Electrical Power Plant	3
EEE/NUC 464 Nuclear Engineering Experiments	3
EEE/NUC 465 Radiation Dosimetry and Instrumentation	3
IEE 300 Economic Analysis for Engineers	3
MAE 317 Dynamic Systems and Control	4
or EEE 480 Feedback Systems (4)	
MAE 371 Fluid Mechanics	3
or EEE 302 Electrical Networks II (3)	
MAE 382 Thermodynamics	3
or EEE 303 Signals and Systems(3)	
Technical electives*	12-14
Total	48-50

* Two courses of engineering design content are required

NUCLEAR ENGINEERING SCIENCE

NUC 460 Nuclear Concepts for the 21st Century. (3) F
Neutron interactions with matter Principles of neutron chain reacting systems Neutron diffusion and moderation Heat removal from nuclear reactors Point reactor kinetics Cross listed as EEE 460 Prerequisite PHY 361

461 Health Physics Principles and Radiation Measurements. (3) N
Sources, characteristics, dosimetry shielding, and measurement techniques for natural and synthetic radiation. Philosophy of radiation

protection Emphasis on instrumentation detectors, and environmental monitoring. Lecture/lab Cross listed as EEE 461 Prerequisite ECE 301.

462 Reactor Safety Analysis. (3) N
Power reactor safety and licensing methodologies. Reactor transient and accident analysis. Time dependent solution to neutron diffusion equation. Use of industry codes to assess fission product build up emergency core-cooling behavior, reactivity, off-site releases, and dose calculations Cross listed as EEE 462. Prerequisite EEE/NUC 460.

463 Electrical Power Plant. (3) F
Nuclear fossil and solar energy sources. Analysis and design of steam supply systems electrical generating systems, and auxiliary systems. Power plant efficiency operation and costs and analyses Cross listed as EEE 463. Prerequisites ECE 301 340

464 Nuclear Engineering Experiments. (3) N
Theory and applied concepts in reactor design instrumentation, electronics and shielding Experimental measurements of nuclear parameters using subcritical reactors and fission neutron generator. Fast and thermal activation analysis Mossbauer spectrometry Lecture, lab Cross listed as EEE 464 Corequisite EEE/NUC 460

465 Radiation Dosimetry and Instrumentation. (3) F
Radiation dosimetry and instrumentation used at nuclear power plants. Calculation of external and internal radiation doses Radiation biology Shielding calculations. Cross listed as EEE 465 Prerequisite EEE/NUC 461

490 Senior Design Laboratory. (3) F S
Project oriented laboratory Each student completes one or more design projects during the semester Lecture, lab Prerequisites. EEE/NUC 460 senior status or instructor approval

566 Nuclear Instrumentation. (3) N
Design and analysis of measuring systems for nuclear sciences applications and research Laboratory experiments using computerized multichannel analyzer systems whole body counting systems and computerized tomography Lecture/lab Cross listed as EEE 566 Prerequisite: EEE/NUC 465 or instructor approval

567 Radiation Shielding and Transport. (3) F
Shielding for radiation therapy diagnostic radiology, cyclotrons and nuclear reactors Monte Carlo and empirical computational methods, regulations and design problems Cross listed as BME/EEE 567 Prerequisite. BME 465 or EEE/NUC 465

569 Radiochemistry and Advanced Nuclear Instrumentation. (3) N
Advanced concepts in environmental and power plant radiochemistry. Chemical separations for iodine strontium, radium, and uranium. Advanced detection concepts in alpha gamma spectrometry, and quench rate on Lecture/lab. Cross listed as EEE 569 Prerequisite BME 465 or EEE/NUC 465

Omnibus Courses: See page 40 for omnibus courses that may be offered

Pre-medical Engineering. In the past decade, the interrelation between engineering and medicine has become vigorous and exciting. Our rapidly expanding technology dictates that engineering will continue to become increasingly involved in all branches of medicine. As this develops, so will the need for physicians trained in the engineering sciences medical men and women with a knowledge of computer technology, transport phenomena, biomechanics, bioelectric phenomena, operations research, and cybernetics. This option is of special interest to students desiring entry into a medical college and whose medical interests lie in research, aerospace and undersea medicine, artificial organs, prostheses, biomedical engineering, or biophysics. Since both engineering and medicine have as their goal the well being of humans, this program is compatible with any field of medical endeavor. *Academic Requirements* In addition to the general studies requirements, BIO 181 General Biology (basic science elective) and CHM 116 General Chemistry must be selected in the engineering core. Refer to page 240, engineering core section Other engineering core requirements are outlined in the area of emphasis descriptions The following courses are required in the pre-medical engineering option and have been selected to meet all university and ABET accreditation requirements:

	<i>Semester Hours</i>
AGB/BME 435 Animal Physiology I	4
BIO 182 General Biology	4
BME 331 Transport Phenomena I Fluids	3
BME 334 Heat and Mass Transfer	3
BME 411 Biomedical Engineering I	3
or BME 412 Biomedical Engineering II (3)	
BME 413 Physiological Instrumentation	3
BME 417 Biomedical Engineering Design	3
BME 423 Physiological Instrumentation Laboratory	1
BME 490 Biomedical Engineering Projects	2
BME 496 Professional Seminar ¹	0
CHM 113 General Chemistry	4
CHM 331 General Organic Chemistry	3
CHM 332 General Organic Chemistry	3
CHM 335 General Organic Chemistry Laboratory	1

CHM 336	General Organic Chemistry Laboratory	1
	Engineering technical electives ¹	11 13
Total		49 51

¹ Students must register for BME 496 each semester.

² To be selected from an area of emphasis and must include one course of engineering design type content.

Students interested in pre medical engineering may choose either computer science or general bioengineering as an area of emphasis.

Computer Science This emphasis is designed for students interested in the application of modern computer technology for medical information processing and medical scientific computation and for the recognition, storage, retrieval, and processing of medical data. The following courses are required in the engineering core: CSE EEE 225 or 226, ECE 334, 340, and 352 and MAT 242. ECE 312 is not required in the engineering core. Technical electives must include CSE 310, one advanced computer programming course selected from CSE 383 or 470, and upper division engineering courses of engineering science and design content.

General Bioengineering This emphasis is designed to strengthen the student's knowledge of bioengineering. It emphasizes biomedical research.

The following courses are required in the engineering core: ECE 333, 340, 350; MAE 305. ECE 312 is not required in the engineering core. The technical electives may be selected from engineering, biology, or chemistry upper-division courses, but these courses must include adequate engineering science and design content.

**Pre-medical Engineering
Program of Study
Typical Four-Year Sequence**

		<i>Semester Hours</i>
First Semester		
BME 496	Professional Seminar	0
CHM 113	General Chemistry	4
ECE 105	Introduction to Languages of Engineering	3
ECN 111	Macroeconomic Principles	3
ENG 101	First Year Composition	3
MAT 290	Calculus I	5
Total		18

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

Second Year

First Semester		
BIO 181	General Biology	4
BME 496	Professional Seminar	0
ENG 102	First Year Composition	3
MAT 274	Elementary Differential Equations	3
PHY 131	University Physics II Electricity and Magnetism	3
PHY 132	University Physics Laboratory II	1
General studies elective (HU or SB)*		3
Total		17

Second Semester		
BIO 182	General Biology	4
BME 496	Professional Seminar	0
CHM 331	General Organic Chemistry	3
CHM 335	General Organic Chemistry Laboratory	1
ECE 210	Engineering Mechanics I Statics	3
ECE 301	Electrical Networks I	4
Literacy and critical inquiry elective*		3
Total		18

Third Year

First Semester		
BME 331	Transport Phenomena I: Fluids	3
BME 435	Animal Physiology I	4
BME 496	Professional Seminar	0
CHM 332	General Organic Chemistry	3
ECE 340	Thermodynamics	3
or CHM 441 General Physical Chemistry (3)		
ECE 350	Structure and Properties of Materials	3
or CHM 442 General Physical Chemistry (3)		
or ECE 351 Engineering Materials (3) or ECE 352 Properties of Electronic Materials (3)		
Technical elective		3
Total		19

Second Semester		
BME 334	Heat and Mass Transfer	3
BME 496	Professional Seminar	0
CHM 336	General Organic Chemistry Laboratory	1
ECE 313	Introduction to Deformable Solids	3

ECE 333	Electrical Instrumentation	3
or ECE 334 Electronic Devices and Instrumentation(4)		
ECE 384	Numerical Analysis for Engineers I	2
or ECE 386 Partial Differential Equations for Engineers (2) or MAT 242 Elementary Linear Algebra (2)		
General studies elective (HU or SB)*		3
Technical elective		3
Total		18

Fourth Year

First Semester		
BME 411	Biomedical Engineering I	3
or BME 412 Biomedical Engineering II (3)		
BME 413	Physiological Instrumentation	3
BME 423	Physiological Instrumentation Laboratory	1
BME 490	Biomedical Engineering Projects	2
BME 496	Professional Seminar	0
MAE 305	Measurements and Microcomputers	4
or CSE/EEE 225 Assembly Language Programming (Motorola) (3) or CSE/EEE 226 Assembly Language Programming (Intel) (3) or IEE 463 Computer Aided Manufacturing and Control (3)		
General studies elective (HU or SB)*		3
Technical elective		3
Total		19

Second Semester		
BME 417	Biomedical Engineering Design	3
BME 496	Professional Seminar	0
ECE 383	Probability and Statistics for Engineers	2
ECE 400	Engineering Communications	3
General studies elective (HU or SB)*		3
Technical elective		3
Total		14

Degree requirements: 133 semester hours plus English proficiency

* See pages 45-65 for the requirements and the approved list of courses

Systems Engineering. Systems engineering deals with the integration of diverse components into a functioning whole. The curriculum of this option combines studies in electrical, mechanical, and computer engineering

with contemporary analytical and computer skills. Graduates are prepared for a broad variety of career opportunities in research and development and systems engineering within today's industry.

After completing a basic core of fundamental courses in mathematics, physical sciences, and engineering sciences, each systems engineering student undertakes a major set of courses that includes further fundamental courses in systems analysis together with courses in the design of control systems, mechanical systems, and computer (microprocessor) systems.

Technical electives are selected to allow the student to achieve concentrated knowledge in a wide variety of areas offered in the School of Engineering.

The following courses are required as a part of the engineering core and mathematics electives:

	<i>Semester Hours</i>
CSE/EEE 225 Assembly Language Programming (Motorola)	3
or CSE/EEE 226 Assembly Language Programming (Intel) (3)	
ECE 210 Engineering Mechanics I: Statics	3
ECE 312 Engineering Mechanics II: Dynamics	3
ECE 313 Introduction to Deformable Solids	3
ECE 334 Electronic Devices and Instrumentation	4
ECE 340 Thermodynamics	3
ECE 352 Properties of Electronic Materials	3
or ECE 350 Structure and Properties of Materials (3)	
ECE 383 Probability and Statistics for Engineers	2
MAT 274 Elementary Differential Equations	3
MAT 342 Linear Algebra	3
PHY 361 Introductory Modern Physics	3
(basic science elective)	

In addition, the following courses are required:

	<i>Semester Hours</i>
ASE 490 Project in Design and Development	3
CSE/EEE 120 Digital Design Fundamentals	3
CSE/EEE 325 System Design with Microprocessors (Motorola)	3
or CSE/EEE 326 System Design with Microprocessors (Intel) (3)	

CSE 330 Computer Organization and Architecture	3
EEE 302 Electrical Networks II	3
EEE 303 Signals and Systems	3
EEE 455 Communication Systems	4
EEE 480 Feedback Systems	4
IEE 300 Economic Analysis for Engineers	3
IEE 461 Integrated Production Control	3
IEE 475 Introduction to Simulation	3
IEE 476 Operations Research Techniques/Applications	4
Technical electives	8
Total	47

ENGINEERING INTERDISCIPLINARY STUDIES—B.S.

Geological Engineering. This option 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 that influence the design and construction of engineering structures such as foundations, excavations, dams, highways, and sites for waste disposal. Additionally, the geological factors associated with land use planning and with the development of water, petroleum, and mineral deposits are encompassed within the program.

Refer to page 240, engineering core section. The following courses are re-

quired as a part of the engineering core (only ECE 333 Electronic Instrumentation may be deleted):

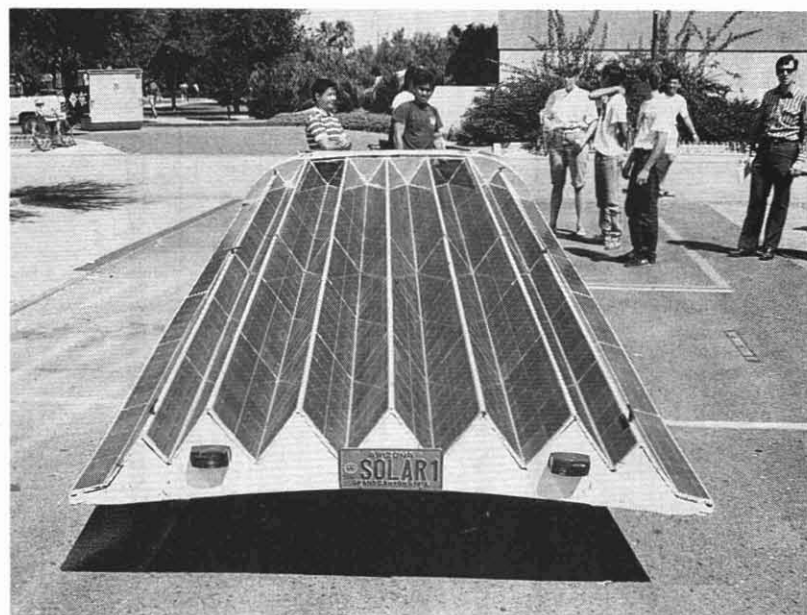
	<i>Semester Hours</i>
CEE 400 Microcomputer Applications in Civil Engineering	3
ECE 210 Engineering Mechanics I: Statics	3
ECE 312 Engineering Mechanics II: Dynamics	3
ECE 351 Engineering Materials	3
GLG 101 Introduction to Geology I (Physical) ¹	3

In addition, the following courses are required in the major:

	<i>Semester Hours</i>
CEE 351 Soil Mechanics	4
CEE 452 Foundations	3
CEE 552 Geological Engineering	3
CEE 556 Seepage and Earth Dams	3
GLG 103 Introduction to Geology I—Laboratory	1
GLG 310 Structural Geology	3
GLG 321 Mineralogy	3
GLG 322 Mineralogy Laboratory	2
GLG 362 Geomorphology	3
GLG 424 Petrology-Petrography	4
MAE 371 Fluid Mechanics	3
Engineering technical electives ²	20
Total	52

¹ Basic science elective.

² Must include two courses of engineering science and three courses of engineering design type content. An approved summer engineering-geology field course is also highly recommended.



College of Fine Arts

Seymour L. Rosen, B.S.
Dean

PURPOSE

The College of Fine Arts provides for preprofessional and professional education in the several arts disciplines and also an opportunity for nonmajors to become culturally literate through participation and involvement in the creative and performing arts.

The college, through its programs in art, dance, music, and theatre, reflects a wide range of challenges facing the artist and scholar in the 20th century. The arts, as an integral part of our curriculum and of human expression, offer the student a rewarding educational experience balanced and strengthened by studies in related fine arts areas, the humanities, social sciences, and the sciences.

In addition to professional curricula offered in each department or school, the college makes available courses designed to meet the specific educational needs of students pursuing majors in other colleges. The cultural life of the university community is further enriched by study opportunities offered at off-campus sites. The College of Fine Arts also offers community audiences many hours of cultural enjoyment through myriad concerts, art exhibitions, music and dance concerts, dramatic productions, opera, lectures, and seminars.

ORGANIZATION

The college houses the School of Art, the Department of Dance, the School of Music, and the Department of Theatre. An average of 2,000 students per semester enroll as majors in various degree programs offered through these units. The college also includes the ASU Art Museum and the Institute for Studies in the Arts.

ADMISSION

Students meeting basic admission standards of ASU may matriculate in the College of Fine Arts. Separate admissions procedures and approvals are required for some programs within the college. Students must contact specific departments or schools for details.

Transfer of Community College Credits. Credits transferred from any accredited junior or community college may be accepted up to a maximum of 64 semester hours. A community college student planning to transfer at the end of his or her first or second year

should plan to take community college courses that meet the requirements of the ASU curriculum selected. Students attending Arizona community colleges are permitted to follow the degree requirements specified in the ASU *General Catalog* in effect at the time they begin their community college work, providing their college attendance has been continuous.

Courses transferred from community colleges are not accepted as upper-division credit at ASU. Arizona students are urged to refer to the *Arizona Higher Education Course Equivalency Guide* for transferability of specific courses from Arizona community colleges. Copies of the guide are available in counselors' offices. In choosing courses at a community college, students should be aware that a minimum of 50 hours of work taken at the university must be upper-division credits. While attending a community college, it is suggested that students elect general studies and lower-division courses in the major field.

General Transfer Credit. Direct transfer of courses from other accredited institutions to the College of Fine Arts are subject to (1) the existence of parallel and equal courses in the college's curriculum and (2) departmental or school evaluation of studio courses with respect to performance standards. A minimum of 30 semester hours earned in resident credit courses at ASU is required of every candidate for the bachelor's degree. Transfer students enrolled in the College of Fine Arts must complete a minimum of 15 semester hours of resident credit in the major as approved by the faculty.

ADVISEMENT

Advisement is handled as a decentralized activity within the college. To offer personalized attention, each academic unit establishes its own graduation advisement procedures. Students are encouraged to make appointments through the central office of their major disciplines.

Baccalaureate Degrees

The three baccalaureate degrees differ in curricula with respect to the amount of specialization permitted in the major field. The Bachelor of Arts degree provides a broad, scholarly, humanistic program, while the other two programs place greater emphasis

HONORS
COLLEGE

ARCHITECTURE

LIBERAL ARTS

BUSINESS

EDUCATION

ENGINEERING

FINE ARTS

LAW

NURSING

PUBLIC
PROGRAMSSOCIAL
WORKEXTENDED
EDUCATIONGRADUATE
COLLEGE

College of Fine Arts Degrees and Majors

Major	Degree	Administered by
Baccalaureate Degrees		
Art Emphases: art history, photographic studies, studio art	B.A.	School of Art
Art Concentrations: art education, ceramics, drawing, fibers, graphic design, intermedia, metals, painting, photography, printmaking, sculpture, wood	B.F.A.	School of Art
Choral General Music	B.M.	School of Music
Dance	B.A.	Department of Dance
Dance Concentrations: dance education, performance and choreography	B.F.A.	Department of Dance
Instrumental Music Concentrations: instrumental, string	B.M.	School of Music
Music	B.A.	School of Music
Music Therapy	B.M.	School of Music
Performance Concentrations: guitar, jazz, keyboard, music theatre, orchestral instrument, piano accompanying, voice	B.M.	School of Music
Theatre	B.A.	Department of Theatre
Theatre Concentrations: performance/production, theatre education	B.F.A.	Department of Theatre
Theory and Composition Concentrations: composition, theory	B.M.	School of Music
Graduate Degrees		
Art Concentrations: art education, art history	M.A.	School of Art
Art Concentrations: ceramics, drawing, fibers, intermedia, metals, painting, photographic studies, photography, printmaking, sculpture, wood	M.F.A.	School of Art
Choral Music Concentrations: choral music, general music	M.M.	School of Music
Choral Music	D.M.A.	School of Music
Creative Writing	M.F.A. ¹	Committee on Creative Writing
Dance	M.F.A.	Department of Dance
General Music	D.M.A.	School of Music
Instrumental Music	M.M., D.M.A.	School of Music
Music History and Literature	M.A.	School of Music
Performance Concentrations: music theatre musical direction, music theatre performance, performance pedagogy, piano accompanying, solo performance (instrumental), solo performance (keyboard), solo performance (voice)	M.M.	School of Music
Secondary Education	Ed.D. ²	
Concentrations: art education		School of Art
music education		School of Music
Solo Performance	D.M.A.	School of Music
Theatre	M.A.	Department of Theatre

¹ This program is administered by the Graduate College. See the "Graduate College" section of this catalog.

² The Ed D degree is administered through the College of Education.

Major	Degree	Administered by
Theatre	M.F.A.	Department of Theatre
Concentrations: scenography, theatre for youth		
Theatre	Ph.D.	Department of Theatre
Concentration: theatre for youth		
Theory and Composition	M.M.	School of Music
Concentrations: composition, theory		

¹ This program is administered by the Graduate College. See the "Graduate College" section of this catalog
² The Ed.D. degree is administered through the College of Education.

upon the major field. General studies play an integral role within the educational mission of the university and as such constitute an important component of all undergraduate degrees in the College of Fine Arts. See pages 281-282 for general studies requirements.

In cooperation with the College of Education, a K-12 endorsement for teacher certification is available in the disciplines of art, dance, music, and theatre for students preparing for a teaching career in the public schools. *Students should, with the advice and counsel of their arts education advisors, fulfill the requirements for the appropriate area of specialization under the Bachelor of Fine Arts or Bachelor of Music degrees.* In addition, a student wishing to be admitted to the Professional Teacher Preparation Program (PTPP) in the College of Education (leading to teaching certification) must obtain an advisor from the Office of Student Affairs in the College of Education before making application for the PTPP. Students must have completed 56 hours with a minimum GPA of 2.50 and also have passed the three Pre-Professional Skills Tests in order to be eligible for the program. Further detail on admission requirements and procedures for the PTPP can be found on pages 191-192 under the College of Education.

Graduate Degrees

Master's programs range from 30-60 semester hours, depending upon the degree chosen. Doctoral programs vary in scope and curricula. See the *Graduate Catalog* for specific requirements for the M.A., M.F.A., M.M., D.M.A., Ed.D., and Ph.D. degrees.

DEGREE REQUIREMENTS

In addition to the general information given below, consult the sections of this catalog listed under School of Art, Department of Dance, School of

Music, or Department of Theatre for specific degree requirements.

Bachelor of Arts (B.A.) Degree. The Bachelor of Arts degree requires 45-60 semester hours for the major. Depending on the major, 18-24 hours must be selected from upper-division courses (300 or 400 level). The semester-hour requirements in the major are distributed between a field of specialization (30-53 hours) and one or more related fields (an additional 15 hours). The exact content of the major is selected by a student in consultation with an advisor under rules and regulations of the department or school concerned.

Bachelor of Fine Arts (B.F.A.) Degree. The Bachelor of Fine Arts degree requires 65-88 semester hours for the major. At least 30 of these hours, depending on the major, must be selected from upper division courses (300 or 400 level). The curriculum for the major is designed as preprofessional study in art, dance, or theatre. Auditions and/or interviews are required for admission to the B.F.A. programs in Dance and Theatre. Consult these departments for specific information.

Bachelor of Music (B.M.) Degree. The Bachelor of Music degree requires 84 semester hours for the major. The required number of upper division courses (300 or 400 level) is dependent on the area of specialization. The curriculum for the major is designed to provide a broad yet concentrated preparation with a choice of specialization among the areas of music performance, music theatre, jazz, music therapy, piano accompanying, theory-composition, instrumental music, and choral general music. An entering undergraduate music student, regardless of the area of specialization, must perform an entrance audition in his or her primary performing medium (voice or instrument).

GENERAL STUDIES REQUIREMENTS

To meet the general studies requirement, a minimum of 35 semester hours must be completed in the general studies areas. Six semester hours must also be completed in the awareness areas. A course may concurrently satisfy a core area requirement and an awareness area requirement. Neither courses in the major nor related field area courses may be cross listed in fulfillment of both major and general studies core or awareness requirements with the exception of concurrent listings in the numeracy (computer applications) and literacy areas, as specified by the university general studies guidelines.

Core Areas:	Semester Hours
Literacy and critical inquiry	6
Numeracy	6
* Humanities and fine art	6 or 9
(Fine arts majors must take at least six semester hours of fine arts course work in areas outside of the major school or department. These may be courses in art, dance, music, or theatre. A student may concurrently fulfill this requirement and the humanities and fine arts general studies requirement by selecting approved courses as indicated in the <i>Schedule of Classes</i> . This requirement may also be met by taking any College of Fine Arts course outside of the student's major and listing it under general studies electives.)	
* Social and behavioral sciences	6 or 9
Natural sciences	8
Awareness Areas:	
Global awareness	3
Historical awareness	3

* 15 hours total

Refer to pages 45-48 of this catalog for a description of the university general studies requirements. General studies courses are regularly reviewed.

To determine whether a course meets one or more general studies course credit requirements, see the listing of courses, pages 49–65. General studies courses are also identified following course descriptions according to the key to general studies credit abbreviations, page 48.

GRADUATION REQUIREMENTS

Several programs require additional general studies electives that may be selected from anthropology, architecture, biology, botany, chemistry, communication, economics, English (except ENG 101, 102, 105, 107, and 108), foreign languages, geography, geology, history, humanities, interdisciplinary studies in liberal arts (LIA), journalism and telecommunication, philosophy, physical education (except activity courses), physical science, physics, political science, psychology, religious studies, sociology, zoology, and any College of Fine Arts course outside the student's major to meet the minimum number required for a particular degree program. Additional electives to complete the total of 126 semester hours may be taken in any area of the university.

In addition, the student must meet the university English proficiency requirement: ENG 101 and 102 (six hours) or ENG 105 (three hours). Foreign students may satisfy this requirement by taking ENG 107 and 108.

All Bachelor of Arts degrees require the equivalent of 16 semester hours in one foreign language except for the Bachelor of Arts degrees in Dance, Theatre, and Art with an emphasis in studio art, which strongly recommend but do not require foreign language study. Course work may be selected in any language and must follow the sequence of language courses 101, 102, 201, and 202. This requirement may be fulfilled at the secondary school level or by examination. If acquired in secondary school, two years of instruction in one foreign language is considered the equivalent of one year of college instruction. Transfer students are placed in language study at the level above completed work. Candidates for the B.M. degree in Performance with concentrations in piano accompanying or voice and in Theory and Composition with a concentration in theory have specific foreign language requirements, which are stated in each of the degree requirements pages 294–295). There

is no foreign language requirement for other concentrations of the B.F.A. or B.M. degrees.

The minimum graduation requirement is the completion of 126 semester hours with a minimum cumulative GPA of 2.00. Of these 126 semester hours, at least 50 must be selected from upper division courses. Many professional programs within the College of Fine Arts require additional semester hours for graduation and a higher cumulative GPA of their majors. To be acceptable as graduation credit, all course work in the major discipline must show an earned grade of "C" (2.00) or higher.

ACADEMIC STANDARDS

The terms of disqualification, reinstatement, and appeals are consistent with those set forth by the university on page 44 of this catalog, except for Theatre. For the B.F.A. in Theatre, a student must have a minimum GPA of 3.00 in the major to enroll in upper division courses and to remain in good standing. In addition, a student disqualified in any program is normally not eligible for reinstatement for two semesters.

SPECIAL PROGRAMS

Together with faculty, visiting scholars, and artists in residence, students in all fields of the College of Fine Arts participate in dynamic, innovative programs. The creative energy that infuses the visual and performing arts finds expression in research and study.

The School of Art is one of the largest organizations of its kind in the country and offers students unique opportunities for study in the visual arts. The diversity of course work and programs as well as the quality of the faculty provide students with a stimulating environment for creative and scholarly work. A number of the unique offerings are neon, foundry, wood, Native American art, video, and the visiting artists program in drawing/painting. Additionally, in computer graphics, students may work with software for "painting," solid modeling, and three dimensional animation. While computer graphics makes use of the latest technology, other areas preserve and revitalize established media. The Graphic Design Workshop provides students a professional working environment, and the internship program

offers the opportunity to work with leading design studios. Women's studies in the visual arts examines contemporary and historical issues and trends in the context of students' artistic and scholarly pursuits. The Children's Art Workshop is an on-campus program for the Phoenix metropolitan area taught by students in art education. In the emerging field of photographic studies, students are trained in photographic history, criticism, and exhibition management. The School of Art publishes the student-authored *The History of Photography Monograph Series* and sponsors the teaching gallery, North light, which hosts exhibitions of well-known photographers. The visiting artists and guest lecturer program brings prominent artists and scholars to the campus community. Students participate in workshops and presentations by key figures in their fields.

The Visual Arts Research Studios, in the School of Art, conduct research in historical and contemporary technologies in the visual arts. The Studios bring together artists, master printers, and photographers to encourage collaboration and research. Students are appointed to assist VARS personnel in the planning and production of projects in the Print Research facility, the Photography Collaborative facility, and the Pyracantha Press.

Recognized as offering some of the top programs in the country, the Department of Dance emphasizes the choreography, performance, and theory of modern dance. The artist-in-residence program brings major figures and companies to campus each year. The department was selected as one of five in the United States to participate for three years in the Curriculum Development Project of the Dance Notation Bureau in important research on labanotation. Students work closely with visiting artists, artists in residence, and researchers investigating labanotation and the possibilities of video and computer technology in dance and dance music composition. At the American College Dance festivals for the past several years, graduate students have taken top honors at both the regional and national levels.

An ambitious performance program offers to the public several concerts each year, some with works created and performed by graduate and undergraduate students and others featuring works by faculty and visiting artists. Dance

Arizona Repertory Theatre (DART) gives graduate and undergraduate students the opportunity to perform and tour in the metropolitan area, the region, and the state.

Faculty in the School of Music include a wide range of performers, teachers, conductors, composers, and scholars who are recognized both nationally and internationally. Students have the opportunity to participate in comprehensive degree programs that provide for wide and divergent opportunities in performance and course work. Student performing organizations are recognized as being some of the finest in the nation, and ASU students regularly compete successfully in national competitions. The broad scope of degree options allows students excellent choices in gaining depth and breadth in the musical field.

The Department of Theatre takes special pride in its B.F.A. concentrations in performance/production (acting, design/technology) and theatre education, and its M.F.A. concentrations in scenography and theatre for youth. The theatre education and theatre for youth programs enjoy an international reputation, provide comprehensive training, and attract students, scholars, and visitors from around the world. Students are challenged to excel in every aspect of theatrical training. They have opportunities to act in and direct mainstage and touring shows, to

conduct research, and to teach on and off campus. The program has developed Hayden Library's Child Drama Special Collection, which includes rare books, plays, and personal and national association archives. It is the most complete and extensive collection of its kind in the English-speaking world. Students in the scenography program are actively involved in all aspects of design and technology for mainstage and studio productions and receive regional and national awards for their work on a regular basis. The acting, multiethnic theatre, and experimental theatre programs provide exciting opportunities for students to work with resident and professional actors and directors while providing venues for original and established professional and semiprofessional performance pieces and productions.

A faculty playwright works closely with both undergraduate and graduate directing students to create and showcase original scripts from students and faculty. An interdisciplinary M.F.A. in Creative Writing encourages graduate students to work closely with writers of drama, fiction, and poetry and with directors and producers from the Departments of English and Theatre. Faculty in the Departments of Theatre and English offer students a unique opportunity to tailor a course of study to fit individual needs, talents, and goals.

GENERAL INFORMATION

Undergraduate Credit for Graduate Courses. To enable interested students to benefit as much as possible from their undergraduate studies, the Graduate College and the College of Fine Arts extend to seniors with a GPA of at least 2.50 the privilege of taking 500-level graduate courses for undergraduate credit. Application for admission to a graduate course for undergraduate credit must be completed in advance of the regular registration period. The application must be approved by the instructor of the class, the student's advisor, the chair or director of the department or school, and dean of the college in which the course is offered.

Preprofessional Programs. Students preparing for admission to professional graduate schools should obtain information regarding admission requirements by writing directly to schools in which they may be interested.

School of Art

Julie F. Codell

Director

(ART 102) 602/965-3468

PROFESSORS

BRECKENRIDGE, CHOU, CODELL,
ERICKSON, GASOWSKI,
GILLINGWATER, JAY, LINDERMAN,
LOVELESS, MAGENTA,
MEISSINGER, PILE, PIMENTEL,
STULER, SWEENEY,
J.R. TAYLOR, WOODS

ASSOCIATE PROFESSORS

ALQUIST, BRITTON, COCKE,
DeMATTIES, DETRIE, ECKERT,
FAHLMAN, FRONSKE, GULLY,
HAJICEK, JENKINS, KAIDA,
KROEGER, KRONENGOLD, PATEL,
PITTSLEY, RABINER, RISSEEUW,
SCHMIDT, SHARER, STOKROCKI,
UMBERGER, WEISER, WHITE,
B. YOUNG, J. YOUNG

ASSISTANT PROFESSORS

COLLINS, DUNCAN, HULICK,
MAXWELL, SANFT, SCHLEIF,
SCHOEBEL, SCHUTTE, SERWINT,
SHIPP, VERSTEGEN

PROFESSORS EMERITI

BROADLEY, FARNESS, FINK, GOO,
GRIGSBY, HAHN, HALE, HELLER,
JACOBSON, KELLY, SCHAUMBURG,
J.J. TAYLOR, WAGNER,
WATSON, WOOD

MAJOR REQUIREMENTS

For advisement purposes, all students registering in a School of Art degree program enroll through the College of Fine Arts. Each degree program and area of specialization has its own check sheet, which describes the particulars of course sequence and special requirements. Check sheets are available in the School of Art office.

BACHELOR OF ARTS DEGREE

The School of Art offers three emphases for Art majors in the program Bachelor of Arts program: studio art, photographic studies, and art history. These emphases are intended to give the student a broadly based general education in the field with some more specialized work at the upper-division level.



Studio Art

This emphasis consists of a minimum of 45 semester hours as approved by the student's advisor. It requires 30 semester hours in studio, including ART 111, 112, 113, and 115, and 15 hours in a related field(s), including ARS 101 and 102. Normally the related field is art history. At least 18 of the 45 hours must be upper division credit. All credit applied to the emphasis must be with a "C" or better. The foreign language requirement of the B.A. degree is optional but strongly recommended.

Art History

The emphasis in art history consists of a minimum of 45 semester hours as approved by the student's advisor. It requires 33 semester hours of art history courses and 12 in a related field(s). Normally the related field is studio art. At least 18 of the 45 hours must be upper-division credit. All credit applied to the major must be with a "C" or better. The art history areas of ancient, medieval, Renaissance, baroque, modern, and non-Western art must each be represented with at least one course. Satisfactory completion of ARS 480 is required before the senior year. Other requirements are ARS 101 and 102, one lower division ARS (non-Western) course, ARS 498 and ART 111, 112, and 115. Knowledge in at least one foreign language is required, equivalent to the level obtained through the completion of two years' study at the college level. For specific courses, see the Department of Foreign Languages section.

Photographic Studies

The emphasis in photographic studies consists of a minimum of 48 semester hours as approved by the student's advisor. Required courses include ARS 450, 451, and 454, ART 409, one upper division ARS course in modern art, and one upper division ARS course in criticism. Knowledge in at least one foreign language is required, equivalent to the level obtained through the completion of two years of study at the college level. For specific courses, see the Department of Foreign Languages section.

BACHELOR OF FINE ARTS DEGREE

Art

The major in Art consists of 75 semester hours, with a concentration in one area selected on the basis of the student's interests. The following concentrations are available to the student: art education, ceramics, drawing, fibers, graphic design, intermedia, metals, painting, photography, printmaking, sculpture, and wood.

All students in this degree program follow the same pattern of courses in art for the first two semesters: ARS 101, 102; ART 111, 112, 113, 115.

At least 30 upper division semester hours must be earned within the major, with a minimum of 12 semester hours within the concentration.

All course work counted in the major must be with a "C" or better. The specific requirements for the concentration are recommended by the faculty advisors of the area and are listed on School of Art check sheets.

Courses from other departments, when approved by the advisor and the School of Art, may be applied to the major if deemed appropriate to the student's program of study.

Graphic Design

The concentration in graphic design requires a special application procedure. The application procedure for new and transfer students is separate from and in addition to the required admission to ASU. Acceptance is determined by the graphic design faculty and is based on an application, test, and portfolio. Applications must be made between February 15 and March 15 for admission for the following fall semester. Students are accepted for entry into the graphic design program in the fall semester only of each academic year. Selection of applicants is made by April 1. Due to space limitations, not all qualified applicants can be accommodated, and the admission process is necessarily selective. For application forms and further information, contact the School of Art.

Art Education

The concentration in art education consists of 75 semester hours, including ARS 101 and 102 and two ARS upper division electives (including one in art during the 20th century and one in non-Western art); ART 111, 112, 113, 115, 201, and 223, and one three-dimen-

sional course (either ART 231, 261, 272, 274, or 276). The following art education courses are required: ARE 350, 450, 470, 482, 486, 494, and 496. In addition a minimum of 21 hours, including 12 hours of upper division credit, must be taken in a specific area of art proficiency approved by an advisor of art education. The art proficiency can be in art history, ceramics, drawing, fibers, intermedia, metals, painting, photography, printmaking, sculpture, or wood. Teaching experience is provided in the Children's Art Workshop, which is an on campus art history based studio program for children ages five to 15. Participation in the workshop is part of the requirements for ARE 486. ARE 486 meets the state certification requirements for the elementary methods class, and ARE 496 meets the requirements for the secondary methods class in the subject area. Both of these courses have pre-requisites.

A student pursuing a B.F.A. in Art with a concentration in art education may also choose to become certified for teaching art K-12. If certification is elected while pursuing the art education undergraduate degree, additional hours are required in the College of Education. Students must make special application to the professional education program in the College of Education at the beginning of the junior year. To be considered for admission to the professional program, students must have successfully completed the Pre-Professional Skills Test (PPST) during the sophomore year. In addition, as part of the certification process, students must meet the U.S. and Arizona constitution requirement. Certification may also be pursued after receiving an undergraduate degree in art through the postbaccalaureate program in the College of Education. Interested students should contact an advisor in the College of Education and in art education for admission requirements to the postbaccalaureate program. Art education courses for this program are ARE 450, 482, 486, and 496.

The B.F.A. in Art with a concentration in art education and the postbaccalaureate program for certification in art have special art education application procedures. This procedure is separate from, and in addition to, the admission requirements of ASU. Acceptance is determined by the art education faculty

and is based on application materials that include a three to five page paper describing and historically interpreting a work of art and a portfolio of studio work and on having a 2.50 GPA and a grade of "B" or better in ARE 350 (undergraduates only). Undergraduates pursuing the concentration in art education and postbaccalaureate students pursuing certification in art need to have completed the foundations courses and 12 semester hours of art history including at least one course in art of the 20th century before or during the semester in which they apply. The application for the undergraduate concentration must be submitted while enrolled in ARE 350 before October 1 for the following spring and before March 1 for the following fall. Application for postbaccalaureate certification in art must be submitted before October 1 for the spring semester and occurs in only the fall semester. In addition, the student should check deadlines for the admission to the College of Education professional program.

Student teaching in art education occurs in only the spring semester. To be accepted into student teaching, a student must be recommended in writing by the art education faculty and must have completed all art education classes except for ARE 496, which should be taken concurrently with student teaching. Students who are not recommended may complete the B.F.A. in Art with a concentration in art education without certification or may reapply after meeting deficiencies in knowledge and/or skills related to the teaching of art.

GRADUATE PROGRAMS

The School of Art offers programs leading to the Master of Arts degree with a major in Art, including an emphasis in art education or art history, and the Master of Fine Arts degree with an emphasis in ceramics, drawing, fibers, intermedia, metals, painting, photographic studies, photography, printmaking, sculpture, or wood. In cooperation with the College of Education, the degree Doctor of Education is offered with a concentration in art education. Consult the *Graduate Catalog* for requirements for all graduate degrees.

STUDIO CORE CURRICULUM

- ART 111 Drawing I.** (3) F, S, SS
Fundamentals, technical, and perceptual skills using common drawing media and their application to pictorial organization. 6 hours a week
- 112 Two-Dimensional Design.** (3) F, S, SS
Fundamentals of pictorial design. 6 hours a week
- 113 Color.** (3) F, S, SS
Principles of color theory as related to the visual arts. 6 hours a week. Prerequisites: ART 111, 112
- 115 Three-Dimensional Design.** (3) F, S, SS
Fundamentals of three-dimensional form. 6 hours a week. Prerequisites: ART 111, 112

DRAWING

- ART 211 Drawing II.** (3) F, S, SS
Continued development of technical and perceptual skills. Emphasis on materials and pictorial content. 6 hours a week. Prerequisites: ART 113, 115
- 214 Life Drawing I.** (3) F, S, SS
Development of skill and expressiveness in drawing the basic form, construction, and gesture from the human figure. 6 hours a week. Prerequisites: ART 113, 115
- 311 Drawing III.** (3) F, S
Emphasis on composition, experimentation of drawing media. 6 hours a week. Prerequisites: ART 211 and 214; instructor approval
- 314 Life Drawing II.** (3) F, S
Drawing from the model with greater reference to structural, graphic, and compositional concerns. 6 hours a week. Prerequisite: ART 214 or instructor approval
- 315 Life Drawing III.** (3) F, S
The human figure as the subject for drawing. Emphasis on conceptual alternatives and management of materials. 6 hours a week. Prerequisite: ART 314 or instructor approval.
- 411 Advanced Drawing.** (3) F, S
Visual and intellectual concepts through problem solving and independent study. Emphasis on the individual creative statement. 6 hours a week. May be repeated for credit. Prerequisites: ART 311, instructor approval.
- 414 Advanced Life Drawing.** (3) F, S
Various media and techniques on an advanced level. The human figure as an expressive vehicle in various contexts. 6 hours a week. May be repeated for credit. Prerequisite: ART 315 or instructor approval.
- 415 Art Anatomy.** (4) N
Study of human anatomical structures as applied to the practice of figure-oriented art. 3 hours lecture, 5 hours studio a week. Prerequisite: ART 214.

PAINTING

- ART 223 Painting I.** (3) F, S, SS
Fundamental concepts and materials of traditional and experimental painting media. Emphasis on preparation of painting supports, composition, and color. 6 hours a week. Prerequisites: ART 113, 115.
- 227 Watercolor I.** (3) F, S
Fundamental concepts, materials, and techniques of watercolor. Emphasis on problem solving, basic skills, composition, and color. 6 hours a week. Prerequisites: ART 113, 115.

- 323 Painting II.** (3) F, S
Development of competency in skills and expression. Assigned problems involve light, space, color, form, and content. 6 hours a week. Prerequisite: ART 223 or instructor approval.
- 324 Painting III.** (3) F, S
Continuation of ART 323. 6 hours a week. Prerequisite: ART 323 or instructor approval.
- 325 Figure Painting.** (3) F, S
The human figure clothed and nude as the subject for painting in selected media. 6 hours a week. Prerequisites: ART 314, 323
- 327 Watercolor II.** (3) A
Explorations of personal expression in watercolor. Continued development of watercolor skills using traditional and experimental materials and techniques. 6 hours a week. Prerequisite: ART 227

- 421 Painting Materials and Techniques.** (3) A
Traditional and modern materials and techniques of painting. Experimental problems in tempera, encaustic, casein emulsions, Maroger's Medium, and synthetic media. 6 hours a week. Prerequisite: instructor approval.
- 423 Advanced Painting.** (3) F, S
Continuation of ART 324. 6 hours a week. May be repeated for credit. Prerequisite: ART 324
- 425 Advanced Figure Painting.** (3) F, S
Continuation of ART 325. 6 hours a week. May be repeated for credit. Prerequisites: ART 315, 324, 325.
- 427 Advanced Watercolor.** (3) F, S
Continuation of ART 327. 6 hours a week. May be repeated for credit. Prerequisite: ART 327.

INTERMEDIA

- ART 340 Intermedia.** (3) F, S
Experimental, conceptual, and interdisciplinary studio art with emphasis on new media and technologies. 6 hours a week. May be repeated once for credit. Prerequisites: ART 113 and 115 and 6 hours additional studio requirements or instructor approval.
- 341 Mixed Media.** (3) A
Experimenting visual effects by combining traditional and nontraditional methods, techniques, and concepts. 6 hours a week. May be repeated once for credit. Prerequisites: ART 113 and 115 and 6 hours additional studio requirements or instructor approval.
- 440 New Media Concepts.** (3) F, S
Continued experiments with new media and interdisciplinary concerns in art. 6 hours a week. May be repeated for credit. Prerequisite: ART 340.
- 441 Video Art.** (1) F, S
Utilizing video and audio equipment essential to the production of broadcast quality video art. 2 hours a week. May be repeated for credit. Corequisites: ART 340, 341 (or 440) instructor approval.

PHOTOGRAPHY

- ART 201 Photography I.** (3) F, S
Development of skills and techniques of black and white photography. Emphasis on camera work and darkroom procedures. 2 hours lecture, 3 hours lab.

301 Photography II. (3) F, S

Photography as an art medium with additional experiment on into personal photographic aesthetics. 6 hours a week. Prerequisites: ART 113 and 115 and 201 or instructor approval

304 Advanced Photography. (3) F, S

Interpretation and manipulation of light as a tool in the performance of expressive photography. 6 hours a week. Prerequisite: ART 301 or instructor approval

305 Color Photography I. (3) F, S

Application of color transparencies and prints to photographic craft. 6 hours a week. Prerequisite: ART 304 or instructor approval

306 Photo Techniques. (3) F, S

Exploration of camera and darkroom techniques with emphasis on creative control for the well-crafted black and white print. 6 hours a week. Prerequisite: ART 301 or instructor approval.

401 Nonsilver Photography. (3) F, S

Recognition of the inherent characteristics of nonsilver processes and the use of these processes in the communication of ideas. 6 hours a week. May be repeated for credit. Prerequisite: ART 306 or instructor approval.

403 Black and White Photography. (3) F, S

Advanced exploration of experimental interpretive, and straight photography. 6 hours a week. May be repeated for credit. Prerequisite: ART 304 or instructor approval.

404 Portraiture Photography. (3) F, S

Photographing people. Critical discussions and slide lectures on issues in portraiture. 6 hours a week. May be repeated for credit. Prerequisites: ART 304 and 306 or instructor approval

405 Advanced Color Photography. (3) F, S

Intensive use of subtractive color process in photographic printing. 6 hours a week. May be repeated for credit. Prerequisite: ART 305 or instructor approval.

409 Photographic Exhibition. (3) A

Care of photographic prints, print presentation, and exhibition. Practical experience in gallery operations. 6 hours a week. May be repeated for credit. Prerequisite: ART 304 or instructor approval.

PRINTMAKING**ART 252 Lithography I.** (3) F, S

Black and white planographic printmaking utilizing zinc stone and aluminum plate processes. 6 hours a week. Prerequisites: ART 113, 115

351 Intaglio I. (3) F, S

Introduction to contemporary and traditional development techniques for black and white prints. 6 hours a week. Prerequisite: instructor approval.

352 Lithography II. (3) F, S

Continuation of ART 252. Introduction to color techniques and advanced image format on processes. 6 hours a week. Prerequisite: ART 252 or instructor approval

354 Screen Printing I. (3) F, S

Introduction to paper direct and photographic stencil techniques. 6 hours a week. Prerequisite: ART 113.

355 Photo Process for Printmaking I. (3) A

Introduction to photographic principles and skills for photomechanical printmaking processes including photolithography, photo etch, and photoetching. 6 hours a week. Prerequisite: instructor approval

451 Advanced Intaglio. (3) F, S

Various contemporary and traditional methods of printing to achieve color prints. 6 hours a week. May be repeated for credit. Prerequisite: instructor approval.

452 Advanced Lithography. (3) F, S

Continuation of ART 352. 6 hours a week. May be repeated for credit. Prerequisite: instructor approval.

454 Advanced Screen Printing. (3) A

Continuation of ART 354. 6 hours a week. May be repeated for credit. Prerequisite: instructor approval.

455 Advanced Photo Processes for Printmaking. (3) A

A continued study of photomechanical techniques and applications to printmaking or photographic processes. Prerequisite: ART 355 or instructor approval.

456 Fine Printing and Bookmaking I. (3) A

Letterpress printing and typography as fine art. Study of history, alphabets, mechanics of hand typesetting, presswork, and various forms of printed matter. Prerequisite: instructor approval

457 Fine Printing and Bookmaking II. (3) A

Continuation of ART 456. Bookbinding, book design and printing, advanced typography, theory, and presswork. May be repeated for credit. Prerequisites: ART 456; instructor approval

458 Papermaking. (3) F, S

History, theory, demonstrations, sheet forming, color treatments, and 3-dimensional approaches. 6 hours a week. May be repeated for credit. Prerequisite: instructor approval.

459 Monoprinting. (3) F, S

The nonmultiple printed image using a variety of technical approaches. 6 hours a week. May be repeated for credit. Prerequisites: ART 311, 323 or any 300 level printmaking class; instructor approval.

551 Intaglio Projects. (3) F, S

The materials and methods of Intaglio as a matrix for exploring various contemporary issues. Specifically structured to accommodate the graduate-level drawing with no printmaking background. Studio

SCULPTURE**ART 231 Sculpture I.** (3) F, S, SS

Exploration and expression of sculptural form through ideas and concepts related to basic materials; studio safety. 6 hours a week. Prerequisites: ART 113, 115

331 Sculpture II. (3) F, S

Continuation of ART 231. 6 hours a week. Prerequisite: ART 231

332 Advanced Sculpture. (3) F, S

Sculptural problems related to architecture and man's environment. Exploration in all media. Color relationships as applied to sculpture. 6 hours a week. Prerequisite: ART 331.

333 Experimental Sculpture. (3) N

An experimental approach to form material relationship toward atmospheric kinetic, audio, electronc and earth works. 6 hours a week. Prerequisite: ART 332 or instructor approval

431 Special Problems in Sculpture. (3) F, S

Development of a personal approach to sculpture, emphasis on form, individual problems, and related color technology. Professional

practices and presentation. 6 hours a week.

May be repeated for credit. Prerequisites: ART 332, instructor approval

432 New Directions in Sculpture. (3) A

Examination of environment as resource for images and ideas. Experimentation on nontraditional methods and interrelating disciplines. 6 hours a week. May be repeated for credit. Prerequisite: ART 332 or instructor approval.

436 Architectural Sculpture. (3) N

Sculptural concepts as related to architecture and other man-made environments. Scale drawing models, and relief sculpture. 6 hours a week. May be repeated for credit. Prerequisite: ART 332 or instructor approval

437 Non-Permanent Sculpture. (3) N

Art of a temporary nature including sequential and conceptual works. Attitudes may be presented in films or other visual media. 6 hours a week. May be repeated for credit. Prerequisite: instructor approval.

438 Experimental Systems in Sculpture. (3) N

Systems and concepts for phase changes of materials, temperature pressure field time compression/extension and electronic activation of dimensional forms. 6 hours a week. May be repeated for credit. Prerequisite: instructor approval.

CERAMICS**ART 260 Ceramics for Non-majors.** (3) F, S, SS

Handbuilding methods, wheel throwing, glaze and decorative processes, Raku and stoneware firing. 6 hours a week.

261 Ceramic Survey. (3) F, S, SS

Handforming methods, throwing on the wheel, decorative processes, and glaze application. 6 hours a week. Prerequisites: ART 112, 115

360 Ceramic Throwing. (3) F, S

Design analysis and production of functional pottery. Emphasis on throwing techniques, surface enrichment, and glaze application. 6 hours a week. May be repeated once for credit. Prerequisite: ART 261

364 Ceramic Handbuilding I. (3) F

Search for form using handbuilding techniques. Knifing and related problems. Prerequisite: ART 261

365 Ceramic Handbuilding II. (3) S

Continuation of ART 364 with an additional focus on large scale works, surface treatments, and glaze decoration with related kiln firing applications. Prerequisite: ART 364 or instructor approval

460 Ceramic Clay. (3) A

Research into various clay body formulations, local natural materials, slip glazes and engobes. 6 hours a week. Prerequisites: ART 360 and 364 or instructor approval

463 Ceramic Glaze. (3) A

Glaze formulation and calculation using various glaze surfaces and colors. 6 hours a week. Prerequisite: ART 460 or instructor approval

466 Special Problems in Ceramics. (3) F, S, SS

Emphasis on personal expression with the structure of seminars, critiques and studio work. Professional methods of presentation/documentation of work. 6 hours a week. May be repeated for credit. Prerequisite: ART 364 or instructor approval.

FIBERS

ART 276 Fibers I. (3) F S

Exploration of various materials and basic techniques in the structural use of fibers and surface design on fabric. 6 hours a week. Prerequisites: ART 113 and 115 or instructor approval

376 Fibers: Loom Techniques. (3) A
Investigation of loom controlled techniques. Plain weave, double weave, tapestry will be explored. 6 hours a week. Prerequisites: ART 113 and 276 or instructor approval

377 Surface Design. (3) F, S
Surface design on fabric through the application of dyes and pigments. Techniques include painting, printing, a brushing, and the cyanotype process. Prerequisite: ART 276 or instructor approval

476 Advanced Fibers. (3) F S
Experimentation with advanced techniques in fiber and fabric. May be repeated for credit. 6 hours a week. Prerequisites: ART 376, instructor approval

477 Printed Textiles. (3) A
Techniques for screen printing on fabric, exposing or printing patterns as a composition element. Various stencil methods including photographic processes. Studio. May be repeated for credit. Prerequisite: ART 377 or instructor approval

METALS

ART 272 Jewelry I. (3) F, S

Emphasis on fabrication in jewelry making. Basic techniques of forming, cutting and polishing, forging and soldering. 6 hours a week.

372 Jewelry II. (3) F S
Fabricated approach to jewelry making. Techniques in stone setting and surface embellishment. 6 hours a week. Prerequisites: ART 113 and 115 and 272 or instructor approval

373 Metalworking I. (3) A
Compression, die and stretch forming as applied to hollow form construction. Hot and cold forging techniques as applied to smithing. 6 hours a week. Prerequisites: ART 113 and 115 and 272 or instructor approval

472 Advanced Jewelry. (3) F S
Jewelry making with emphasis on development of personal statements and craftsmanship. 6 hours a week. May be repeated for credit. Prerequisites: ART 372 or instructor approval

473 Advanced Metalworking. (3) A
Forging and forming techniques in individualized directions. 6 hours a week. May be repeated for credit. Prerequisites: ART 373, instructor approval

WOOD

ART 274 Wood I. (3) F, S

Fundamental woodwork techniques to produce creative functional 3-dimensional objects. 6 hours a week

374 Wood II. (3) F S
Individual and directed problems in wood related to the production of unique functional art objects. 6 hours a week. Prerequisites: ART 113 and 115 and 274 or instructor approval

378 Furniture I. (3) A

Design and building of contemporary furniture. Exploration in the technique of joinery, assembly, carving, and finishing procedures. 6 hours a week. Prerequisites: ART 113 and 115 and 274 or instructor approval

474 Advanced Wood. (3) F, S

Extended experience and advanced techniques in the use of wood to create functional works of art. 6 hours a week. May be repeated for credit. Prerequisites: ART 374; instructor approval

478 Advanced Furniture. (3) A
Form concepts are explored in construction of inventive furniture. Emphasis on meditative experimentation. 6 hours a week. May be repeated for credit. Prerequisite: ART 378

GRAPHIC DESIGN

ART 283 Letterform I. (3) F

Drawing of letterforms with focus on proportion and structure. Introduction to letterform nomenclature and classification. 6 hours a week. Prerequisites: ART 113, 115; acceptance into graphic design program. Corequisite: ART 284

284 Visual Communication I. (3) F
Theoretical and applied studies in shape, drawing, and color. 6 hours a week. Prerequisites: ART 113, 115; acceptance into graphic design program. Corequisite: ART 283

286 Visual Communication II. (3) S
Transition from theoretical to applied problems. Emphasis on refinement of visual skills. 6 hours a week. Prerequisites: ART 283, 284; acceptance into graphic design program. Corequisite: ART 287

287 Letterform II. (3) S
Continuation of Letterform I with an emphasis on lowercase letters, basics of pen writing and font design. 6 hours a week. Prerequisites: ART 283, 284. Corequisite: ART 286

382 Graphic Representation. (3) F
Studio practice in drawing with an application towards graphic communication. 6 hours a week. May be repeated once for credit. Prerequisites: ART 284, instructor approval.

383 Typography I. (3) F
Theoretical exercises in spatial and textural qualities of type. Problems in activation and balance. Exercises in simple typographic applications. 6 hours a week. Prerequisites: ART 286-287; acceptance into graphic design program. Corequisite: ART 386.

385 Typography II. (3) S
Problems in composition, choice, and combination of type faces, formats, and their application to a variety of design projects. 6 hours a week. Prerequisites: ART 286, 383. Corequisite: ART 387

386 Visual Communication III. (3) F
Problems in specific design applications such as poster, packaging, publications. Emphasis on development of concepts in visual communication. 6 hours a week. Prerequisite: ART 286. Corequisite: ART 383

387 Visual Communication IV. (3) S
Client-oriented projects. Problems are multifaceted and the emphases are on continuity of design in more than one medium and format. 6 hours a week. Prerequisite: ART 386. Corequisite: ART 385

481 Visual Communication V. (3) F S

Studio problems with an emphasis on analysis, problem solving, and professional portfolio preparation. 6 hours a week. Prerequisites: ART 387; instructor approval.

482 Visual Communication VI. (3) S
Individual and group projects with outside clients. A projects curriculum exhibit. 6 hours a week. Prerequisite: ART 481

485 Graphic Design Workshop. (3) F S, SS
Preprofessional client/designer situations from concept to printed work. Studio workshop and internships for selected students. 6 hours a week. May be repeated once for credit. Prerequisite: instructor approval

SPECIAL STUDIO ART

ART 444 Computer Art I. (3) F S

A study of PC hardware and software for creating art. Emphasis on computer graphics history, hardware/software configurations, DOS, principles of 2- and 3-dimensional graphics. 2 hours lecture, 2 hours studio. Prerequisites: ART 111-112 or equivalent in instructor approval. *General studies: N3*

446 Computer Art II. (3) A

Three-dimensional modeling, lighting surface attributes, and special effects for art applications. Emphasis on explicit commands. Studio. Prerequisite: ART 444 or instructor approval. *General studies: N3*

530 2-Dimensional and 3-Dimensional Computer Art. (3) A

Integration of 2-Dimensional and 3-Dimensional computer imaging for art. Emphasis upon new directions for computer imaging which accounts for media characteristics. Studio.

540 Advanced Computer Art. (3) A

Study of motion for 3-dimensional models, light sources, and surface effects. Course assumes students have a comprehension of complex modeling, mapping, and lighting. Studio. Prerequisite: ART 446 or instructor approval

621 Studio Problems. (3) F S, SS

Advanced study in the following areas:
(a) Drawing
(b) Painting
(c) Photography
(d) Printmaking
(e) Sculpture
(f) Ceramics
(g) Metals
(h) Wood
(i) Fiber Art
(j) Studio Art
6 hours a week each section. May be repeated for credit. Prerequisite: instructor approval

680 Practicum: M.F.A. Exhibition. (1-15) F, S SS

Studio work in preparation for required M.F.A. exhibition. Public exhibit to be approved by the student's supervisory committee and accompanied by a final oral examination. Photographic documentation and written statement of problem. Prerequisite: approval of the student's supervisory committee

Omnibus Courses: See page 40 for omnibus courses that may be offered

ART EDUCATION

ARE 301 Studio Art and Child Development. (3) A

The study of children's development in studio art from early childhood to early adolescence

303 Art Appreciation and Child Development. (3) A

Foundations of art for children and young adults. Emphasis on learning, development, and understanding art in historical and cultural contexts. For non-Art majors. One-hour lecture, four hours studio

350 Art Education and Design. (3) F S

Profession of art education; principles of visual organization; design as a tradition in art and art education; sequencing design instruction. 2 hours lecture, 2 hours studio. Prerequisites: ART 113 and 115 or ARS 101 and 102 or instructor approval

450 Studio Art: Art History I. (3) A

Art traditions prior to the 20th century as a basis for studio and art history instruction. 2 hours lecture, 2 hours studio. Pre- or corequisite: ARE 350.

470 Art Criticism: Aesthetics. (3) S

Traditions of aesthetics and art criticism. Conceptual issues in contemporary art, education in the visual arts. 2 hours lecture, 2 hours studio. Students are recommended to take ARE 482 concurrently. Prerequisite: ARE 450

482 Studio Art: Art History II. (3) S

Art traditions of the 20th century as a basis for studio and art history instruction. 2 hours lecture, 2 hours studio. Must be taken before enrollment in ARE 486. Students are recommended to take ARE 470 concurrently. Prerequisite: ARE 450.

486 Art Education: Strategies and Applications. (3) F

The implementation and evaluation of art instruction for K-12 population includes teaching of Saturday classes in the Children's Art Workshop. Prerequisite: ARE 482

496 Methods and Assessment of Learning in Art. (3) A

Individual or group research on the assessment of art learning incorporating theory and practice. Prerequisites: ARE 470 and 486 or instructor approval.

510 Art Education Colloquium. (3) F

Historical foundations of art education and faculty presentation of positions regarding teaching and research related to the visual arts. Must be taken in the first 6 hours of study.

515 Art Foundations of Art Education. (3) A

Foundations of art education with an emphasis on psychological, philosophical, and historical frames of reference.

520 Issues in Teaching Art History. (3) A

Critical examination of issues concerning teaching art history to different populations of students. Historical and philosophical foundations and emphasis on developing inquiry into historical and cultural contexts for art. Recommended to be taken with ARE 525.

525 Research on Teaching Art History. (3) A

Review of empirical and historical research, research methods, learning theory and assessment of learning in art history. Development of instructional resources and pilot studies of how these materials affect learning. Recommended to be taken with ARE 520.

530 Issues in Teaching Studio Art. (3) A

Critical examination of issues concerning teaching studio art to different populations of students. Historical and philosophical foundations, emphasis on how concepts for representation are developed. Recommended to be taken with ARE 535.

535 Research on Teaching Studio Art. (3) A

Review of empirical and historical research methods, learning theory, and assessment of learning in studio art including developmental studies and the ramifications. Development of instructional resources and pilot studies. Recommended to be taken with ARE 530.

540 Integrating Studio Art and Art History. (3) A

Historical and empirical foundations for relating studio art and art history. Emphasis on the development of instructional resources and pilot studies of how art historical information influences learning in studio art

550 Aesthetic Inquiry. (3) A

Literature on aesthetic methods of inquiry, and implications for art education.

570 Analyzing Works of Art. (3) N

The critical examination of art or statements about art and the development of ways for guiding this examination.

610 Issues and Trends in Art Education. (3) N

Doctoral-level investigation of historical and contemporary issues related to teaching and research in art education.

611 Curriculum Development in Art Education. (3) N

Doctoral-level inquiry into the philosophical, psychological, and sociological foundations of curriculum development

Omnibus Courses: See page 40 for omnibus courses that may be offered.

ART HISTORY

ARS 100 Introduction to Art. (3) F S, SS

Development of understanding and enjoyment of art and its relationship to everyday life through the study of painting, sculpture, architecture, and design. May not be taken for credit by student who has completed ARS 300 nor used as art history credit by Art majors. *General studies:* HU.

101 Art of the Western World I. (3) F S

History of Western art from the Paleolithic period through the Middle Ages. *General studies:* HU, H

102 Art of the Western World II. (3) F, S

History of Western art from the Renaissance to the present. *General studies:* HU

201 Introduction to Asian Art. (3) A

History of art of the Asian cultures with emphasis on China, Japan, and India. *General studies:* HU, G, H

202 Art of Africa, Oceania, and the Americas. (3) A

History of art of Africa, Oceania, and the Americas from prehistory to the present. *General studies:* HU, G, H.

300 Introduction to Art. (3) F, S

Course content same as ARS 100 but requires a higher level of accomplishment and comprehension. May not be taken for credit by student who has completed ARS 100, nor used as art history credit by Art majors. *General studies:* HU.

340 Art in America. (3) A

American art from colonial times through the Second World War. Not available to students who have had ARS 444, 542, or 543. Prerequisites: ARS 101 and 102 or instructor approval. *General studies:* HU.

400 History of Printmaking. (3) A

History of the print as an art form and its relation to other modes and forms of artistic expression. Prerequisites: ARS 101 and 102 or instructor approval. *General studies:* HU, H

402 Art of Ancient Egypt. (3) N

Aesthetic, philosophical, and cultural basis of Egyptian art from pre-Dynastic period through New Kingdom. Emphasis on sculpture and architectural monuments. Prerequisites: ARS 101 and 102 or instructor approval. *General studies:* HU, H.

404 Greek Art. (3) A

History of art architecture of Aegean civilizations (Cycladic, Minoan, Mycenaean) and of Greece to end of Hellenistic period. Prerequisites: ARS 101 and 102 or instructor approval. *General studies:* HU, H.

406 Roman Art. (3) A

Art and architecture of Etruria, the Roman Republic, and the Roman Empire. Prerequisites: ARS 101 and 102 or instructor approval. *General studies:* HU, H.

410 Early Christian and Byzantine Art. (3) A

Art and architecture of the early church and the Byzantine Empire from the 4th to the 15th century. Prerequisites: ARS 101 and 102 or instructor approval. *General studies:* HU

412 Early Medieval Art. (3) N

Painting, sculpture, architecture, and the minor arts from Migration, Carolingian, and Ottonian periods considered within religious, social, and economic contexts. Prerequisites: ARS 101 and 102 or instructor approval. *General studies:* HU, H

414 Romanesque Art. (3) A

Sculpture, painting, architecture, and minor arts in western Europe ca. 1030–1200 considered within religious, economic, and social contexts. Prerequisites: ARS 101 and 102 or instructor approval. *General studies:* HU, H

416 Gothic Art. (3) A

Painting, sculpture, and architecture in western Europe during the Gothic period. Prerequisites: ARS 101 and 102 or instructor approval. *General studies:* HU.

418 Renaissance Art in Northern Europe.

(3) A
Graphs, painting, sculpture, and architecture ca. 1450–1550. Reformat on themes and Renaissance style considered within religious, political, social, and economic contexts. Prerequisites: ARS 101 and 102 or instructor approval. *General studies:* HU

420 Early Renaissance Art in Italy. (3) N

Painting, sculpture, and architecture in Italy from 1300 to 1500. Prerequisites: ARS 101 and 102 or instructor approval. *General studies:* HU, H.

422 Italian High Renaissance Art and Mannerism. (3) A

History of Italian art during the 16th century, including the achievements and influence of Leonardo da Vinci, Raphael, and Michelangelo. Prerequisites: ARS 101 and 102 or instructor approval. *General studies:* HU

424 Italian Baroque Art. (3) A

Italian painting, sculpture, and architecture of the 17th century. Prerequisites: ARS 101 and

102 or instructor approval. *General studies HU, H.*

426 Art of the 17th Century in Northern Europe. (3 A)

Baroque painting, sculpture and architecture in Flanders, the Netherlands, France and England. Prerequisites: ARS 101 and 102 or instructor approval. *General studies: HU, H.*

428 Art of the 18th Century. (3 A)

History of painting, sculpture, architecture, graphic arts, and the decorative arts from 1700 to the French Revolution (1789). Prerequisites: ARS 101 and 102 or instructor approval. *General studies HU, H.*

430 Art of Spain and Its Colonies. (3 A)

Architecture, painting and sculpture from 1500 to 1800. Focus on central Mexico and the American Southwest. Prerequisite: ARS 102 or instructor approval. *General studies: HU, H.*

432 Art and Revolution: European Art 1770–1850. (3 A)

Impact of American and the French revolutions and Napoleonic epoch on the visual arts. Focus on neoclassical and romantic movements. Prerequisites: ARS 101 and 102 or instructor approval. *General studies HU.*

434 Realism and Impressionism: European Art 1840–1880. (3 N)

Social, political and aesthetic forces affecting art. Concentration on Courbet, Daubigny, Manet, Monet, Degas, and tensions between avant-garde and Academic art. Prerequisites: ARS 101 and 102 or instructor approval. *General studies HU.*

436 Art at the Turn-of-the-Century: 1885–1914. (3 A)

History of European avant-garde movements. Concentration on post-impressionism, symbolism, expressionism and cubism. Prerequisites: ARS 101 and 102 or instructor approval. *General studies: HU.*

438 Art of the 20th Century I. (3 A)

Developments and directions in art between 1900 and World War I. Prerequisites: ARS 101 and 102 or instructor approval. *General studies: HU.*

439 Art of the 20th Century II. (3 A)

Art since World War I with consideration of new concepts and experimentation with media and modes of presentation. Prerequisites: ARS 101 and 102 and 438 or instructor approval. *General studies: HU, H.*

442 American Art I. (3 A)

Art in the United States from European settlement to 1850. Prerequisites: ARS 101 and 102 or instructor approval. *General studies: HU.*

443 American Art II. (3 A)

Art in the United States from 1850 to 1892. Prerequisites: ARS 101 and 102 or instructor approval. *General studies: HU.*

444 Modern American Art, 1900–1945. (3 A)

American painting, sculpture, photography, and architecture 1900–1945. Covers major movements, including the eight modern movements, regionalism, and the WPA. Prerequisites: ARS 101 and 102 or instructor approval. *General studies: HU.*

450 19th-Century Photography. (3 A)

History of photography from the medium's prehistory to 1914, personalities, processes, images, and ideas. Prerequisites: ARS 101 and 102 or instructor approval. *General studies: HU.*

451 20th-Century Photography. (3 A)

Personality, processes, images, and ideas in photography from 1914 to present. Prerequisites: ARS 101 and 102 or instructor approval. *General studies: HU.*

454 Research and Writing in Photography. (3 A)

Principles and practice of research and writing in the history and criticism of photography. Papers required. Prerequisites: ARS 450 and 451 or instructor approval. *ENG 101 and 102 or equivalents.*

456 History of Art Criticism I. (3 N)

History of theories of criticism of the visual arts. Readings from visual arts criticism literature from Plato to 18th century. Prerequisites: ARS 101 and 102 or instructor approval. *General studies: HU, H.*

457 History of Art Criticism II. (3 N)

Theories of criticism of the visual arts from late 18th century to present. Prerequisites: ARS 101 and 102 or instructor approval. *General studies: HU, H.*

458 20th-Century Art Criticism. (3 N)

Seminar in current writings in development of modern art criticism. Role of art critic in journalism in relation to art community. Prerequisites: ARS 101 and 102 or instructor approval. *General studies: HU.*

459 Writing Art Criticism. (3 N)

Traditional and contemporary approaches to the criticism of art. Students will write critical essays. The latter half of the semester will stress the criticism of contemporary art in various media. Prerequisite: ARS 458 or instructor approval.

462 Precolumbian Art I. (3 A)

Architecture, sculpture, ceramics, painting, and other arts of Mesoamerica before European contact. Satisfies non-Western art history requirement. Prerequisites: ARS 101 and 102 or instructor approval. *General studies: HU, H.*

463 Precolumbian Art II. (3 A)

Architecture, sculpture, ceramics, textiles, and other art of South America prior to European contact with focus on the Central Andes. Satisfies non-Western art history requirement. Prerequisites: ARS 101 and 102 or instructor approval. *General studies: HU.*

465 Native North American Art. (3 A)

Native American art forms of the United States and Canada from prehistoric times to the present. Prerequisites: ARS 101 and 102 or instructor approval. *General studies: HU, H.*

466 Native American Art of the Southwest. (3 A)

American and art in the southwestern states from its origins to the present day. Satisfies non-Western art history requirement. Prerequisites: ARS 101 and 102 or instructor approval. *General studies: HU, C, H.*

468 Shamanism and Art. (3 A)

Performance arts as well as traditional art objects associated with the shaman in Siberia and North America. Satisfies non-Western art history requirement. Prerequisites: ARS 101 and 102 or instructor approval. *General studies: HU.*

469 Mexican Art. (3 A)

Art of Mexico and related Central American cultures from the prehistoric to the contemporary schools. Prerequisites: ARS 101 and 102 or instructor approval. *General studies: HU, H.*

472 Art of China. (3 A)

Study of major forms in Chinese art: ritual bronze, sculpture, ceramic calligraphy, painting and architecture. Satisfies non-Western art history requirement. Prerequisites: ARS 101 and 102 or instructor approval. *General studies: HU, G.*

473 Art of Japan. (3 A)

Japanese art from the Jomon period to the present. Satisfies non-Western art history requirement. Prerequisites: ARS 101 and 102 or instructor approval. *General studies: HU.*

475 Chinese Painting. (3 A)

From Ku K'a-chin to Ch'Pa-shih. Major artists, styles, and movements in Chinese painting. Satisfies non-Western art history requirement. Prerequisites: ARS 101 and 102 or instructor approval. *General studies: HU.*

480 Research Methods. (3 F, S)

Methodology and resource material for art historical research. Techniques of scholarly and critical writing and evaluation of bibliographic sources. Prerequisites: ARS 101 and 102 or instructor approval. *General studies: L2.*

498 Pro-Seminar. (3–6 A)

Undergraduate seminar in topics selected from the following. Problems or criticism in:

- (a) Chinese Art
- (b) Ancient Art
- (c) Medieval Art
- (d) Renaissance Art
- (e) Baroque Art
- (f) Modern Art
- (g) American Indian Art
- (h) Pre-Columbian Art
- (i) Photograph History
- (j) American Art

Prerequisite: instructor approval.

501 Methodologies and Art History. (3 A)

The history of the discipline and an exploration of various methodologies and critical bibliographies used by art historians. Seminar.

502 Critical Studies in Egyptian Art. (3 N)

Egyptian art from pre-Dynastic to New Kingdom periods. Focus on aesthetic, philosophical and cultural context. Research paper and readings required.

504 Critical Approaches to Greek Art. (3 A)

Art and architecture of Aegean civilizations (Cycladic, Minoan, Mycenaean) and of Greece to end of Hellenistic period. Research paper and readings required.

506 Critical Studies in Roman Art. (3 A)

Art and architecture of Etruria, the Roman Republic and the Roman Empire. Research paper and/or supplementary readings required.

514 Critical Approaches to Romanesque Art. (3 N)

Sculpture, painting, architecture and the minor arts in western Europe, ca. 1030–1200, considered with religious, economic, and social contexts. Research paper required.

516 Critical Approaches to Gothic Art. (3 N)

Architecture, sculpture, painting, and the minor arts in western Europe, ca. 1150–1350, considered with religious, social, and economic contexts. Research paper required.

522 Sixteenth Century Italian Art. (3 A)

Critical study of painting, sculpture, and architecture in 16th century Italy in its religious and historical context.

528 Eighteenth Century Art in Europe. (3 A)

Critical study of European art from the late Baroque to the early years of Neoclassicism.

530 Art of Spain and New Spain. (3) A

Critical study of architecture, painting and sculpture from 1500 to 1800. Lecture-conference.

532 Art, Politics, and Patronage 1770–1850. (3) F

Critical analyses of political events in Europe. Issues of patronage, art as propaganda examined. Impact of war and revolution on visual arts.

542 American Art I. (3) A

Explores themes and issues in American art with a critical study of American painting from the 18th century to 1848. Prerequisite: instructor approval.

543 American Art II. (3) A

Explores themes and issues in American art with a critical study of American painting from 1848 to 1900. Prerequisite: instructor approval.

544 American Modernism and Realism, 1900–1945. (3) A

Critical study of the social, political, and artistic changes in American art during the first half of the twentieth century. Prerequisites: ARS 101 and 102 or 340.

562 Art of Ancient Mesoamerica. (3) F

Critical study of art and architecture of Mexico and Maya area before Spanish contact. Lecture, conference.

565 Native Art of North America. (3) A

Critical examination of Native American art with a cultural prehistory to the present. Prerequisites: ARS 101 and 102 or instructor approval.

574 Studies in Japanese Art. (3) A

Critical examination of the nature and history of Japanese art. Its rich heritage and its indebtedness to foreign sources. Lecture, discussion. Prerequisites: ARS 101 and 102 or instructor approval.

575 Approaches to Chinese Painting. (3) F

Critical history of Chinese painting from Eastern Chou to 1911. Emphasis on masters, regional developments, and conceptual underpinnings. Lecture, discussion. Prerequisites: ARS 101 and 102 or instructor approval.

591 Seminar. (3–6) A

Graduate seminar in topics selected from the following. Problems or critical seminar:

- a) Chinese Art
- b) Ancient Art
- c) Medieval Art
- d) Renaissance Art
- e) Baroque Art
- f) Modern Art
- g) American and Art
- h) Pre-Columbian Art
- i) Photographic History
- j) American Art

Prerequisite: instructor approval.

Omnibus Courses: See page 40 for omnibus courses that may be offered.

ART AUXILIARY COURSES**ARA 202 Introduction to Photo Aesthetics.** (3) F, S

Seminar course in understanding photography as a fine art form.

345 Design Rhetoric. (3) F, S

Development of critical thinking and expression of ideas in concise and persuasive written and spoken form. Prerequisites: ENG 101, 102.

460 Gallery Exhibitions. (3) F, S

Practical experience in all phases of department gallery operations and preparation of gallery publications. May be repeated for credit. Prerequisite: instructor approval.

485 Women's View of Art. (3) A

Study of women visual artists, their lives and the social, political, aesthetic and educational issues related to their art. Lecture, discussion, readings, and studio experiences. 3 hours a week. Prerequisite: instructor approval.

488 Understanding Art. (3) F, S

Understanding art as an emergent cultural phenomenon with an emphasis on a critical examination of conceptual issues in art. Writing required. Prerequisites: ARS 101 and 102 or instructor approval. *General studies L2 HU.*

Omnibus Courses: See page 40 for omnibus courses that may be offered.

Dance

Elizabeth C. Lessard
Chair
(PEBE 107B) 602 965–5029

PROFESSORS

JONES KEUTER, LESSARD, LUDWIG

ASSOCIATE PROFESSORS

CHLISTOWA, KAPLAN, MARION

ASSISTANT PROFESSORS

HAZARD, MATT, MOONEY

INSTRUCTOR

VISSICARO

SENIOR LECTURER

NAGRIN

ASSOCIATE INSTRUCTIONAL**PROFESSIONAL**

ROSEN

PROFESSOR EMERITUS

GISOLO

LECTURER EMERITUS

DESJARDIN

DEPARTMENTAL MAJOR REQUIREMENTS

For advisement purposes, all students registering in a Dance degree program enroll through the College of Fine Arts. Each degree program and area of specialization has its own check sheet, which describes the particulars of course sequence and special requirements. These check sheets are available in the Department of Dance office.

Placement Examinations

All students who enroll in an undergraduate Dance degree program are required to take part in a placement audi-

tion to determine their levels of technical proficiency in modern dance and ballet. Official dates for auditions are set for the orientation periods that precede the fall and spring semesters of each academic year. Transfer students who have completed music theory for dance, dance production, or choreography courses at another institution are also required to take placement examinations in these areas before enrolling in intermediate or advanced levels of course work.

BACHELOR OF ARTS DEGREE

The Dance major consists of a minimum of 53 semester hours in dance, of which the following are required: DAH 190, 401, 402; DAN 121, 134, 135, 164, 171, 172, 173, 174, 210, 228, 234, 235, 264, 265, 334, 340, 341. Fifteen additional hours approved by an advisor must be in no more than two related fields. Additional requirements are listed on the departmental check sheet.

At least 50 semester hours, including 18 in the major, must be in the upper division. Grades in classes required for the major must be "C" or better. First-semester students should take DAH 190, DAN 134 and 135, ENG 101, MUS 100, and one general studies requirement.

BACHELOR OF FINE ARTS DEGREE

The Dance major consists of 75 to 88 semester hours with a concentration in either performance and choreography or dance education. The following core courses are required: DAH 190, 401, 402; DAN 121, 134, 135, 164, 171, 172, 173, 174, 210, 211, 228, 234, 235, 264, 265, 334, 340, 341, 464, 465, 480. The following additional requirements are included for the concentration in performance and choreography: DAN 321, 328, 335, 371, 434; MUS 100, 347 (or 355 or 356); THP 101. For the concentration in dance education, DAN 350, 351, 357 and 359, one hour of Jazz Dance, and MUS 100 must be completed as well as all state secondary certification requirements. Other requirements for each option are listed on the departmental check sheet.

At least 50 semester hours, including 30 in the major, must be upper division hours. Grades in classes required for the major must be "C" or better. First-semester students should take DAH

190, DAN 134 and 135, ENG 101, MUS 100, and one general studies requirement.

DEPARTMENTAL GRADUATE PROGRAM

The faculty in the Department of Dance offer a program leading to the Master of Fine Arts degree with a major in Dance. The program is designed to train professionals in the technique, performance, choreography, and theoretical bases of modern dance. Consult the *Graduate Catalog* for requirements.

DANCE HISTORY

DAH 100 Introduction to Dance. (3 F S) Orientation to the field of dance focusing on history, styles, cultural, and theatrical aspects of the art form. *General studies: HU*

190 Introduction to the Dance Profession. (1) F

Oriented to the dance profession introducing career options and university department resources. Designed for Dance majors.

300 Introduction to Dance. (3 F, S) Course content same as DAH 100 but requires a higher level of accomplishment and comprehension. May not be taken for credit by student who has completed DAH 100. *General studies: HU*

301 Philosophy and Criticism of Dance. (3 F S)

Philosophical issues in dance and dance criticism with emphasis on written analysis and interpretation. Prerequisite: 1 semester of First Year Composition. *General studies: L2 HU*

401 Dance History I. (3 F) Cultural and theatrical development of dance from prehistory through the 19th century Romantic period, including the early history of ballet. *General studies: HU*

402 Dance History II. (3 S) Cultural and theatrical development of dance from 19th century Romantic period through Contemporary times. Includes ballet, modern and musical theatre dance. *General studies: HU*

495 Dance Research Sources. (2 F) The investigation of various resources and methods for conducting research in dance Seminar. Prerequisite: instructor approval.

496 Senior Thesis Project. (2) S A culminating research project which integrates dance and a related field of interest. Prerequisite: DAH 495

501 Philosophy of Dance. (3 S) Analytical and critical study of the implications of traditional and contemporary philosophies of dance regarding meaning, identity, form, content, genre, and style

502 Cultural Concepts of Dance. (3 S) Cultural concepts, trends, economic, political, and geographical forces in major eras of dance history

Omnibus Courses: See page 40 for omnibus courses that may be offered

DANCE

DAN 121 Music Theory for Dance. (2 S) Elements of musical structures and their relationship to dance. Emphasis on rhythmic analysis and dance accompaniment. Prerequisite: MUS 100 or instructor approval

130 Dance. (1 F, S, SS) Ballet, improvisation, jazz, modern, Afro-Caribbean, Ballet Folklórico, Tai Chi, and other dance forms. 2.5 hours a week. May be repeated for credit

134 Technique and Theory of Modern Dance. (3 F, S) Elementary concepts of modern dance technique. Development of movement quality and performance skills. 6 hours a week. May be repeated for credit. Placement audition required. Prerequisite: Dance major.

135 Technique and Theory of Ballet. (2) F, S Elementary ballet technique with emphasis on alignment, control, and development of the feet with proper awareness of style and phrasing. 4 hours a week. May be repeated for credit. Placement and auditions required

164 Improvisation. (1) F, S Improvisation techniques employing the basic elements of space, time, and energy. Student

171 Dance Production Lab: Costume. (0) F, S Participate in concert dance production in the area of costume. Required of all Dance majors. Lab

172 Dance Production Lab: Technical Theatre. (0) F, S Participate in concert dance production in the area of technical theatre. Required of all Dance majors. Lab

173 Dance Production Lab: Management. (0) F, S Participate in concert dance production in the area of production management. Required of all Dance majors. Lab

174 Dance Production Lab. (0) F, S Participate in concert dance production in the areas of costume or technical theatre or management. Required of all Dance majors. Lab. Prerequisites: DAN 171, 172, 173.

210 Dance Production I. (2 F) Theory of lighting, scenery, and sound as related to dance.

211 Dance Production II. (2 S) Theory and practice of publicity, makeup, costuming, house, and stage management as related to dance production. Prerequisite: DAN 210 or instructor approval

228 Dance Notation I. (3 F) Survey of systems of dance notation. Introduction to effort shape analysis of movement. Emphasis on learning elementary notation. Prerequisites: DAN 121; MUS 100

230 Dance. (1) F, S Intermediate levels. Continuation of DAN 130. 2.5 hours a week. May be repeated for credit

234 Technique and Theory of Modern Dance. (3 F, S)

Intermediate concepts of modern dance technique. Development of movement quality and performance skills. 6 hours a week. May be repeated for credit. Placement audition required. Prerequisite: Dance major

235 Technique and Theory of Ballet. (2) F, S The advanced study of elementary ballet technique through the traditional exercises with

proper awareness of style and phrasing. 4 hours a week. May be repeated for credit. Placement audition required.

237 Beginning Pointe. (1 F, S) The study of elementary pointe technique through the traditional exercises. 2 hours a week. May be repeated for credit. Prerequisites: basic ballet training. Instructor approval.

264 Fundamentals of Choreography I. (2) F, S Introduction to and application of basic choreographic principles with emphasis on improvisation, movement invention, and development of evaluative skills. Prerequisites: DAN 164. Instructor approval

265 Fundamentals of Choreography II. (2) F, S Intermediate application of basic choreographic principles with emphasis on improvisation, form, content, and evaluative skills. Prerequisites: DAN 164. Instructor approval

318 Dance and Video. (2) N Fundamentals of dance video production, including camera operation, scripting, and camera editing. Prerequisites: junior standing; instructor approval

321 Music Literature for Dance. (3) F Historical survey of music relative to dance. Emphasis on developing listening skills and knowledge of musical versus choreographic forms. Prerequisite: DAN 121 or instructor approval

328 Dance Notation II. (2) S Intermediate study of labanotation. Emphasis on score reading. Prerequisite: DAN 228 or equivalent

330 Dance. (1 F, S) Advanced levels. Continuation of DAN 230. 2 hours a week. May be repeated for credit

334 Technique and Theory of Modern Dance. (3) F, S Advanced concepts of modern dance technique. Development of movement quality and performance skills. 6 hours a week. May be repeated for credit. Placement audition required

335 Technique and Theory of Ballet. (2) F, S Intermediate ballet technique with emphasis on strength, dynamics, rhythmic impulses, and transitions with awareness of proper style and phrasing. 4 hours a week. May be repeated for credit. Placement audition required.

336 Classic Jazz Dance. (2) F Study of 150 years of jazz dance in America through the learning of period dances, reading, creative work, and performance. May be repeated for credit. Student. Prerequisite: instructor approval.

337 Intermediate Pointe. (1) F, S Study of intermediate and advanced pointe technique through the traditional exercises. 2 hours a week. May be repeated for credit. Prerequisite: DAN 237 or instructor approval

340 Dance Kinesiology I. (3 F) Kinesiological principles applied to dance technique. Including analysis of muscular patterns in dance movement and the pathomechanics of dance injury. Prerequisite: ZOL 201 or instructor approval

341 Dance Kinesiology II. (3) S Continuation of DAN 340. Prerequisite: DAN 340

342 Ideokinesis. (2) F

A study of posture using the visualization of image goals to facilitate improved alignment and movement efficiency. May be repeated for credit. Lecture studio.

350 Methods of Teaching Modern Dance in Secondary Education. (3) F

Analysis and acquisition of teaching materials for the technique, improvisation, and choreography of modern dance. Lecture, studio. Prerequisite: DAN 334 or equivalent.

351 Methods of Teaching Ballet and Jazz in Secondary Education. (2) S

Analysis and acquisition of teaching techniques and materials for ballet and jazz dance forms. Lecture studio. Prerequisite: DAN 334 or equivalent.

357 Children's Dance. (3) F SS

Theory and practice of teaching creative dance to children. Designed for Dance majors and related curricula but open to all students.

359 Dance Education Theory. (3) S

Application of principles of motivation, learning, and evaluation to the teaching of dance. Prerequisite: DAN 334 or equivalent.

371 Dance Theatre Performance

Production. (1-3) F, S
Performance or technical theatre work in designated dance productions. 3 hours a week per semester hour. May be repeated for credit. Prerequisite: instructor approval.

434 Technique and Theory of Modern

Dance. (3) F, S
Preparation in the performance and comprehension of professional level modern dance technique. 6 hours weekly. May be repeated for credit. Placement audition required.

435 Technique and Theory of Ballet. (2) F, S

The study of professional advanced ballet technique with emphasis on preparation for performance. 4 hours weekly. May be repeated for credit. Placement audition required.

437 Partnering. (2) S

Fundamental technique theory and practice of partnering applicable to all dance forms. Varies from ballet (on pointe and off). May be repeated for credit. Prerequisite: instructor approval.

464 Choreography and Accompaniment.

(3) F
Function of accompaniment for dance experience in the use of percussion voice, records piano, and selected instruments in relation to the use in choreography. Studio. Prerequisites: DAN 264 and 265 or equivalent.

465 Advanced Choreography. (3) S

Investigation and practice of contemporary styles of choreography. Studio. Prerequisite: DAN 264 and 265 or equivalent.

480 Senior Performance in Dance. (2) F

Original choreography for group performance with analysis and critique of problems encountered in production. Must be repeated for a total of 4 credits. Prerequisites: DAN 464, 465.

510 Dance Stagecraft and Production. (3) N

Theory of lighting, costume, makeup, scenery, and sound as related to dance performance. May be repeated once for credit. Lecture studio. Prerequisite: DAN 211 or equivalent.

518 Dance and Video Production. (2) N

Dance video production and analysis of current research in the field. Special projects, including thesis documentation are discussed. Lecture studio.

528 Dance Notation III. (3) N

Advanced study of abanotation. Experiences in notating and reconstructing abanotation dance scores. Lecture, studio. Prerequisites: DAN 328 or equivalent.

534 Technique and Theory of Modern Dance. (2) F, S

Preparation in the performance and comprehension of professional level modern dance for first year graduate students. 6 hours weekly. May be repeated for credit. Placement audition required.

535 Technique and Theory of Ballet. (1) F, S

Graduate level study of professional advanced ballet technique with emphasis on preparation for performance. 4 hours weekly. May be repeated for credit. Placement audition required.

536 Classic Jazz Dance. (2) F

Study of 150 years of jazz dance in America, learning period dance reading, and choreographic assignments. May be repeated for credit. Studio. Prerequisite: instructor approval.

537 Partnering. (2) S

Fundamental technique, theory and practice of partnering, applicable to all dance forms. Varies from ballet (on pointe and off). May be repeated for credit. Prerequisite: instructor approval.

542 Ideokinesis. (2) F

A theoretical examination of ideokinetic methods of facilitating postural change and movement efficiency.

550 Graduate Dance Pedagogy: Modern.

(3) S
Advanced analysis of teaching techniques for modern dance.

551 Graduate Dance Pedagogy: Ballet. (3) F

Advanced analysis of teaching techniques for ballet. Prerequisite: instructor approval.

561 Choreographer/Composer Workshop.

(3) N
Analysis of, experimentation with and practice in working with composers of music for choreography. Open to experienced choreographers and composers. Lecture studio. Prerequisite: instructor approval.

563 Solo and Group Choreography. (3) F

Original choreography created for solo and group performance. May be repeated once for credit. Prerequisites: DAN 464 and 465 or equivalent.

571 Dance Theatre. (1-3) F, S

Performance in specially choreographed dance productions. 3 hours a week. May be repeated for credit. Prerequisite: instructor approval.

591 Seminar. (0-3) F, S

Seminar focusing on enrichment topics, production aspects of thesis projects, teaching concerns, special lectures, films, or critiques.

634 Technique and Theory of Modern

Dance. (2) F, S
Preparation in the performance and comprehension of professional level modern dance for second year graduate students. 6 hours weekly. May be repeated for credit. Placement audition required.

640 Advanced Problems in Analysis of Dance Technique. (3) S

Theories and principles of human anatomy, kinesiology, and the psychology of learning

applied to analysis of dance movement. Prerequisites: DAN 340 and 342 or instructor approval.

680 MFA Performance. (1-9) F, S

Studio work in preparation for required MFA concert. Public performance to be approved by the student's supervisory committee and to be followed by a final oral examination. A written bound document as well as video documentation must be left with the department. Prerequisite: instructor approval.

Omnibus Courses: See page 40 for omnibus courses that may be offered.

School of Music

George E. Umberson

Director

(MUSIC 185) 602-965-3371

REGENTS' PROFESSORS

HICKMAN, UNG

PROFESSORS

ATSUM, BAILEY, BOSWELL,
D. BRITTON, M. BRITTON, CLARK,
DEBENPORT, DOAN, FLEMING,
HAMLTON, HARRIS, HOFFER,
HOOVER, HUMPHREYS,
KIEWER-BRITTON, LOCKWOOD,
MAGERS, MAROHNIC, METZ,
OLDANI, PAGANO, PERANTONI,
ROSEN, SELLHEIM, SHINN,
SKOLDBERG, H.C. SMITH, SPINOSA,
STOCKER, STRANGE, SWAIM,
UMBERSON, WELLS, WYTKO

ASSOCIATE PROFESSORS

BARROLL, ASCHAFFENBURG,
COSAND, CROWE, DeMARS,
FERRIS, HACKBARTH, HAEFER,
HOLBROOK, KOONCE, LEEK, MAY,
MEYER, RAUSCH, RAVE, REBER,
REYNOLDS, ROGERS, SPRING,
SUNKETT, WILLIAMSON, WILSON

ASSISTANT PROFESSORS

CARPENTER, HOOKER,
MONTGOMERY, J.B. SMITH,
SOLIS, STAUFFER

PROFESSORS EMERITI

ANDRESS, BOWERS, D'ANDREA,
DRESSKELL, ENGLISH, FLETCHER,
HANNA, HINES, LAMM, LOMBARDI,
McEWEN, McLEOD, RICKEL,
ROBINSON, SCOLAR, SEPP,
M.W. SMITH, STALZER

The School of Music is a member of the National Association of Schools of Music, and the requirements for entrance and graduation set forth in this catalog are in accordance with the published regulations of the association.

The following statement of basic musicianship is endorsed by the School of Music:

All musicians, whether performers, composers, scholars or teachers, share common professional needs. Every musician must to some extent be a performer, a listener, a historian, a composer, a theorist, and a teacher. For this reason, certain subject matter areas and learning processes are common to all baccalaureate degrees in music.

Basic musicianship is developed in studies which prepare the student to function in a variety of musical roles which are supportive of his/her major concentration. All undergraduate curricula, therefore, provide the following:

1. A conceptual understanding of such musical properties as *sound, rhythm, melody, harmony, texture* and *form* and opportunities for developing a comprehensive grasp of their interrelationships as they form the cognitive affective basis for listening, composing and performing.
2. Repeated opportunities for enacting in a variety of ways the roles of listener (analysis), performer (interpretation), composer (creation), scholar (research), and teacher.
3. A repertory for study that embraces all cultures and historical periods.

MAJOR REQUIREMENTS

For advisement purposes, all students registering in a School of Music major program 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 pages 45–67 of this catalog.

Placement Examination. All students who enroll in an undergraduate music degree program are required to perform an entrance audition in their primary performing medium (instrument or voice). Audition forms and specific audition requirements for each instrument or voice may be obtained upon request by writing the School of Music. Official dates for these auditions are set for each academic year. Students may request to audition on other dates if necessary or may send a tape recording if distance prohibits coming to the campus. Entering students must also take a placement test in piano at the time they enter the university including transfer students who have completed four semesters of piano at another institution.

These transfer students are required to reach a minimum level of achievement indicated on the Piano Placement Exam.

BACHELOR OF ARTS DEGREE

The Music major consists of 50 semester hours. The following courses are required:

Music Theory. MTC 125, 221, 222, 223, 320 (or 321), 327, 422.

Music History. MHL 341, 342.

Major Performing Medium. Eight semester hours of MUP 111 or 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 are selected by the student in consultation with an advisor. Areas of study may include music history, ethnomusicology, and music theory. At least 23 semester hours, 12 in the field of specialization, must be in the upper division. Language requirements are listed on page 282 of this catalog.

BACHELOR OF MUSIC DEGREE

This curriculum consists of 84 semester hours and offers majors in Choral–General Music, Instrumental Music, Music Therapy, Performance, and Theory and Composition. Choral General Music and Instrumental Music majors are provided for students wishing to meet certification requirements for teaching in the public schools. The following requirements are included in each major.

Choral–General Music Major

This degree program may include a teaching minor in instrumental music.

Music Theory. MTC 125, 221, 222, 223, 327, 431.

Music History. MHL 341, 342.

Conducting. MUP 209, 339.

Music Education. MUE 313, 315, 480.

Major Performing Medium. Eight semester hours of MUP 111 and eight semester hours of MUP 311 to obtain a proficiency level necessary to meet the graduation recital requirement. MUP 495 completes the requirement.

Minor Performing Medium. A proficiency equal to six semesters of study in keyboard or voice (whichever is not the major performing medium). Students wishing to extend their profi-

ciency beyond this level may continue to study in MUP 321.

Ensemble. Eight different semesters of participation, including at least six semesters of MUP 352 and/or MUP 353, four of which must be at ASU.

Recital Attendance. Six semesters of MUP 100.

Instrumental Music Major, Instrumental Concentration

It is strongly recommended that this degree program include a minor in Choral Music or a minor in Jazz Education.

Music Theory. MTC 125, 221, 222, 223, 327.

Music History. MHL 341, 342.

Conducting. MUP 210, 340.

Music Education. MUE 315, 317, 318, 327, 328, 336, 337, 338, 481, 482.

Class Piano. MUP 131, 132, 231, 232 (unless waived by proficiency examination).

Major Performing Medium. Eight semester hours of MUP 111 and eight semester hours of MUP 311 to obtain a proficiency level necessary to meet the graduation recital requirement. MUP 495 completes the requirement.

Ensemble. Eight different semesters of participation, four of which must be at ASU. For wind and percussion players, two of the four ASU semesters must be in marching band. String players must have a minimum of six semesters of MUP 345. Wind and percussion players must have a minimum of six semesters of MUP 361.

Recital Attendance. Six semesters of MUP 100.

Instrumental Music Major, String Concentration

Music Theory. MTC 125, 221, 222, 223, 327.

Music History. MHL 341, 342.

Conducting. MUP 210, 340.

Music Education. MUE 315, 317 (or 318, whichever does not include the major instrument), 329, 335, 336, 339, 482, 485; MUP 121 (three hours, a string instrument in the area other than the major instrument), MUP 121 (one hour, a third string instrument), MUP 121 (one hour, a fourth string instrument).

Class Piano. MUP 131, 132, 231, 232 (unless waived by proficiency exam).

Major Performing Medium. Eight semester hours of MUP 111 and eight semester hours of MUP 311 to obtain a proficiency level necessary to meet the

graduation recital requirement. MUP 495 completes the requirement

Ensemble Eight different semesters of participation, four of which must be at ASU. A minimum of six semesters of MUP 345.

Recital Attendance Six semesters of MUP 100.

Recommended Electives MUE 313.

Performance Major, Guitar Concentration

Music Theory MTC 125, 221, 222, 223, 320, 327.

Music History MHL 341, 342, 447. *Repertoire and Pedagogy*. MUP 451, 481.

Conducting. MUP 210.

Major Performing Medium Sixteen semester hours of MUP 127 and 16 hours of MUP 327 to attain a proficiency level necessary to meet the graduation recital requirements. A half recital (MUP 495) and a full recital (MUP 496) are required.

Class Piano MUP 131, 132, 231, 232 (unless waived by proficiency examination)

Ensemble Eight semester hours of ensemble within a minimum of six different semesters. Four of the eight hours must be MUP 379 Chamber Music Ensemble—Guitar.

Recital Attendance Six semesters of MUP 100.

Performance Major, Jazz Concentration

Music Theory MTC 125, 221, 222, 223, 315, 316, 321, 327, 440, 441.

Music History MHL 152, 341, 342, 352.

Conducting MUP 210.

Pedagogy MUP 341.

Major Performing Medium Eight semester hours of MUP 111 and eight semester hours of MUP 311 to obtain a proficiency level necessary to meet the graduation recital requirements. Two half recitals (MUP 495) are required, with one in the jazz idiom.

Class Piano MUP 131, 132, 231, 232, 235, 236, 294.

Improvisation. MUP 141, 142, 217, 218, 417, 418.

Ensemble. Eight semesters including two semesters of MUP 386 and six semesters of MUP 379 Chamber Music Ensembles.

Recital Attendance Six semesters of MUP 100.

Performance Major, Keyboard Concentration

Music Theory. MTC 125, 221, 222, 223, 320 (or 321), 327, 425 (or 428).

Music History MHL 341, 342, 447. *Repertoire and Pedagogy*. MUP 451 (or 452), 481 (or 482)

Conducting MUP 209 or 210.

Harpsichord One credit of harpsichord required

Major Performing Medium. Sixteen semester hours of MUP 127 and 16 hours of MUP 327 to attain a proficiency level necessary to meet the graduation recital requirements. A half recital (MUP 495) and a full recital (MUP 496) are required.

Ensemble Eight semester hours within a minimum of six different semesters, including two semesters of accompanying and two semesters of chamber music

Recital Attendance. Six semesters of MUP 100.

Performance Major, Music Theatre Concentration

Music Theory MTC 125, 221, 222, 223, 327.

Music History. MHL 341, 342, 447, two elective hours

Conducting. MUP 209 or 210

Major Performing Medium Eight semester hours of MUP 111 and eight semester hours of MUP 311 to attain a proficiency level necessary to meet the graduation requirement of a public performance of two roles, one of which must be of major proportion.

Class Piano MUP 131, 132, 231, 232 (unless waived by proficiency examination).

Ensemble Five semesters of MUP 370, three semesters of MUP 371, and eight semesters of MUP 373.

Recital Attendance Six semesters of MUP 100.

Additional Requirements. A minimum of six semester hours each in the theatre and dance.

Performance Major, Orchestral Instrument Concentration

Music Theory MTC 125, 221, 222, 223, 320, 327, 425.

Music History MHL 341, 342, 447. *Repertoire and Pedagogy*. MUP 451 or 481.

Conducting MUP 210, 340.

Major Performing Medium Sixteen semester hours of MUP 127 and 16 hours of MUP 327 to attain a proficiency level necessary to meet the

graduation recital requirements. A half recital (MUP 495) and a full recital (MUP 496) are required.

Class Piano. MUP 131, 132, 231, 232 (unless waived by proficiency examination).

Ensemble. Eight semester hours of large ensembles within a minimum of six different semesters plus four semester hours of small ensembles within a minimum of four different semesters.

Recital Attendance Six semesters of MUP 100.

Performance Major, Piano Accompanying Concentration

Music Theory. MTC 125, 221, 222, 223, 320, 327, 428

Music History. MHL 341, 342, 447.

Diction and Repertoire MUP 250 (two semesters), 451, 453, 454.

Conducting. MUP 209 or 210

Major Performing Medium. Sixteen semester hours of MUP 127, eight semester hours of MUP 311, and eight semester hours of MUP 337. In addition, each student accompanies two half recitals (MUP 495), one for a singer and one for an instrumentalist, during his or her junior year. (A half solo recital may be substituted for either of the above.) During the senior year, the student accompanies two full recitals (MUP 496), one vocal and one instrumental.

Ensemble. Two semesters of MUP 379 (chamber music), one semester of MUP 379 (two piano ensemble), one semester of MUP 487 (piano accompanying), four semesters of MUP 388, and two semesters of ensemble elective (minimum of six different semesters)

Recital Attendance Six semesters of MUP 100

Language. Eight hours of one for each language: French, Italian, or German

Performance Major, Voice Concentration

Music Theory MTC 125, 221, 222, 223, 320, 327, 425.

Music History MHL 341, 342, 447.

Repertoire and Pedagogy MUP 451, 481; two semester hours selected from MUP 453 or 454 or a repeated enrollment of MUP 451.

Diction. MUP 250; three semester hours of diction for singers Italian, German, French.

Conducting. MUP 209.

Major Performing Medium. Sixteen semester hours of MUP 127 and 16 hours of MUP 327 to attain a profi-

ciency level necessary to meet the graduation recital requirements. A half recital (MUP 495) and a full recital (MUP 496) are required.

Class Piano MUP 131, 132, 231, 232 (unless waived by proficiency examination).

Ensemble Four different semesters of large ensembles plus five semester hours of ensembles within five different semesters to be selected from large and/or small ensembles.

Recital Attendance. Six semesters of MUP 100.

Additional Requirements. Sixteen semester hours in more than one foreign language, chosen from French, German, and 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.

Music Therapy Major

Students must apply to the National Association for Music Therapy for registration as a music therapist on completion of the requirements for graduation.

Music Theory MTC 125, 221, 222, 223, 327, 422.

Music History. MHL 341, 342.

Conducting. MUP 209 or 210.

Music Education MUE 211, 313, 319, 329, 335, 336, 339.

Music Therapy MUE 161, 261, 361, 362, 381, 384, 385, 386, 387, 388, 441, 475, 476.

Major Performing Medium. Six to eight semesters, which must include at least four hours of MUP 311

Piano. Proficiency equal to four semesters of study.

Voice. Two semesters of study.

Ensembles Six semesters of participation with at least four semesters in large groups.

Recital Attendance. Six semesters of MUP 100.

Additional Requirements Four semester hours of functional dance and specified courses in science and social and behavioral sciences.

Theory and Composition Major, Theory Concentration

Music Theory. MTC 125, 221, 222, 223, 320, 321, 323, 327, 422, 425, 428, 496, 10 hours electives in MTC courses 300 or above, to be chosen in consultation with advisor.

Music History. MHL 341, 342, 447, and three elective hours.

Conducting MUP 209 and 339 or

MUP 210 and 340

Applied Music Twelve semester hours of study, eight of which must be MUP 111.

Class Piano. MUP 131, 132, 231, 232 (unless waived by proficiency examination).

Ensemble. Eight semesters of participation.

Final Project. MTC 496.

Recital Attendance. Six semesters of MUP 100.

Language The equivalent of 16 semester hours of credit in one foreign language; the choice of language subject to approval of advisor.

Theory and Composition Major, Composition Concentration

Music Theory. MTC 125, 221, 222, 223, 320, 321, 323 (four semesters), 327, 422, 425, 428, 429, 430, 432, 433.

Music History. MHL 341, 342, 447, and three elective semester hours.

Conducting. MUP 209 and 339 or MUP 210 and 340.

Applied Music. Twelve semester hours of study, eight of which must be MUP 111.

Class Piano. MUP 131, 132, 231, 232 (unless waived by proficiency examination).

Ensemble. Eight semesters of participation.

Final Project. MTC 495.

Recital Attendance Six semesters of MUP 100.

GRADUATE PROGRAMS

The School of Music offers the following graduate programs: the Master of Arts degree with a major in Music History and Literature; the Master of Music degree with majors in Choral Music (choral music, general music), Instrumental Music, Performance [music theatre musical direction, music theatre performance, performance pedagogy, piano accompanying, solo performance (instrumental), solo performance (keyboard), solo performance (voice)], and Theory and Composition; and the Doctor of Musical Arts degree with majors in Choral Music, General Music, Instrumental Music, and Solo Performance. The Doctor of Education degree in Secondary Education (music education) is offered in cooperation with the College of Education. Consult the *Graduate Catalog*. A document on graduate degree programs in music may be obtained by writing to the School of Music.

MUSIC

MUS 100 Fundamentals of Music Notation. (3) F, S, SS

Provides non-Music majors with sufficient symbolery to begin work in the field of musical learning. No credit for Music majors.

107 Introduction to Music. (2) F, S, SS
Correlation of music with literature, science and art. A non-technical course in the humanities for non-Music majors. *General studies: HU*

340 Survey of Music History. (3) F, S, SS
Major periods, composers, and compositions in the history of music. May be used to meet the Music History requirement for a minor in Music. *General studies: HU, H*

347 Jazz in America. (3) F, S, SS
Current practices employed by contemporary jazz musicians; the historical development of jazz techniques. *General studies: HU*

353 Survey of Afro-American Music. (3) A
Afro-American music traced from its origins in Africa to the present with emphasis on spiritual, blues, jazz, gospel, and classical styles. *General studies: HU*

354 Popular Music. 3 A
Emphasis on historical, cultural, and performance patterns in a variety of popular music idioms. *General studies: HU*

355 Survey of American Music. (2) F, S, SS
Growth and development of America's music. *General studies: HU, H*

356 Survey of the Musical Theatre. (3) N
Music's place in the theatre, viewed in terms of historical importance and relative function. *General studies: HU*

357 Aesthetic Perception in Music Performance. (3) F, S, SS
Introduces the non-Music major to the aesthetics of performance by stressing the physical and emotional involvement in the direction motion intensity and color spectrum of music. *General studies: HU*

Omnibus Courses: See page 40 for omnibus courses that may be offered.

MUSIC EDUCATION

MUE 161 Introduction to Music Therapy. (2) F

Overview of music therapy. Orientation to mental health, special education and related therapies. Required on site visits.

211 Music in Recreation. (2) F
Materials, methods, and organizational structures appropriate for recreational music.

261 Music Therapy as a Behavioral Science. (2) F

Orientation to preclinical experience with an emphasis on observation skills, assessment, goal setting, and professional ethics. Required off-campus observations. Prerequisite: MUE 161

310 Music in Early Childhood Education. (3) F

Identifying and understanding musical needs of young children. Methods and materials for program development for classroom teachers.

311 Music for the Classroom Teacher. (3) F, S

Development of the classroom music program in the elementary school. No previous music experience or course work required. Not for Music majors or minors.

313 Elementary Music Methods. (3 F) Methods of instruction, organization, and presentation of appropriate content in music. Prerequisite: Music major

315 Music in the Junior High School. (2 A) Student characteristics, curriculum, and teaching strategies for choral and general music. Prerequisite: Music major

The following Educational Methods for Teaching Instruments (317-339) offer teaching and paying skills. Three hours per week.

317 Educational Methods for Violin and Viola. (1) F, S

Teaching and paying skills for music teachers

318 Educational Methods for Cello and String Bass. (1) F, S

Teaching and paying skills for music teachers

319 Educational Methods for Strings. (1) F Teaching and paying skills for music therapists and Music majors

327 Educational Methods for Trumpet and Horn. (1) F, S Teaching and paying skills for music teachers.

328 Educational Methods for Trombone, Euphonium, and Tuba. (1) F, S Teaching and paying skills for music teachers.

329 Educational Methods for Brass. (1) S Teaching and paying skills for music therapists and Music majors.

335 Educational Methods for Guitar. (1) F, S Teaching and paying skills for music teachers

336 Educational Methods for Percussion. (1) F, S Teaching and paying skills for music teachers.

337 Educational Methods for Flute, Clarinet, and Saxophone. (1) F, S Teaching and paying skills for music teachers.

338 Educational Methods for Double Reed Instruments. (1) F, S Teaching and paying skills for music teachers

339 Educational Methods for Woodwinds. (1) F Teaching and playing skills for music therapists and Music majors.

361 Music Therapy Theory and Practice in Psychopathology. (3) F Influence of music on behavior; principles and practices of music therapy and psychiatric clients. Prerequisites: MUE 261; Music Therapy major

362 Music Therapy Techniques. (3) S Organization, administration, and use of music in rehabilitation with various client populations. Prerequisites: MUE 361; Music Therapy major

381 Music Therapy Research. (3) S Statistics and research design appropriate for investigations in music therapy. *General studies: L2.*

384 Therapy Preclinical I. (1) F, S Paired students will provide music therapy for small groups at a community agency for mentally retarded, geriatrics, or physically disabled clients for a minimum of 10 clock hours. Prerequisites: MUE 211, 261

385 Therapy Preclinical II. (1) F, S See MUE 384

386 Therapy Preclinical III. (1) F, S See MUE 384

387 Therapy Preclinical IV. (1) F, S See MUE 384

388 Therapy Preclinical V. (1) F, S See MUE 384.

441 Psychology of Music. (3) S Psychological and physiological aspects of music emphasizing musical behavior, function, perception, and learning. Prerequisites: Music Therapy major or instructor approval; junior standing

475 Group Process and Music Therapy. (1) F Principles of group process, verbal counseling, professional writing, as related to music therapy practice. Prerequisites: MUE 362; Music Therapy major

476 Internship in Music Therapy. (1) F, S A 6-month residency in an approved clinical institution

480 Choral Methods. (3) S Methods of instruction, organization, and presentation of appropriate content in choral music classes. Prerequisite: Secondary Education major

481 Instrumental Practicum/Methods. (5) F Instrumental music as a means of developing music skills, understandings, and attitudes in elementary and secondary school students. Prerequisite: Secondary Education major

482 Instrumental Practicum/Methods. (5) S See MUE 481. Prerequisites: Secondary Education major and MUE 481 or 485).

485 String Practicum/Methods. (2) F For students preparing to administer a string program and teach strings at the elementary level. Lecture/lab

548 Introduction to Research in Music Education. (3) F, SS Survey of research methods and literature in music education. Focus on interpretation and evaluation

549 Foundations of Music Education. (3) A A treatment of historical perspectives, philosophy, aesthetics, identified with music education and learning theories applied to music teaching/learning. Basic research and writing skills appropriate to graduate studies in music education

550 Studies in Music Curricula. (3) A Scope and sequence of musical experiences. Development of criteria for the evaluation of music curricula.

551 Advanced Studies in Elementary School Music. (3) A For experienced teachers; organization and content of the general music classes in kindergarten and the first 6 grades of elementary school. Emphasis on teaching music reading and ear training to young children.

552 General Music, Music Theory, and Music History Classes in the Junior and Senior High School. (3) N

Organization and content of school music classes which are not performance oriented

553 Contemporary Elementary Music. (3) F Identification and development of materials and techniques for teaching special units of music study to elementary (K-8) children

564 Instrumental Music, Advanced Rehearsal Techniques. (3) A

An in-depth analysis of instrumental techniques in preparation for a thorough discussion of band tuning problems and solutions. Discussion of productive conducting and rehearsal techniques for school music teachers

566 Instrumental Literature for Schools. (3) N Comprehensive study and analysis of a types of instrumental music.

568 Choral Music, Advanced Rehearsal Techniques. (3) A Musical and vocal techniques necessary for presentation of choral literature. Analysis and experimentation with psychological, acoustical, and other problems of rehearsal and performance

570 Choral Literature for Schools. (3) A Comprehensive study and analysis of choral music for the high school with special emphasis on octavo literature

579 Psychology of Music. (3) N The nature of musicality and its evaluation. A review of recent research.

585 Vocal Acoustics and Production. (3) A An in-depth approach to the psychological and physiological workings of the vocal mechanism

733 Contemporary Issues and Research in Music Education. (3) S Emphasis upon recent research relating to music instruction at all levels; current and historical issues in choral, general, and instrumental music.

744 Higher Education Instruction. (3) F Philosophical and psychological principles of college/university teaching. Patterns of music teacher education and a project on course outlines

755 Philosophy and Aesthetics in Music Education. (3) SS Philosophy and aesthetics as they influence curriculum content and teaching procedures.

Omnibus Courses: See page 40 for omnibus courses that may be offered

MUSIC HISTORY

MHL 142 Music Listening. (1) S Aura, perception of a variety of music traditions, genres, forms, and techniques. Prerequisite: Music major

152 Jazz Listening. (1) F An introduction to jazz forms, idioms, and major innovators.

341 Music History. (3) F, S Western music from the Greeks to the present day. Need not be taken in sequence with MHL 342. Prerequisite: MTC 221

342 Music History. (3) F, S See MHL 341. Prerequisite: MTC 221.

352 The Evolution of Jazz. (3) F Origin, development, and styles of jazz music and its exponents. Prerequisite: MTC 223. *General studies: H.*

438 Music in the Classic Era. (3) N Development of the classical style of the 18th century: major works of Haydn, Mozart, and Beethoven. Prerequisites: MHL 341, 342, MTC 327. *General studies: H.*

439 Music in the 19th Century. (3) N European art music after Beethoven. Prerequisites: MHL 341, 342; MTC 327. *General studies: L2, H.*

441 Music of the Baroque Era. (3) N
Works of major composers and stylistic tendencies of the period. Prerequisite: MHL 341, 342, MTC 327. *General studies*: L2 H

447 Music Since 1900. (3) F SS
Survey of the works by major composers and stylistic trends. Prerequisite: MHL 341, 342, MTC 327. *General studies*: L2 H

456 History of Opera. (3) S
The development of opera from its creation c. 1600 to present. Emphasis placed on major stylistic developments and representative works. Prerequisite: MHL 341, 342, MTC 222

466 North American Indian Music. (3) N
Various styles of Indian music in the United States, Canada, and Mexico. Open to Music majors and nonmajors. *General studies*: L2, HU C

532 Music Bibliography. (3) F
Major historical and analytical writings: systematic and historical collections of music. Reading knowledge of a foreign language recommended.

535 Medieval Music. (3) F
Music of Europe in the Middle Ages, Gregorian chant, religious, and secular monophony and polyphony to 1400.

536 Music of the Renaissance. (3) F
Music in Europe, with emphasis on stylistic concepts and changes, c. 1400–1580

544 World Music I. (3) N
Music of traditional and folk cultures of Africa, Europe, and the Americas

545 World Music II. (3) N
Traditional, folk, and art music of the Pacific, Near East, and Asia.

547 Topics in American Music. (3) S
Selected topics in the history of music. Composers working in the Americas with emphasis upon music since 1900

557 Topics in Symphonic Literature. (3) N
An examination of the evolution of the symphony and symphonic poem from the early classical era through the 19th century, with emphasis on the analysis of selected works

575 History of Choral Music. (3) F
Major choral works

644 Notation of Polyphonic Music. (3) N
Music notation from the 15th through 17th centuries including problems of transcription into modern notation.

Omnibus Courses: See page 40 for omnibus courses that may be offered.

MUSIC THEORY AND COMPOSITION

MTC 125 Basic Music Theory. (3) F S
For Music majors. Designed to develop aural and notational skills. Meets daily.

221 Music Theory: 18th Century. (3) F S
Music from the 18th century with a view toward developing students' abilities to analyze, theorize, perform, and create examples within the style. Development of related aural, visual, and keyboard skills. Prerequisite: MTC 125

222 Music Theory: 19th Century. (3) F, S
Musical compositions chosen from the late 18th and 19th centuries. Harmonic progressions, melodic construction, and rhythmic developments: development of related aural, visual, and keyboard skills. Prerequisite: MTC 221.

223 Music Theory: 20th Century. (3) F, S
Representative 20th-century compositions with particular emphasis on those elements of melody, harmonic, and rhythmic treatment which break with past conventions. Development of related aural, visual, and keyboard skills. Prerequisite: MTC 222

315 Modern Arranging. (2) F
Technical arranging for the contemporary jazz, radio, television, and studio orchestra. Prerequisite: MTC 223

316 Modern Arranging. (2) S
Continuation of MTC 315. Prerequisite: MTC 315

320 Modal Counterpoint. (2) F
Counterpoint based on 16th-century vocal polyphonic style. Prerequisite: MTC 221

321 Tonal Counterpoint. (2) S
Counterpoint based on 18th-century polyphonic style. Prerequisite: MTC 221

323 Composition. (2/3) F S
Creative writing in the smaller forms including the use of harmonic textures and contrapuntal devices. May be repeated for credit. Prerequisite: instructor approval

327 Form and Analysis I. (3) F S
Organizing elements in the most important contrapuntal and homophonic musical forms from the Renaissance through the 19th century. Prerequisite: MTC 222

422 Musical Acoustics. (3) N
Properties of sound and tone. Harmonic series, instruments, the ear, auditory acoustics, and the reproduction of sound. A thorough knowledge of musical notation, intervals, scales, and harmony or 2 years of music theory is assumed.

425 Studies in 20th-Century Theory. (3) F
Continued development of analytical techniques and aural skills, with an examination of theoretical systems applicable to 20th-century music. Prerequisite: MTC 223

428 Form and Analysis II. (3) S
Organizing principles of the large forms of musical composition in the 19th and 20th centuries. Prerequisite: MTC 327

429 Canon and Fugue. (2) N
Writing of canons and fugues in tonal style. Prerequisite: MTC 321.

430 20th-Century Counterpoint. (2) N
Counterpoint studies utilizing 20th-century idioms. Prerequisite: MTC 223.

431 Choral Arranging. (2) S
Practical studies in editing and arranging for choral organizations. Preparation of suitable materials for young choirs and advanced groups. Study of accompaniments. Prerequisite: MTC 223.

432 Instrumentation. (2) N
Study of the characteristics and performance techniques of individual orchestral instruments. Prerequisite: MTC 223

433 Orchestration. (2) N
Theoretical and practical study of scoring music for orchestra. Prerequisite: MTC 432.

436 Electronic Studio Techniques I. (2) F
Principles of analog electronic music systems and their application in the composition of electronic music. A thorough knowledge of musical notation and intervals will be assumed.

437 Electronic Studio Techniques II. (2) S
Principles of digital electronic music systems and their applications in the composition of electronic music. Prerequisite: MTC 436

440 Jazz Theory and Ear Training. (2) F
Advanced study of jazz harmonic systems. Daily oral drills. Prerequisite: MTC 223

441 Jazz Composition. (2) F
Creative writing in the smaller forms and in the idiom of jazz. Prerequisite: MTC 321

495 Final Project. (0) F, S
A final recital of compositions or approval of a large-scale composition or a research paper

496 Theory Project. (3) F, S SS
Supervised individual writing project dealing with music theory

501 Ear Training Review. (2) SS
Melodic and harmonic dictation. Credit cannot be applied toward the graduate theory requirement

516 Baroque Music. (3) N
Detailed analysis of selected examples from the Baroque period

520 Analytical Techniques. (3) S, SS
Analytical techniques systematically applied to music. Concentration on structural and compositional procedures.

523 Advanced Composition. (2) F, S
Creative writing in the larger forms for chorus, orchestra, and band. May be repeated for credit

525 Pedagogy of Theory. (3) N
Practices and principles of teaching music theory. Emphasizes most desirable and practical offerings possible. Comparative studies of existing practices

527 Evolution of Musical Theory. (3) F, S
Theory from Pythagoras to the present. Need not be taken in sequence with MTC 528

528 Evolution of Musical Theory. (3) F, S
See MTC 527

540 Jazz Theory and Ear Training. (2) F
Advanced study of jazz harmonic systems. Daily oral drills. Prerequisite: MTC 223

553 Advanced Choral Arranging. (2) F
Choral techniques in composition and arranging. Vocal writing through analysis of choral works. Projects in both arranging and composition

554 Advanced Scoring Problems. (2) N
Instrumentation. Paying character studies of each instrument writing and arranging idiomatic music for the instrument. Projects in both scoring and composition.

Omnibus Courses: See page 40 for omnibus courses that may be offered.

MUSIC PERFORMANCE

MUP 100 Concert Attendance. (0) F, S
Required of all music majors for 6 semesters in each degree program, with a minimum of 7 concerts attended each semester

111 Studio Instruction. (2) F, S
For majors in Music degree program. Bassoon, cello, clarinet, contrabass, cornet, euphonium, flute, guitar, harp, harpsichord, horn, oboe, organ, percussion, piano, saxophone, trombone, trumpet, tuba, viola, violin, voice. Minimum contact of 1 hour plus studio class weekly. May be repeated for credit. May not be taken for audit. Prerequisites: placement examination and audition

121 Studio Instruction. (1) F, S, SS

For secondary or minor instrument instruction and nonmajors in the university Bassoon, cello, clarinet, contrabass, cornet, euphonium, flute, guitar, harp, harpsichord, horn, oboe, organ, percussion, piano, saxophone, trombone, trumpet, tuba, viola, violin, voice. Minimum contact of one-half hour per week. May be repeated for credit. May not be taken for audit. Prerequisite: placement examination and audition.

127 Studio Instruction. (4) F, S

For Performance majors in Bachelor of and Master of Music degree programs only. Bassoon, cello, clarinet, contrabass, cornet, euphonium, flute, guitar, harp, harpsichord, horn, oboe, organ, percussion, piano, saxophone, trombone, trumpet, tuba, viola, violin, voice. Minimum contact of 1 hour plus studio class weekly. May be repeated for credit. May not be taken for audit. Prerequisites: placement examination and audition.

130 Beginning Group Piano. (1) F, S

Provides a basic introduction to playing piano through music reading, chords, rhythmic, and written activities. Non-Music majors only.

131 Class Piano. (1) F, S

A four-semester sequence (with MUP 132, 231, and 232) designed for those lacking piano experience and those who need piano as a classroom tool. Emphasis on keyboard technique, sight reading, simple accompaniments, and improvisation. 2 hours per week. May not be taken for audit.

132 Class Piano. (1) S

See MUP 131.

133 Class Voice. (1) F, S

A four-semester sequence (MUP 134, 233, and 234) open to all students. 2 hours per week. May not be taken for audit.

134 Class Voice. (1) F, S

See MUP 133. Prerequisite: MUP 133 or instructor approval.

141 Jazz Fundamentals. (1) F

Principles, methods, and theory of jazz performance, especially designed for the small jazz ensemble. 2 hours per week.

142 Jazz Fundamentals. (1) S

Continuation of MUP 141. 2 hours per week.

209 Beginning Choral Conducting. (1) F, S

Essentials of choral conducting techniques. 2 hours per week.

210 Beginning Instrumental Conducting. (1) S

Essentials of instrumental conducting techniques. 2 hours per week.

217 Improvisation Workshop. (2) F, S

Emphasis on basic jazz literature, chord symbol reading, melodic patterns, ear training, melodic concepts, and analysis of improvised solos. Must be taken in sequence with MUP 218. May not be taken for audit. Prerequisites: MTC 125, MUP 111 (1 semester).

218 Improvisation Workshop. (2) F, S

Continuation of MUP 217. Prerequisite: MUP 217.

231 Class Piano. (1) F

See MUP 131.

232 Class Piano. (1) S

See MUP 131.

233 Class Voice. (1) F, S

See MUP 133. Prerequisite: MUP 134 or instructor approval.

234 Class Voice. (1) F, S

See MUP 133. Prerequisite: MUP 233 or instructor approval.

235 Jazz Piano. (1) F

A 2-semester sequence (with MUP 236) designed for jazz keyboard experience. Emphasis on chord symbol reading, simple improvisation, and voicing. 2 hours per week. Prerequisite: MUP 132.

236 Jazz Piano. (1) S

See MUP 235. Prerequisite: MUP 132.

250 Diction for Singers. (1) F, S

Use of phonetics in the study of song and opera literature. Language emphasis differs each semester. May be repeated for credit.

301 Advanced Class Piano. (1) F

Required for Choral and General Music majors. Open to other music majors who have completed MUP 232. Emphasis on accompaniments, ensemble playing, score reading, advanced harmonizations, repertoire, technique, and improvisation. 2 hours per week. May not be taken for audit. Prerequisites: MUP 232 or proficiency; placement examination.

302 Advanced Class Piano. (1) S

Required for Choral and General Music majors. Open to other Music majors who have completed MUP 301. A sequential continuation of MUP 301 skills which include both group and studio instruction. 2 hours per week. May not be taken for audit. Prerequisites: MUP 301 or proficiency; placement examination.

311 Studio Instruction. (2) F, S

See MUP 111.

321 Studio Instruction. (1) F, S, SS

See MUP 121.

327 Studio Instruction. (4) F, S

See MUP 127.

337 Studio Instruction-Piano Accompanying. (2) S

Lessons for Performance majors with a concentration in piano accompanying only. Repertoire to be selected from vocal and instrumental literature. 1-hour lesson per week. May be repeated for credit. Prerequisite: placement examination.

339 Choral Conducting. (2) F, S

Elements of choral conducting technique and interpretation. 3 hours per week. Prerequisite: MUP 209.

340 Instrumental Conducting. (2) F

Fundamentals of score reading and interpretation of instrumental music. 3 hours per week. Prerequisite: MUP 210.

341 Jazz Pedagogy. (3) S

Training and supervised practice in conducting jazz ensembles with emphasis on literature, programming, and rehearsal techniques. 2 class hours and 2 field experience hours each week. Prerequisite: MUP 210.

344 Chamber Orchestra. (1) F, S

Important masterpieces from all periods of music will be performed throughout the year. Membership by audition. May be repeated for credit.

345 Symphony Orchestra. (1) F, S

Open to all students who can qualify on the basis of auditions with the director. Over a 4-year period, the student is introduced to the masterpieces of symphony orchestra literature. 3 times per week. May be repeated for credit.

350 Choral Union. (1) F, S

Open to all students in the university and to interested singers in the community by audi-

tion. Preparation and performance of the larger choral works. 2 hours per week. May be repeated for credit.

352 Concert Choir. (1) F, S

4 hours per week. May be repeated for credit. Prerequisite: instructor approval.

353 University Choir. (1) F, S

4 hours per week. May be repeated for credit. Prerequisite: instructor approval.

355 Men's Chorus. (1) F, S

Open to all male students in the university who can qualify on the basis of auditions. Rehearsal and performance of music for male voices. 2 hours per week. May be repeated for credit. Prerequisite: instructor approval.

357 Women's Chorus. (1) F, S

2 hours per week. May be repeated for credit. Prerequisite: instructor approval.

361 Marching and Concert Bands. (1) F, S

Open to all students who can qualify on the basis of auditions with the director. Staging of formations and drills for football games and other events (fall, masterpieces of symphony band literature (spring)). Meets daily. May be repeated for credit.

370 Music Theatre: Techniques. (1) F, S

Exercises and improvisations for the singer/actor emphasizing body awareness, basic music theater performance skills, and freedom of the vocal and breath mechanisms. Section 1 (Movement for Singers); Section 2 (Expression); Section 3 (Interpretation); Section 4 (Advanced Expression); Section 5 (Advanced Interpretation). Sections 2 through 5 must be taken in sequence. Each section 3 hours per week. May be repeated for credit.

371 Music Theatre: Workshops. (1) F, S

Development of specific skills for musical dramatic interpretation. Section 1 (Arts Preparation); Section 2 (Broadway I); Section 3 (Broadway II). Each section: 1-hour lecture demonstration, 1 lab per week. May be repeated for credit.

372 Music Theatre: Orchestras. (1) F, S

Open to all students who can qualify on the basis of auditions with the instructor. Participation in Lyrical Opera Theatre productions. Section 1 (Orchestra); Section 2 (Chamber Orchestra); Section 3 (Chamber Ensemble). May be repeated for credit. Prerequisite: instructor approval.

373 Music Theatre: Performance. (1) F, S

Open to all students who can qualify on the basis of auditions with the instructor. Participation in Lyrical Opera Theatre productions. Section 1 (Principal Roles); Section 2 (Chorus). May be repeated for credit. Prerequisite: instructor approval.

374 Music Theatre: Production. (1) F, S

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.

379 Chamber Music Ensembles. (1) F, S

String, brass, woodwind, percussion, keyboard, vocal, and mixed ensembles. 2 hours per week. May be repeated for credit. Prerequisite: instructor approval.

382 Collegium Musicum. (1) F, S

Singers and instrumentalists specializing in the performance of early and unusual music. 2 hours per week. May be repeated for credit. Prerequisite: instructor approval.

383 New Music Ensemble. (1) F, S
Rehearsal and performance of music written in the last 20 years. May be repeated for credit. Prerequisite: instructor approval.

384 Brass Choir. (1) F, S
Specializing in public performance of music written for brass instruments. 3 hours per week. May be repeated for credit. Prerequisite: instructor approval.

385 Percussion Ensemble. (1) F, S
Rehearsal and performance of standard and original repertoire for the percussion ensemble and related instruments. 2 hours per week. May be repeated for credit. Prerequisite: instructor approval.

386 Stage Band. (1) F, S
Rehearsal and performance of literature for the stage band. 4 hours per week. May be repeated for credit. Prerequisite: instructor approval.

387 Ethnomusicology Ensembles. (1) F, S
Performance earning experience for the music of various cultures of the world. May be repeated for credit. Prerequisite: knowledge of instrument or instructor approval.

388 Piano Accompanying. (1) F, S
Accompanying majors (others at the discretion of instructor). Piano accompaniments found in vocal and instrumental literature; discussion of styles and performance practices, experience in public performance. 2 hours per week. May be repeated for credit.

417 Advanced Improvisation. (2) F, S
Emphasis on analysis and performance of advanced jazz literature; composition in contemporary styles. Must be taken in sequence with MUP 418. May not be taken for audit. Prerequisite: MUP 218.

418 Advanced Improvisation. (2) F, S
Continuation of MUP 417. Prerequisite: MUP 417.

440 Keyboard Harmony. (1) F
Performance or ented class emphasizing chord progressions, harmonization, figured bass realization, stylistic improvisation, transcription, open score reading, and sight reading. Prerequisite: Performance major with a concentration in keyboard or instructor approval.

451 Repertoire. (2) F, S
Literature available for performance in all performing media. May be repeated for credit. Prerequisite: junior standing in major performance field.

452 Piano Repertoire II. (2) S
Continuation of MUP 451 (Piano). Romantic and contemporary keyboard literature. Prerequisites: junior standing as Performance major with a concentration in piano accompanying; instructor approval.

453 Song Literature. (2) A
American, Russian, Spanish, Scandinavian, and contemporary song.

454 Song Literature. (2) A
Early Italian, English, German, and French art song.

481 Performance Pedagogy and Materials. (2) F, S
Principles and methods of performance techniques for each performance field. May be repeated for credit. Prerequisite: senior or standing or instructor approval.

482 Piano Pedagogy II. (2) N
Continuation of MUP 481 (Piano). Problems and techniques of teaching intermediate to advanced piano students. Prerequisites: junior or standing as Piano major, instructor approval.

487 Piano Accompanying. (1) F
Keyboard majors. Piano accompaniments found in vocal and instrumental literature; discussion of styles and performance practices, experience in public performance. 2 hours per week. May be repeated for credit. May not be taken for audit.

495 Solo Performance. (0) F, S
For candidates of a Bachelor of Music degree in Performance in which one half credit is a graduation requirement.

496 Solo Performance. (0) F, S
For candidates of a Bachelor of Music degree in Performance in which a full credit is a graduation requirement. Prerequisite: MUP 495.

507 Group Piano Practicum. (2) F
Curriculum, materials and teaching techniques for group teaching at the university and community college levels. Observation/supervised teaching in group piano.

508 Studio Observation. (1) F, S
Weekly observation of studio teaching by various piano faculty. Paper as final requirement. Prerequisite: M.M. performance/pedagogy piano student.

511 Studio Instruction. (2) F, S
For majors in Music degree program. Bassoon, celesta, clarinet, contrabass, cornet, euphonium, flute, guitar, harp, harpsichord, horn, oboe, organ, percussion on piano, saxophone, trombone, trumpet, tuba, viola, violin, voice. Minimum contact of 1 hour plus studio class weekly. May be repeated for credit. May not be taken for audit. Prerequisites: Placement examination and audition.

521 Studio Instruction. (1) F, S, SS
For secondary or minor instrument instruction and non-majors in the university. Bassoon, celesta, clarinet, contrabass, cornet, euphonium, flute, guitar, harp, harpsichord, horn, oboe, organ, percussion, piano, saxophone, trombone, trumpet, tuba, viola, violin, voice. Minimum contact of one half hour per week. May be repeated for credit. May not be taken for audit. Prerequisites: Placement examination and audition.

527 Studio Instruction. (2 or 4) F, S
For Performance majors in Master of Music degree program only. Bassoon, celesta, clarinet, contrabass, cornet, euphonium, flute, guitar, harp, harpsichord, horn, oboe, organ, percussion, piano, saxophone, trombone, trumpet, tuba, viola, violin, voice. Minimum contact of one half hour per week. May be repeated for credit. May not be taken for audit. Prerequisites: Placement examination and audition.

540 Advanced Conducting. (3) F
Score preparation and conducting techniques for instrumental music. Concentration on study of historical styles. Required of D.M.A. students in Instrumental Music.

541 The Art Song. (3) N
Solo song from its beginning to the present day.

544 Chamber Orchestra. (1) F, S
Important masterpieces from all periods of music will be performed throughout the year. May be repeated for credit. Prerequisite: instructor approval.

545 Symphony Orchestra. (1) F, S
Open to all students in the university with the director. Masterpieces of symphony orchestra literature. Three times per week. May be repeated for credit.

550 Choral Union. (1) F, S
Open to all students in the university and to interested singers in the community by audition. Preparation and performance of the larger choral works. 2 hours per week. May be repeated for credit.

551 Repertoire. (2) N
Literature available for performance in all performing media. May be repeated for credit.

552 Concert Choir. (1) F, S
4 hours per week. May be repeated for credit. Prerequisite: instructor approval.

553 University Choir. (1) F, S
4 hours per week. May be repeated for credit. Prerequisite: instructor approval.

555 Men's Chorus. (1) F, S
Open to male students in the university who can qualify on the basis of audition. Rehearsal and performance of music for male voices. 2 hours per week. May be repeated for credit. Prerequisite: instructor approval.

557 Women's Chorus. (1) F, S
2 hours per week. May be repeated for credit. Prerequisite: instructor approval.

561 Marching and Concert Bands. (1) F, S
Open by audition only. Staging of formations and drills for football games and other events (fall) masterpieces of symphonic band literature (spring). Meets daily. May be repeated for credit.

570 Music Theatre: Techniques. (1) F, S
Exercises and improvisations for the singing actor emphasizing body awareness, so-fa-ations, and freedom of the vocal and breath mechanisms. Section 1 (Interpretation); Section 2 (Expression); Section 3 (Movement for Singers). Each Section 3 hours per week. May be repeated for credit.

571 Music Theatre: Workshops. (1) F, S
Development of specific skills for the musical dramatic interpretation. Section 1 (Role Preparation); Section 2 (Styles); Section 3 (Opera Scenes), Section 4 (Musical Comedy), Section 5 (Revue Ensembles). Each section on 1 hour lecture demonstration, 1 lab per week. May be repeated for credit.

572 Music Theatre: Orchestras. (1) F, S
Open to all students who can qualify on the basis of auditions with the instructor. Participation in Lyrical Opera Theatre productions. Section 1 (Orchestra); Section 2 (Chamber Orchestra); Section 3 (Chamber Ensemble). May be repeated for credit. Prerequisite: instructor approval.

573 Music Theatre: Performance. (1) F, S
Open to all students who can qualify on the basis of auditions with the instructor. Participation in Lyrical Opera Theatre productions. Section 1 (Principal Roles); Section 2 (Chorus). May be repeated for credit. Prerequisite: instructor approval.

574 Music Theatre: Production. (1) F, S
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.

579 Chamber Music Ensembles. (1) F, S
String, brass, woodwind, percussion, keyboard, vocal, and mixed ensembles. 2 hours per week. May be repeated for credit. Prerequisite: instructor approval.

581 Performance Pedagogy and Materials. (2) N
Principles and methods of performance techniques for each performance field. May be repeated for credit.

582 Collegium Musicum. (1) F, S
Singers and instrumentalists specializing in the performance of early and unusual music. 2 hours per week. May be repeated for credit. Prerequisite: instructor approval.

583 New Music Ensemble. (1) F, S
Rehearsal and performance of music written in the last 20 years. May be repeated for credit. Prerequisite: instructor approval.

584 Brass Choir. (1) F, S
Public performance of music written for brass instruments. 2 hours per week. May be repeated for credit. Prerequisite: instructor approval.

585 Percussion Ensemble. (1) F, S
Rehearsal and performance of standard and original repertoire for the percussion ensemble and related instruments. 2 hours per week. May be repeated for credit. Prerequisite: instructor approval.

586 Stage Band. (1) F, S
Rehearsal and performance of literature for the stage band. 4 hours per week. May be repeated for credit. Prerequisite: instructor approval.

587 Ethnomusicology Ensembles. (1) F, S
Performance learning experience for the music of various cultures of the world. May be repeated for credit. Prerequisite: knowledge of instrument or instructor approval.

588 Piano Accompanying. (1) F, S
Performance majors with a concentration in piano accompanying others at the discretion of the instructor. Piano accompaniments found in vocal and instrumental literature; discussion of styles and performance practices. Experience in public performance. 2 hours per week. May be repeated for credit.

595 Solo Performance. (1) F, S
For Master of Music candidates in applied music only. May be full recital, major repertoire solo performance with orchestra, ensemble, or lecture recital.

596 Solo Performance. (1) F, S
See MUP 595.

727 Studio Instruction. (2 or 4) F, S
For D.M.A. candidates only. Minimum contact of 1 hour per week. May be repeated for credit.

796 Solo Performance. (1-5) F, S
For D.M.A. candidates only. May be repeated for credit.

Omnibus Courses: See page 40 for omnibus courses that may be offered.

Theatre

M. Lin Wright
Chair
(GHALL 232) 602 965-5359

PROFESSORS

AKINS, BARTZ, WRIGHT

ASSOCIATE PROFESSORS

BARKER, BEDARD, EDWARDS,
ENGEL, KNAPP, RISKE, SALDAÑA,
STARK, THOMSON,
VINING, WHITEHEAD

ASSISTANT PROFESSORS

ACKER, BUNDY, LEONARD, SINGER

PROFESSORS EMERITI

DOYLE, YEATER

DEPARTMENTAL MAJOR REQUIREMENTS

The Department of Theatre is a member of the National Association of Schools of Theatre, and the requirements set forth in this catalog are in accordance with the published regulations of the association. For advisement purposes, all students registering in a Theatre degree program enroll through the College of Fine Arts. Special advisement check sheets, providing complete information regarding requirements and suggested electives, are available in the Department of Theatre office for each degree program and area of concentration.

BACHELOR OF ARTS DEGREE

Theatre. The B.A. in Theatre program consists of a minimum of 45 semester hours and a maximum of 56 semester hours. Within the major (including related area studies considered part of the major), only courses with a grade of "C" or higher may be applied toward graduation. The following core of course work in Theatre is required: THE 220, 225, 320, 321; THP 101, 200 (three semesters), 213, 315, 330, 340, 345; at least two semester hours in THP 301, chosen from different production options. Theatre electives, chosen in consultation with an advisor, may be concentrated in one area of Theatre specialization or selected to provide a balanced general program. Up to 15 hours of approved course work in related areas may be included in the major.

General Studies. In addition to meeting all requirements for general studies as established by the university, the Bachelor of Arts degree in Theatre also requires 15 hours of courses designed to further develop the student's artistic and cultural literacy. This requirement may be met in one of two ways: (1) completion of a foreign language at the intermediate level (202 or equivalent) or completion of a foreign language course at the 300 level or above taught in the foreign language or (2) completion of a 15-hour block of courses approved for university general studies core credit in literacy and critical inquiry and/or in humanities and fine arts. Courses selected must be from at least three different departments. Courses used to fulfill other university general studies requirements may not be counted in completing this option.

General Studies Electives. After satisfying all other requirements, remaining electives to total a minimum of 54 hours may be chosen from any of the approved university general studies core courses or any courses in the College of Fine Arts. Lower division courses in a foreign language may also be used as electives.

BACHELOR OF FINE ARTS DEGREE

The B.F.A. in Theatre program consists of a minimum of 74 hours in the theatre (including approved related area studies considered part of the major). On the basis of personal interests and professional objectives, the student may select one of two curriculum options. (1) performance production with an emphasis in acting or design/technology or (2) theatre education. Candidates for the B.F.A. degree must take the last 60 hours of course work in residence at ASU. Retention in the B.F.A. program is determined by annual faculty review of all candidates for the degree; the review process includes consideration of the student's academic record (a minimum 3.00 GPA in the major), professional activities and growth, and artistic potential.

A minimum of 42 hours in general studies is required. See page 281 for approved areas of study and distribution of hours as required by the College of Fine Arts. Some adjustments are made in the theatre education option in

order to meet certification requirements. Admission procedures and the theatre course requirements for each curriculum option and emphasis follow.

Performance Production

Acting. The acting emphasis consists of 74 hours in theatre (including approved related area studies considered part of the major). Admission is by audition before the junior year, and a 3.00 GPA in theatre courses is required. Auditions for transfer students and for scholarship applicants are held only in spring and in late summer. Specific dates may be obtained from the Department of Theatre. Retention in the B.F.A. program is determined by review of all candidates at the end of every semester of the junior and senior year. The following courses are required: THE 220, 225, 320, 321; THP 101, 110, 200, 213, 270, 275, 301 (three hours), 307, 310, 315, 370, 371, 376, 410, 471, 476, 498 PS: Senior Project; two courses from THP 330, 340, and 345; an additional nine hours of theatre history and literature; graduation requirements selected in consultation with a B.F.A. advisor.

Design/Technology. Acceptance in the design/technology emphasis is by interview and portfolio review and requires a 3.00 GPA in theatre courses. Retention in the emphasis is determined at the end of each semester of the junior year. The following theatre courses are required: THE 220, 225, 320, 321, THP 101, 213, 301 (two hours), 315, 330, 340, 345, 431, 435, 440, 445, 498 PS: Senior Project: one course from THP 430, 441, and 494; an additional three hours of theatre history or literature; theatre related area electives selected in consultation with a B.F.A. advisor to complete the major requirement of 74 hours.

Theatre Education

For those seeking secondary school certification by the State of Arizona, the B.F.A. degree offers a teacher certification track. A theatre education/production and related areas track is also available for those with an interest in theatre and arts education without certification.

Teacher Certification Track. This track certifies a teacher for the instruction of theatre to students in grades 7-12 in the Arizona public schools.

Although the B.F.A. theatre education student is officially enrolled in the College of Fine Arts, all professional education courses and recommendation for certification are provided by the College of Education's Professional Teacher Preparation Program (PTPP).

A minor teaching field of 24-30 hours in such areas as English or communication is not required for the theatre education concentration (teacher certification track) but is highly recommended. The minor teaching field's department specifies which courses can be applied toward the minor teaching field. The Arizona Department of Education mandates the minimum number of hours required for major areas, approved areas, and endorsements in certification.

Teacher Education/Production and Related Areas Track. This track allows the student and advisor to design a flexible program for a student's training in drama and theatre with, by, and for youth. This degree track does not lead to certification to teach in the public schools, but serves as preparatory work for a postbaccalaureate teacher certification program or master's level work in the field of theatre for youth.

The following theatre courses are required of both tracks in the core: THE 220, 225, 320, 321; THP 101, 213, 301 (two hours), 315, 330, 340, 345.

In addition to the established theatre core, the following theatre education courses are required for the theatre education concentration (teacher certification track): THE 325 Play Reading (Plays for High School Production), 480; THP 311, 411, 481. Twelve hours in related theatre production courses are also required: THP 110, 270, 275, 415. The PTPP, in cooperation with the theatre education coordinator, establishes professional education course work.

In addition to the established theatre core, the following theatre education courses are required for the theatre education concentration (theatre education/production and related areas track) for students with career interests in theatre by, with, and for youth: THP 311, 312, 318, 411, 418. Six hours in related theatre for youth or theatre education courses are also required. To complete the major degree requirements, the student and theatre education coordinator

design an individual course of study, chosen from a selected list of approved courses, to meet the student's career goals.

Application and Admission. After being formally accepted into the Department of Theatre, a student must meet with the theatre education coordinator to discuss application procedures for the B.F.A. degree in Theatre with a concentration in theatre education.

Acceptance into the program is by interview only. The student must meet with the theatre education faculty to discuss career goals and interests in teaching. The student should also provide a letter of intent and at least two letters of recommendation from ASU Department of Theatre faculty or other former teachers or employers. If distance prohibits coming to campus, the student may be admitted into the program upon submission of these letters of recommendation and a letter of interest to the theatre education faculty.

Application is normally made at the beginning of the sophomore year; applications for early admission of ASU freshmen are accepted toward the end of the second semester of full time study. Strict deadlines are set for state mandated testing and application to the College of Education's Professional Teacher Preparation Program (PTPP); students who express an interest in the theatre education concentration (teacher certification track) are advised to apply no later than the beginning of the sophomore year. If the teacher certification track is chosen, the student is also required to meet admission standards mandated by the PTPP and the Arizona Department of Education for teacher certification (see page 191).

Although the Department of Theatre may admit a student into the program, the College of Education may reject a student's application for admission into the PTPP. Appeal and reapplication procedures are established by the PTPP.

For retention in the program, a GPA of 3.00 in the major and an overall GPA of 2.50 are required. Retention standards established by the College of Education's PTPP must also be maintained for students in the teacher certification track.

DEPARTMENTAL MINOR TEACHING FIELD REQUIREMENTS

Elementary Education. Students pursuing the Bachelor of Arts in Education degree in Elementary Education may select theatre as a minor teaching field. The minor teaching field consists of 30 semester hours including the following courses: THE 220, THP 101, 113, 213, 311, 312, 318, 330, 411, 418.

Secondary Education. Students pursuing the Bachelor of Arts in Education degree in Secondary Education may select theatre as a minor teaching field. The minor teaching field consists of 30 semester hours including the following courses: THE 220, 325 Play Reading: Plays for High School Production, 480; THP 101, 213, 301, 311, 315, 481; two from THP 330, 340, and 345.

DEPARTMENT GRADUATE PROGRAMS

The Department of Theatre offers programs leading to the degree of Master of Arts in Theatre, the Master of Fine Arts in Theatre with concentrations in scenography and theatre for youth, and the Doctor of Philosophy in theatre with a concentration in theatre for youth. Consult the *Graduate Catalog* for details.

THEATRE

THE 100 Introduction to Theatre. (3) F, S
Elements and principles of the theatre. Lecture, discussion. Nonmajors only. *General studies: HU*

220 Principles of Dramatic Analysis. (3) F, S
Analysis, interpretation and evaluation of dramatic literature for theatrical production. Selected readings of classic, modern and contemporary plays. Prerequisite: Theatre major. *General studies: L1*

225 Orientation to Theatre. (1) F
Orientation to university and department resources and procedures. Career planning and guidance. Research and writing related to theatre production. Required for B.A. Theatre majors

300 Film: The Creative Process. (3) F, S, SS
Elements of the theatrical film: cinematography, sound editing, directing, acting, script writing, producing and criticism. 3 hours lecture, 2 hours lab. *General studies: HU*

320 History of the Theatre. (3) F, S
Traces major developments in theatre production from its beginning to the 17th century. *General studies: HU, H*

321 History of the Theatre. (3) F, S
Traces major developments in theatre production from the 17th century to modern times. *General studies: HU, H*

325 Play Reading. (1) F, S, SS
Assigned independent reading programs of plays most frequently included in the modern repertory. Areas of emphasis:

- (a) Modern European
- (b) Modern English and Irish
- (c) Modern American
- (d) Plays for High School Production. Prerequisite: theatre education option.

May be repeated for credit in different sections. Prerequisite: Theatre major.

400 Focus on Film. (3) F, S, SS
Specialized study of prominent film artists and film technique. Emphasis is on the creative process. Enrollment limited. Prerequisite: ENG 101

420 History of the American Theatre. (3) F
History of the plays, artists, and events in the development of American theatre from colonial to modern times. *General studies: HU, H*

421 History of the English Theatre. (3) S
History of the plays, artists, and events in the development of the theatre in England since the Restoration. *General studies: L2, HU*

425 History of the Oriental Theatre. (3) N
History and production techniques of theatre forms in India, China and Japan. Prerequisite: 6 hours of theatre history or instructor approval. *General studies: HU*

480 Methods of Teaching Theatre. (4) F
Methods of drama and theatre instruction at the secondary school level. Prerequisite: acceptance to the Professional Teacher Preparation Program or instructor approval.

500 Research Methods. (3) F
Introduction to graduate study in theatre.

504 Studies in Dramatic Theory and Criticism. (3) F
Dramatic theory, criticism, and aesthetics from the classical period to the nineteenth century. Related readings in dramatic literature.

510 Studies in Literature. (1) F, S
Assigned individual reading programs in standard sources and masterpieces in theatre literature. Topics may be selected from the following:

- (a) Acting—Directing
- (b) Design—Technique
- (c) History
- (d) Criticism

May be repeated for credit in different sections

520 Theatre History and Literature. (3) F
A survey of historical periods, dramatic genres and theatre literature through the 17th century

521 Theatre History and Literature. (3) S
A survey of historical periods, dramatic genres, and theatre literature from the 17th century to present

591 Seminar. (3) A
Selected topics in child drama, community theatre, and theatre history. Prerequisite: written instructor approval.

Omnibus Courses: See page 40 for omnibus courses that may be offered

THEATRE PERFORMANCE AND PRODUCTION

THP 101 Introduction to the Art of Acting. (3) F, S, SS
Improvisations, terminology, exercises, and projects in acting. Special sections provided for the non-major and Theatre students. Studio

110 Acting: Beginning Scene Study. (3) F, S
Rehearsal and performance of modern plays with emphasis on realistic acting styles. Special sections for majors. Prerequisite: THP 101

113 Makeup. (3) F, S
Techniques of theatrical makeup. 1 hour lecture, 2 hours lab.

200 Theatre Workshop. (0) F, S
Attendance at a variety of guest lectures and performances, demonstrations of new techniques, and individual projects

- (a) BFA Acting. 3 semesters.
- (b) General Theatre. 4 semesters.
- (c) BFA Scenography. 3 semesters.
- (d) BFA Theatre Education. 3 semesters.

Prerequisite: Theatre major

210 Acting: TV/Film. (3) S
Special technical aspects of acting before a camera. Prerequisites: THP 110; written instructor approval.

213 Introduction to Technical Theatre. (3) F, S
Procedures of technical theatre production and demonstration. Topics include design and construction of scenery, lighting, and properties. 2 hours lecture, 3 hours lab.

270 Introduction to Stage Speech. (3) F, S
Exercises and techniques to free the voice and improve projection, resonance, and articulation. International Phonetic Alphabet and Standard Stage Speech covered. Prerequisite: THP 101 or instructor approval.

275 Introduction to Stage Movement. (3) A
Movement vocabulary and physical training in relaxation, alignment, conditioning, rhythm, and posture. Prerequisite: THP 101 or instructor approval

301 Theatre Production. (1–4) F, S, SS
Participation in University Theatre productions. May be repeated for credit. Prerequisite: written instructor approval

307 Acting: The Inner Process. (3) F
An advanced class for individualized work on concentration, personalization, self-awareness, visualization, substitution, creating inner and outer characters. Exercises, monologues, and scenes. Prerequisite: B.F.A. acting emphasis or written instructor approval.

310 Acting: Advanced Scene Study. (3) S
Script analysis and performance of modern classics. 6 hours a week. Prerequisite: THP 307 and B.F.A. acting emphasis or written instructor approval

311 Improvisation with Youth. (3) F, S
Theories, procedures and materials special application for children and youth. Related drama activities—storytelling, movement, and oral interpretation. Not open to freshmen

312 Puppetry With Children. (3) A
Construction and manipulation of puppets; practice in performance skills. Emphasis on educational and recreational uses of puppetry by and with children. Prerequisite: junior standing or above required.

315 Directing: Theatre Techniques. (3) A
 Basis of the director's composition book, floor plans, stage business and props, rehearsal techniques etc. Prerequisite: THP 101 and 213 or written instructor approval.

316 Introduction to Video Production. (3) S
 Application of theories, techniques, and materials. Regular participation with children. Prerequisite: THP 311 or instructor approval.

411 Advanced Studies in Improvisation with Youth. (3) S
 Study of improvisation techniques, and materials. Regular participation with children. Prerequisite: THP 311 or instructor approval.

415 Directing Workshop. (3) S
 Rehearsal and performance of scenes and short plays. May not be taken concurrently with THP 110. Prerequisites: THP 315, 317, 418. Prerequisite: THP 315, 317, 418.

418 Advanced Studies in Theatre for Children. (3) F
 Concentration on specific directing and production techniques. Prerequisite: THP 318.

430 Costume Design. (3) N
 Principles of costume design with projects in both modern and period styles. Prerequisite: THP 330.

431 Advanced Costume Construction. (3) A
 Specialized training in costume construction problems and crafts with projects in tailoring, mending and period accessories. Prerequisite: THP 330 and 331 or instructor approval.

435 Advanced Technical Theatre. (3) A
 Section on materials, drafting of working drawings, too operation and construction techniques. 2 hours lecture 2 hours lab. Prerequisites: THP 340 and 345 or instructor approval.

440 Advanced Scene Design. (3) A
 Advanced studio projects in designing nonrealistic scenery for the contemporary proscenium stage. Prerequisite: THP 213 or instructor approval.

340 Scene Design. (3) F S
 Studio projects in designing realistic scenery for the contemporary proscenium stage. Prerequisite: THP 213 or instructor approval.

370 Beginning Voice and Movement for the Stage. (3) F
 Concentration on developing strong and expressive vocal and physical instruments for the actor. B.F.A. acting students only. THP 270 and 275 or written instructor approval.

376 Intermediate Voice and Movement for the Stage. (3) S
 Training for a strong, well-gained, flexible, expressive body. Turning, measuring, judging, combat and characterization. Prerequisites: THP 370, B.F.A. acting emphasis or instructor approval.

401 Theatre Practicum. (1) 3 F, S, SS
 Performance and production assignments for advanced students of acting, technical production and design. May be repeated for credit. Prerequisite: B.F.A. student.

406 Scenography. (3) N
 Concepts of total design directed on production elements including scenery, lighting, costumes and makeup. Prerequisites: THP 330, 340, 345, scene or standing instructor approval.

410 Acting: Classical Styles. (3) A
 Rehearsal and performance of period classical and nonrealistic plays. Emphasis on development of vocal flexibility and power. mastery of elevated American dialect and language skills applied to classical and modern plays. Prerequisite: THP 370.

471 Advanced Voice for the Stage. (3) F
 Exercises to develop vocal flexibility and power. mastery of elevated American dialect and modern plays. Prerequisite: THP 370.

475 Advanced Costume Design. (3) N
 Advanced study of projects in costume design for a variety of production forms. Prerequisite: THP 506; instructor approval.

481 Secondary School Play Production. (3) F
 Methods of directing, designing, and coordinating play production on experiential level. Prerequisite: THP 315 and acceptance to the secondary school. Off-campus practicum. Prerequisite: THP 315 and 317.

484 Special Topics. (1-4) A
 Topics may be selected from the following: (a) Advanced Acting Techniques (b) Curriculum and Supervision of Theatre in the School (c) Puppets in Performance (d) Storytelling (e) Advanced Scene Painting (f) Costume Design (g) Lighting Design (h) Technical Theatre II (i) Properties and Dressings Design and Construction (j) Scene Design II (k) Video and Industrial Scene Design (l) Theatre for Youth Tour (m) Theatre in Educational (n) Theatre in the Community (o) Theatre in the Home (p) Theatre in the Workplace (q) Theatre in the Workplace (r) Theatre in the Workplace (s) Theatre in the Workplace (t) Theatre in the Workplace (u) Theatre in the Workplace (v) Theatre in the Workplace (w) Theatre in the Workplace (x) Theatre in the Workplace (y) Theatre in the Workplace (z) Theatre in the Workplace.

498 Pro-Seminar. (1) 7) A
 Topics may be selected from the following: (a) Advanced Acting Techniques (b) Curriculum and Supervision of Theatre in the School (c) Puppets in Performance (d) Storytelling (e) Advanced Scene Painting (f) Costume Design (g) Lighting Design (h) Technical Theatre II (i) Properties and Dressings Design and Construction (j) Scene Design II (k) Video and Industrial Scene Design (l) Theatre for Youth Tour (m) Theatre in Educational (n) Theatre in the Community (o) Theatre in the Home (p) Theatre in the Workplace (q) Theatre in the Workplace (r) Theatre in the Workplace (s) Theatre in the Workplace (t) Theatre in the Workplace (u) Theatre in the Workplace (v) Theatre in the Workplace (w) Theatre in the Workplace (x) Theatre in the Workplace (y) Theatre in the Workplace (z) Theatre in the Workplace.

506 Scenography. (3) N
 Concepts of total design directed on production elements including scenery, lighting, costumes and makeup. Prerequisites: THP 330 and 340 and 345 and scene or standing instructor approval.

511 Creative Drama Workshop. (3) A
 Readings in literature materials for creative drama. A terminal methods and materials for drama with children and special populations. Prerequisite: THP 311 or graduate standing and instructor approval.

512 Puppetry Workshop. (3) A
 Survey of puppetry in education, puppetry as an art form in design, and performance. Lab fee required.

515 Problems in Directing. (3) A
 Analysis of common directing problems. Topics include creating the ensemble concept, unity, metaphor, nonliteral strategies, and organizational responses of the director. Prerequisite: instructor approval.

517 Stage Management Practicum. (3) F
 Readings and research in stage management and participation as a stage manager in a University Theatre production. Prerequisite: written instructor approval.

518 Directing Practicum in Theatre for Youth. (3) A
 A study of recent production practices in directing and production scenes for young audiences. Studio, on-site practicum. Prerequisite: graduate standing, instructor approval.

530 Advanced Costume Design. (3) N
 Advanced study of projects in costume design for a variety of production forms. Prerequisite: THP 506; instructor approval.

411 Advanced Studies in Improvisation with Youth. (3) S
 Study of improvisation techniques, and materials. Regular participation with children. Prerequisite: THP 311 or instructor approval.

415 Directing Workshop. (3) S
 Rehearsal and performance of scenes and short plays. May not be taken concurrently with THP 110. Prerequisites: THP 315, 317, 418. Prerequisite: THP 315, 317, 418.

418 Advanced Studies in Theatre for Children. (3) F
 Concentration on specific directing and production techniques. Prerequisite: THP 318.

430 Costume Design. (3) N
 Principles of costume design with projects in both modern and period styles. Prerequisite: THP 330.

431 Advanced Costume Construction. (3) A
 Specialized training in costume construction problems and crafts with projects in tailoring, mending and period accessories. Prerequisite: THP 330 and 331 or instructor approval.

435 Advanced Technical Theatre. (3) A
 Section on materials, drafting of working drawings, too operation and construction techniques. 2 hours lecture 2 hours lab. Prerequisites: THP 340 and 345 or instructor approval.

440 Advanced Scene Design. (3) A
 Advanced studio projects in designing nonrealistic scenery for the contemporary proscenium stage. Prerequisite: THP 213 or instructor approval.

340 Scene Design. (3) F S
 Studio projects in designing realistic scenery for the contemporary proscenium stage. Prerequisite: THP 213 or instructor approval.

370 Beginning Voice and Movement for the Stage. (3) F
 Concentration on developing strong and expressive vocal and physical instruments for the actor. B.F.A. acting students only. THP 270 and 275 or written instructor approval.

376 Intermediate Voice and Movement for the Stage. (3) S
 Training for a strong, well-gained, flexible, expressive body. Turning, measuring, judging, combat and characterization. Prerequisites: THP 370, B.F.A. acting emphasis or instructor approval.

401 Theatre Practicum. (1) 3 F, S, SS
 Performance and production assignments for advanced students of acting, technical production and design. May be repeated for credit. Prerequisite: B.F.A. student.

406 Scenography. (3) N
 Concepts of total design directed on production elements including scenery, lighting, costumes and makeup. Prerequisites: THP 330, 340, 345, scene or standing instructor approval.

410 Acting: Classical Styles. (3) A
 Rehearsal and performance of period classical and nonrealistic plays. Emphasis on development of vocal flexibility and power. mastery of elevated American dialect and modern plays. Prerequisite: THP 370.

471 Advanced Voice for the Stage. (3) F
 Exercises to develop vocal flexibility and power. mastery of elevated American dialect and modern plays. Prerequisite: THP 370.

475 Advanced Costume Design. (3) N
 Advanced study of projects in costume design for a variety of production forms. Prerequisite: THP 506; instructor approval.

481 Secondary School Play Production. (3) F
 Methods of directing, designing, and coordinating play production on experiential level. Prerequisite: THP 315 and acceptance to the secondary school. Off-campus practicum. Prerequisite: THP 315 and 317.

484 Special Topics. (1-4) A
 Topics may be selected from the following: (a) Advanced Acting Techniques (b) Curriculum and Supervision of Theatre in the School (c) Puppets in Performance (d) Storytelling (e) Advanced Scene Painting (f) Costume Design (g) Lighting Design (h) Technical Theatre II (i) Properties and Dressings Design and Construction (j) Scene Design II (k) Video and Industrial Scene Design (l) Theatre for Youth Tour (m) Theatre in Educational (n) Theatre in the Community (o) Theatre in the Home (p) Theatre in the Workplace (q) Theatre in the Workplace (r) Theatre in the Workplace (s) Theatre in the Workplace (t) Theatre in the Workplace (u) Theatre in the Workplace (v) Theatre in the Workplace (w) Theatre in the Workplace (x) Theatre in the Workplace (y) Theatre in the Workplace (z) Theatre in the Workplace.

498 Pro-Seminar. (1) 7) A
 Topics may be selected from the following: (a) Advanced Acting Techniques (b) Curriculum and Supervision of Theatre in the School (c) Puppets in Performance (d) Storytelling (e) Advanced Scene Painting (f) Costume Design (g) Lighting Design (h) Technical Theatre II (i) Properties and Dressings Design and Construction (j) Scene Design II (k) Video and Industrial Scene Design (l) Theatre for Youth Tour (m) Theatre in Educational (n) Theatre in the Community (o) Theatre in the Home (p) Theatre in the Workplace (q) Theatre in the Workplace (r) Theatre in the Workplace (s) Theatre in the Workplace (t) Theatre in the Workplace (u) Theatre in the Workplace (v) Theatre in the Workplace (w) Theatre in the Workplace (x) Theatre in the Workplace (y) Theatre in the Workplace (z) Theatre in the Workplace.

506 Scenography. (3) N
 Concepts of total design directed on production elements including scenery, lighting, costumes and makeup. Prerequisites: THP 330 and 340 and 345 and scene or standing instructor approval.

511 Creative Drama Workshop. (3) A
 Readings in literature materials for creative drama. A terminal methods and materials for drama with children and special populations. Prerequisite: THP 311 or graduate standing and instructor approval.

512 Puppetry Workshop. (3) A
 Survey of puppetry in education, puppetry as an art form in design, and performance. Lab fee required.

515 Problems in Directing. (3) A
 Analysis of common directing problems. Topics include creating the ensemble concept, unity, metaphor, nonliteral strategies, and organizational responses of the director. Prerequisite: instructor approval.

517 Stage Management Practicum. (3) F
 Readings and research in stage management and participation as a stage manager in a University Theatre production. Prerequisite: written instructor approval.

518 Directing Practicum in Theatre for Youth. (3) A
 A study of recent production practices in directing and production scenes for young audiences. Studio, on-site practicum. Prerequisite: graduate standing, instructor approval.

530 Advanced Costume Design. (3) N
 Advanced study of projects in costume design for a variety of production forms. Prerequisite: THP 506; instructor approval.

411 Advanced Studies in Improvisation with Youth. (3) S
 Study of improvisation techniques, and materials. Regular participation with children. Prerequisite: THP 311 or instructor approval.

415 Directing Workshop. (3) S
 Rehearsal and performance of scenes and short plays. May not be taken concurrently with THP 110. Prerequisites: THP 315, 317, 418. Prerequisite: THP 315, 317, 418.

418 Advanced Studies in Theatre for Children. (3) F
 Concentration on specific directing and production techniques. Prerequisite: THP 318.

430 Costume Design. (3) N
 Principles of costume design with projects in both modern and period styles. Prerequisite: THP 330.

431 Advanced Costume Construction. (3) A
 Specialized training in costume construction problems and crafts with projects in tailoring, mending and period accessories. Prerequisite: THP 330 and 331 or instructor approval.

435 Advanced Technical Theatre. (3) A
 Section on materials, drafting of working drawings, too operation and construction techniques. 2 hours lecture 2 hours lab. Prerequisites: THP 340 and 345 or instructor approval.

440 Advanced Scene Design. (3) A
 Advanced studio projects in designing nonrealistic scenery for the contemporary proscenium stage. Prerequisite: THP 213 or instructor approval.

340 Scene Design. (3) F S
 Studio projects in designing realistic scenery for the contemporary proscenium stage. Prerequisite: THP 213 or instructor approval.

370 Beginning Voice and Movement for the Stage. (3) F
 Concentration on developing strong and expressive vocal and physical instruments for the actor. B.F.A. acting students only. THP 270 and 275 or written instructor approval.

376 Intermediate Voice and Movement for the Stage. (3) S
 Training for a strong, well-gained, flexible, expressive body. Turning, measuring, judging, combat and characterization. Prerequisites: THP 370, B.F.A. acting emphasis or instructor approval.

401 Theatre Practicum. (1) 3 F, S, SS
 Performance and production assignments for advanced students of acting, technical production and design. May be repeated for credit. Prerequisite: B.F.A. student.

406 Scenography. (3) N
 Concepts of total design directed on production elements including scenery, lighting, costumes and makeup. Prerequisites: THP 330, 340, 345, scene or standing instructor approval.

410 Acting: Classical Styles. (3) A
 Rehearsal and performance of period classical and nonrealistic plays. Emphasis on development of vocal flexibility and power. mastery of elevated American dialect and modern plays. Prerequisite: THP 370.

471 Advanced Voice for the Stage. (3) F
 Exercises to develop vocal flexibility and power. mastery of elevated American dialect and modern plays. Prerequisite: THP 370.

475 Advanced Costume Design. (3) N
 Advanced study of projects in costume design for a variety of production forms. Prerequisite: THP 506; instructor approval.

481 Secondary School Play Production. (3) F
 Methods of directing, designing, and coordinating play production on experiential level. Prerequisite: THP 315 and acceptance to the secondary school. Off-campus practicum. Prerequisite: THP 315 and 317.

484 Special Topics. (1-4) A
 Topics may be selected from the following: (a) Advanced Acting Techniques (b) Curriculum and Supervision of Theatre in the School (c) Puppets in Performance (d) Storytelling (e) Advanced Scene Painting (f) Costume Design (g) Lighting Design (h) Technical Theatre II (i) Properties and Dressings Design and Construction (j) Scene Design II (k) Video and Industrial Scene Design (l) Theatre for Youth Tour (m) Theatre in Educational (n) Theatre in the Community (o) Theatre in the Home (p) Theatre in the Workplace (q) Theatre in the Workplace (r) Theatre in the Workplace (s) Theatre in the Workplace (t) Theatre in the Workplace (u) Theatre in the Workplace (v) Theatre in the Workplace (w) Theatre in the Workplace (x) Theatre in the Workplace (y) Theatre in the Workplace (z) Theatre in the Workplace.

498 Pro-Seminar. (1) 7) A
 Topics may be selected from the following: (a) Advanced Acting Techniques (b) Curriculum and Supervision of Theatre in the School (c) Puppets in Performance (d) Storytelling (e) Advanced Scene Painting (f) Costume Design (g) Lighting Design (h) Technical Theatre II (i) Properties and Dressings Design and Construction (j) Scene Design II (k) Video and Industrial Scene Design (l) Theatre for Youth Tour (m) Theatre in Educational (n) Theatre in the Community (o) Theatre in the Home (p) Theatre in the Workplace (q) Theatre in the Workplace (r) Theatre in the Workplace (s) Theatre in the Workplace (t) Theatre in the Workplace (u) Theatre in the Workplace (v) Theatre in the Workplace (w) Theatre in the Workplace (x) Theatre in the Workplace (y) Theatre in the Workplace (z) Theatre in the Workplace.

506 Scenography. (3) N
 Concepts of total design directed on production elements including scenery, lighting, costumes and makeup. Prerequisites: THP 330 and 340 and 345 and scene or standing instructor approval.

511 Creative Drama Workshop. (3) A
 Readings in literature materials for creative drama. A terminal methods and materials for drama with children and special populations. Prerequisite: THP 311 or graduate standing and instructor approval.

512 Puppetry Workshop. (3) A
 Survey of puppetry in education, puppetry as an art form in design, and performance. Lab fee required.

515 Problems in Directing. (3) A
 Analysis of common directing problems. Topics include creating the ensemble concept, unity, metaphor, nonliteral strategies, and organizational responses of the director. Prerequisite: instructor approval.

517 Stage Management Practicum. (3) F
 Readings and research in stage management and participation as a stage manager in a University Theatre production. Prerequisite: written instructor approval.

518 Directing Practicum in Theatre for Youth. (3) A
 A study of recent production practices in directing and production scenes for young audiences. Studio, on-site practicum. Prerequisite: graduate standing, instructor approval.

530 Advanced Costume Design. (3) N
 Advanced study of projects in costume design for a variety of production forms. Prerequisite: THP 506; instructor approval.

540 Scene Design Applications. (3) N
Conceptual and practical application of the design process including graphic and sculptural projects. Practical design problems investigated in laboratory. Lab fee. Prerequisites: THP 506; instructor approval.

545 Lighting Design Applications. (3) N
Advanced studio projects in stage lighting design. Prerequisites: THP 506; instructor approval.

584 Internship. (1-3) A
Field research and on-site training in theatre for youth, community theatre, and production techniques. Prerequisite: written instructor approval.

593 Applied Projects. (1-12) A
Prerequisite: instructor approval.

594 Conference and Workshop in Child Drama. (3) A
Prerequisite: instructor approval.

611 Creative Drama Seminar. (3) A
Examination of current theory and practices in the field. Prerequisite: instructor approval.

618 Directing Practicum. (3) A
Practical experience in directing and producing an entire play or musical for young audiences. Prerequisites: THP 518; instructor approval.

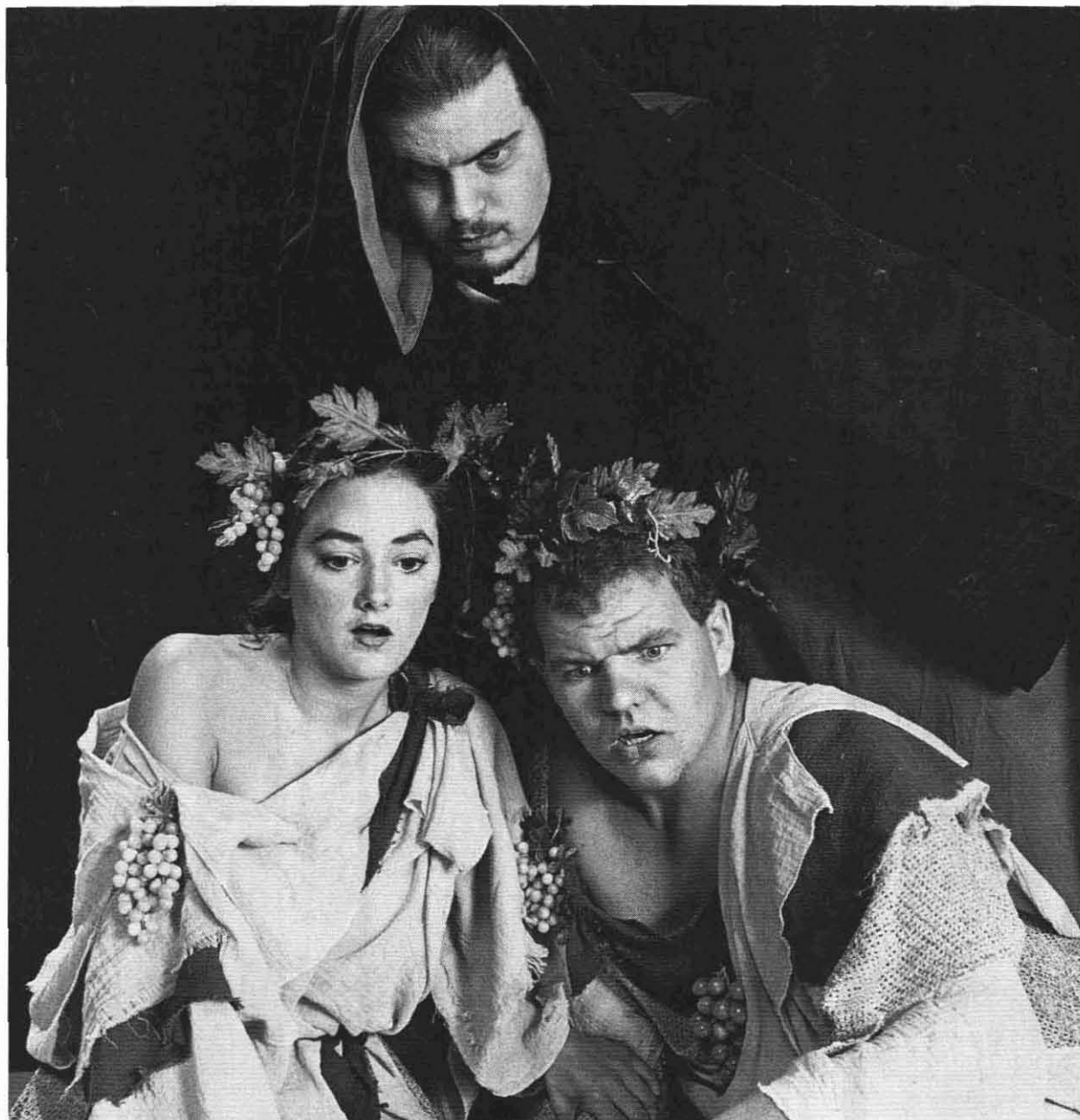
649 Design Studio. (3) F, S
Projects include design of scenery, costume, lighting, or sound for laboratory or mainstage productions. May be repeated for credit. Prerequisites: THP 506; instructor approval.

684 Internship. (3-6) F, S
Field research in improvisation with youth, theatre for youth, puppetry and scenography. Prerequisite: instructor approval.

691 Seminar: Scenography. (3) N
Examination of and research into modern concepts and practices of scenography. Prerequisite: instructor approval.

693 Applied Project. (1-12) F, S
Final projects for M.F.A. Theatre candidates in scenography and theatre for youth. Prerequisite: instructor approval.

Omnibus Courses: See page 40 for omnibus courses that may be offered.



College of Law

Richard J. Morgan, J.D.
Dean

PURPOSE

The prime function of the College of Law is to train men and women for the practicing legal profession and related professional assignments. In addition, the college has the responsibility to contribute to the quality of justice administered in our society.

Juris Doctor Degree

The College of Law offers a three-year program of professional studies at the graduate level leading to the degree of Juris Doctor. Graduates enter many branches of the legal profession as well as careers in government, business, finance, industry, and education.

Students must satisfy all of the following requirements for a J.D. degree:

1. admission to the college as a candidate for the degree and satisfaction of any conditions imposed at the time of admission or before graduation from the college;
2. satisfaction of residency requirements for the College of Law;
3. successful completion of a minimum of 87 hours of academic credit, of which 60* must be graded with a cumulative weighted average of 70 or better and of which no more than eight semester hours of "D" (60-69) grade work after the first year applies toward the 87 hours;
4. completion of all required college courses;
5. completion of the degree requirements within five years of admission into the college; and
6. completion of one substantial paper.

All students, with the exception of transfer students, must be in residence full time for a minimum of six semesters (or their equivalent). A semester in residence is earned when a student has been enrolled in a minimum of 10 hours of course work. Transfer students must complete the work of at least three semesters in residence immediately preceding the granting of a degree.

* Students who wish to be eligible for membership in the Order of the Coif, an honor society open to the top 10% of each graduating class, must complete at least 75% (66 hours) of their law studies in graded classes.

The College of Law offers three dual/concurrent degree programs:

1. J.D./Master of Business Administration;
2. J.D./Master of Health Services Administration; and
3. J.D./Ph.D. in Justice Studies.

Additional information about these programs is available from the College of Law.

ADMISSION

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) and (2) a score on the Law School Admission Test (LSAT), administered by Law Services, Box 2000, Newtown, Pennsylvania 18940, in centers throughout the country.

To be assured consideration, completed applications, college transcripts on all completed course work, the Law School Data Assembly Service Report, the LSAT score, and a typed personal statement not to exceed three pages should be received by the College of Law no later than March 1.

Each year many more students apply than can be accepted. The College of Law receives about 10 applications for each of the 150 places to be filled in the entering class. Accordingly, the admission process is selective. An attempt is made to identify those applicants whose credentials evidence abilities to think clearly, to read and synthesize complicated materials, to write well, and to make a significant contribution to the educational program of the College of Law.

Two main factors considered in the admissions process are the cumulative undergraduate GPA and the LSAT score. In combination, these give a starting point for detailed examination of the file. When the combination of these two items is high, the likelihood of admission is also high.

The selection process is not strictly mathematical since other matters often bear upon the validity of the GPA or LSAT and the capability of the candidate. Therefore, the College of Law, through an Admissions Committee composed of faculty, staff, and student members, may review such factors as an improved grade trend, the college or

university attended, course selection patterns, the rigor of the academic program undertaken, distribution of college grades, a change in performance after an absence from college, unusual writing ability as evidenced by publication, a unique cultural background, performance despite educational or economical disadvantage, employment experience, graduate study, significant community collegiate activities, and Arizona residency.

Affirmative Action. The College of Law has an affirmative action admissions policy, and applications from members of minority groups are encouraged. Under the program, special consideration is given in admissions and financial aid decisions to qualified members of cultural, ethnic, or racial groups who have not had a fair opportunity to develop their potential for academic achievement, who lack adequate representation within the legal profession, and who would not otherwise be meaningfully represented in the entering class. Groups usually qualifying have been blacks, American Indians, Hispanics, Asians, senior citizens, the physically handicapped, the learning disabled, and the seriously economically disadvantaged.

Course of Study

The program of study in the College of Law is designed for full time students. In the first year of the three year program, the course of study is prescribed and incorporates the time proven techniques of legal education. This first year gives students by the "case method," by the "problem method," by "moot court," and through other techniques an intensive exposure to the basic legal processes.

As a part of the program, first year students are assigned to small sections. In the Legal Research and Writing program, first year students prepare legal briefs and memoranda and receive feedback through the use of practice examinations. The program focuses on the development of writing and organizational skills necessary for success in law school and in the practice of law. The second and third years cover a wide range of courses varying in format as well as subject matter, allowing students to pursue both the basic subjects of law study and more specialized interests. By offering great freedom in the selection of subjects, the educa-

tional experience of the second and third years is in sharp contrast to the curriculum of the first year. In addition, the college offers a number of faculty supervised clinical education programs and a program of supervised externships.

Law Journal. The College of Law publishes a professional law review, the *Arizona State Law Journal* edited by students of the second and third year classes. Membership on the law journal is determined by grade performance in the first year and, for some, by submission of written work in a writing competition. Participation on the law review is hard but rewarding work. For those eligible, the review provides one of the finest avenues for legal education thus far developed, contributing to the student's intellectual advancement, to the development of law and the legal profession, and to the stature of the College of Law.

Grading

College of Law courses are graded under the following numerical scale:

90-99	Distinguished
85-89	Excellent
80-84	Very Good
75-79	Good
70-74	Satisfactory
60-69	Deficient
59	Failing

A grade of 60 or above is required to receive credit for any course.

Retention Standards. To be eligible to continue in the College of Law, students must maintain a cumulative weighted GPA of 70 or better at the end of each semester or summer session. Any student who fails to achieve a 70 GPA in any one semester, regardless of the cumulative GPA, is automatically placed on probation. Continuation of enrollment by probationary students is upon such terms and conditions as the college may impose.

A student whose cumulative GPA falls below the required level or whose semester GPA is less than 70 in two consecutive semesters is dismissed but may apply to the Office of the Dean for readmission. The Office of the Dean refers the application to a Faculty Committee on Readmission. Where the GPA 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 GPA. Further detailed information concerning the college's retention standards can be found in the *Bulletin of the College of Law*.

Special Honors at Graduation. At the time of graduation, students who have earned academic distinction in the study of law may be awarded the designations *cum laude*, *magna cum laude* and *summa cum laude*. The college also bestows membership in the Order of the Coif upon students in the top 10% of the class. Recipients of these awards are selected by the law faculty on the basis of academic performance.

Master of Laws Degree

Through the Graduate College, faculty in the College of Law offer a program leading to the Master of Laws (LL.M.) degree. For details concerning this graduate degree program, refer to the current *Graduate Catalog*.

Law Building and Law Library

The John S. Armstrong Law Building is in the central campus near other colleges of the university and 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.

The Law Library, with a collection of more than 290,000 volumes and microform volume equivalents, ranks as one of the strongest in the region.

Center for the Study of Law, Science and Technology

The ASU Center for the Study of Law, Science and Technology is a multidisciplinary research center founded by the Arizona Board of Regents in 1984. The center publishes research studies, sponsors seminars and symposia, and houses visiting scholars and teachers. Through these programs, the center seeks to contribute to the formulation and improvement of law and public policy affecting science and technology and to the wise application of science and technology in the legal system.

In cooperation with the American Bar Association Section on Science and Technology, the center edits the *Jurimetrics Journal of Law, Science and Technology*

Indian Legal Program

In the spring of 1988, the faculty of the College of Law voted to devote substantial new resources and energy to an Indian Legal Program that would have a three part mission: education, legal scholarship, and public service to tribal governments.

The ASU College of Law is located at the center of an active and diverse community of Indian people, tribes, and governments. In the state of Arizona, 21 tribal governments exercise sovereign authority over more than 23 million acres, or approximately 27% of the state. The closest reservation, that of the Salt River Pima Maricopa Indian Community, is located within two miles of the law school, and eight other reservations are located within a 100 mile radius of the school.

Students at the College of Law have the opportunity to participate in all phases of the Indian Legal Program and gain in depth understanding of the legal issues affecting Indian tribes and people. Courses on Federal Indian law and seminars on advanced Indian law topics are offered on a regular basis. Students may participate in externships with the local tribal courts or spend a semester in Washington, D.C., working with the Senate Select Committee on Indian Affairs. This variety of academic and work experience provides the students an outstanding legal education with a firm grounding in both the theoretical and practical aspects of Indian law.

ACCREDITATION

The college is fully accredited by the American Bar Association and is a member of the Association of American Law Schools.

INFORMATION

Further detailed information concerning the course of study, admission practices, expenses, and financial assistance can be found in the *Bulletin of the College of Law*. To request the bulletin or application forms, call 602/965-7896 or write to the Admissions Office, College of Law, Arizona State University, Tempe, Arizona 85287-7906.

Law

Richard J. Morgan
Dean
(LAW 101) 602 965-6181

PROFESSORS

A KEN ARTERIAN FURN SH,
BARTELS, BENDER, BERCH BLAZE
BROWN, CALLEROS, ELLMAN
FURN SH, GUERIN, HALL, KADER,
KARJALA KAYE, LESHY,
LOWENTHAL, MATHESON
MORGAN, MORR S, MURPHY, ROSE,
STANTON, TESON, TUCKER
WE NSTEIN, WINER

ASSOCIATE PROFESSORS

FELLER, GREY, STROUSE WARD

CLINICAL PROFESSIONALS

DALLYN, WEEKS

DIRECTORS

Legal Research and Writing and
Academic Support Group
O'GRADY (Act ng)

Center for the Study of Law, Science and Technology

STROUSE

PROFESSORS EMERITI

DAHL, PEDRICK

LAW

LAW 515 Contracts I. (3 F)
Explorat on of common law legal method and the structure of Article 2 of the UCC in the context of issues of contract format on

516 Criminal Law. (3) F
The substant ve law of crimes

517 Torts I. (3) F
Legal protect ons of persona ty, property, and re ationa interests aga nst physca eco nomc and emot ona harms.

518 Civil Procedure I. (3) F
Exp rat on of the structure of a awsu t and techn ques of a ternat ve d spute resolut on. Specif c topics ncude commencement of suit jo nder of part es, d scovery, pretna mot ons and subject matter jurisd ct on

519 Legal Method and Writing. (2) F
Exam nat on of methods used to ana yze lega prob ems. Rev ew of precedent statutory con struction and bas c res jud cata problems. Use of bas c lega wr tng formats

520 Contracts II. (2) S
Cont nuat on of Contracts I focus ng on con tract nterpretation.

522 Constitutional Law I. (3) S
Ro e of courts n the federa system d str bu t on of powers between state and federal gov ernments, and the ro e of procedure n tga t on of constitut ona quest ons.

523 Property I. (2) F
ndicia of ownershp found property estates n and, land ord tenant.

524 Legal Research and Writing. (2) S
Cont nuat on of LAW 519

525 Torts II. (2) S
Cont nuat on of Torts w th emphas s on strict and products l ab l ty

526 Property II. (3) S
Non possessory interests n property (ease ments covenants, serv tudes nu sance, and use p ann ng, and transfers of interests n property.

527 Civil Procedure II. (3) S
Cont nuat on of LAW 518; subjects n LAW 518 are addressed n greater depth as we as persona jur sd ct on, res jud cata, co latera estoppel, a d cho ce of law under the *Erie* doct r ne

600 Administrative Law. (3) A
Adm n strat ve process emphas z ng nature of powers exerc sed by adm n strat ve agenc es of government prob ems of procedure, and scope of jud ca review

601 Antitrust Law. (3) F, S
Leg s at on and ts mp ementat on to prevent monopoy and bus ness pract ces n restrat nt of trade, includ ng restrict ve agreements n volv ng pr ce f x ng trade assoc at on act v tes and resale pr ce ma ntenance

602 Partnership Taxation. (2) (3) A
Federa tax consequences of form ng, operat ng term nat ng or transferr ng partnershp s

603 Conflict of Laws. (3) A
Prob ems ar s ng when the operat ve facts of a case are connected w th more than one state or nat on. Cho ce of law bases of jur sd ct on effect of fore gn judgments and underly ng federa and const tut ona ssues

604 Criminal Procedure. (3) F, S
The nature of the cr m na procedura system w th spec a focus on const tut ona protect ons for the accused

605 Evidence. (3) A
Prnc pes and pract ce govern ng the compe tency of w tnesses and presentat on of ev dence, ncud ng the ru es of exc us on and roles of awyer judge and ury under the ad ve sary system

606 Federal Income Taxation. (3) F, S
Federa ncome tax n re at on to concepts of ncome property arra gement bus ness act v ty and current tax prob ems, w th focus on the process of tax eg s at on and adm nstra t on

607 Advanced Civil Procedure. (3) F, S
An overv ew of the structure and fecyc e of a lawsu t from p ead ngs to appeal, emphas z ng the Federal Ru es of Cv Procedure

608 Business Associations I. (3) A
Partnershp sm ted partnerships and smal bus ness corporations ncudes a bref ntro duct on to account ng. Deta ed ana ys s of the prob ems of form ng a c ose corporat on, state aw duties of care and oya ty, management d v dends and redempt ons ssuance of stock nterna d spute resolut on d solut on, and the genera law of der vat ve act ons

609 Business Associations II. (3) A
Interre at onsh p of federa and state law and a bref ntroduct on to corporate fnance (1933 Act) A broad overv ew of arge company regu at ons ncud ng report ng rules proxy regu at on, ns der trad ng, sa e of contro ten der offers and takeovers and go ng pr vate Prerequ ste LAW 608

610 Advanced Criminal Procedure. 2 3 A
Topics in criminal procedure with emphasis on legal constraints on grand jury investigation procedures pretrial release, preliminary hearings, prosecutorial discretion, and plea bargaining

611 Estate Planning I. (3 A)
Tax laws relating to transfer of wealth both at death and during lifetime including federal estate tax, gift tax, and income taxation of estates and trusts

612 Family Law. 3 A
Legal and nonlegal problems which an individual may encounter because of a situation as a family member

613 Federal Courts. 3 A
Federal judicial system relationship of federal and state law jurisdiction of federal courts and the relationship to state courts

614 Labor Relations. (3 A)
Collective bargaining including the right of employees to organize and to engage in concerted activities resolution of questions concerning the representation of employees; duty of employers and unions to bargain administration and enforcement of collective bargaining agreements

615 Public International Law. (3) A
Role of law in international disputes. Drafting and interpretation of treaties and multilateral conventions will be considered

616 Jurisprudence. 3 A
Introduction to legal philosophy with readings on the nature of law and legal reasoning, the relationship between law and morality and equality and social justice.

618 Trusts and Estates I. (3) A
Substantive concepts involved in transmitting wealth, including interstate succession wills and will substitutes the modern trust as a family protective device creation of future interests in a planned estate social restrictions of a nontax nature and methods of devoting property to charitable purposes

620 Civil Rights Legislation. (2 3) S
Coverage of the rights and remedies provided by federal civil rights legislation, principally, the key provisions of the Reconstruction Era Civil Rights Acts, portions of the employment discrimination laws, and voting rights legislation

621 Commercial Law: Sales and Negotiable Instruments. (3) A
Transactions in the sales of goods and mechanisms for payment and credit Subjects include contract information, warranty, risk of loss, damages and documentary transactions in sales of goods under Uniform Commercial Code Article 2 the use of checks, promissory notes letters of credit and other instruments under UCC articles 3 4 and 5 related banking practices and credit transactions

622 Commercial Law: Secured Transactions. 3 A
Secured transactions under Article 9 of the Uniform Commercial Code and other relevant sections An overview of the creation, perfection and priority effects of security interests Financing of business enterprise and consumer credit

623 Commercial Torts. 3 A
Involves an analysis of actionable wrongs against a business entity or against proprietary rights held by that entity covering the entire spectrum of private remedies for competitive wrongs

624 Community Property. 1 2 A
Property rights of husband and wife, the Arizona community property system homestead

625 Constitutional Law II. (3) A
Fundamental protection for person, property, political and social rights

627 Corporate Taxation. (3 A)
Problems in taxability of the corporation, corporate distributions, and corporate reorganizations

628 Creditor-Debtor Relations. 3 A
Creditors remedies in satisfaction of claims and debtors' protection and relief under bankruptcy, other laws

630 Employment Discrimination. (2) A
Focus on Title VI of the Civil Rights Act of 1964 which forbids discrimination in employment based upon race, religion, national origin, or sex The substance and procedural aspects of Title VI are covered in detail including coverage administrative procedures, burdens of proof, special problems of religious and sex discrimination statutory and court created defenses seniority systems, and remedies

631 Environmental Law. 3 A
Litigation administrative law and legislation relating to problems of environmental quality Topics covered may include air and water pollution toxic substances, pesticides and radiation.

632 Indian Law. 3 A
Inquiry into legal problems specific to American Indians and tribes

634 Judicial Remedies. 3 A
The nature and merits of injunctive restraint on, and compensatory remedies for the protection of personal property, political, and civil rights

635 Juvenile Justice System. (3) N
Special problems in the juvenile system

636 Land Use Regulation. (3) N
Legal problems in the regulation and control of and development by state and local governments Administration of zoning, subdivisions, and other planning controls issues of fairness and procedure in the utilization of such controls

638 Legal Profession. (2) F S
Organized bar distribution of legal services in modern society, economics of the profession professional canons of ethics for the bar and judiciary, and problems concerning the profession

639 Natural Resource Law. (3) A
Examines the constitutional basis for federal land management and the different kinds of public lands management schemes e.g. parks, forests, wildlife refuges emphasizing acquisition of rights to, and regulation of the different uses of public lands and resources (e.g., mining, grazing timber wildlife habitat, recreation)

640 Securities Regulation. (2 A)
Selected problems arising under the major statutes concerned with regulating the securities market

641 State and Local Government. (2 3) N
Legal problems involved in the organization and administration of governmental units including the city county town village, school district and special district

643 Water Law. (3 A)
Acquisition of water rights, water use controls; interstate conflicts

644 Intellectual Property. 3 A
The protection of intellectual property and encouragement of creativity—trade secrets trade secrets patents copyrights, performing arts, and visual arts.

702 Alternative Dispute Resolution. 2 3 A
A broad exposure to methods of settling disputes in our society such as mediation, arbitration conciliation and negotiation, including examination of the current litigation mode

703 Law, Science, and Technology. 2 3 A
The legal mechanisms used in dealing with various issues raised by contemporary science and technology. Current legal responses to science and technology are explored

705 Mass Communications. (2 3 A)
An examination of First Amendment principles and statutory and regulatory requirements with respect to the conventional print and broadcast media as well as recent technologies such as cable

706 Immigration Law. 2 3 N
Exploration of political economic social and legal issues concerning immigration. Specific topics covered include citizenship and naturalization denaturalization deportation, and refugee rights and asylum

707 Corrections and Sentencing. 2 3 N
Justifications for punishment the effect of punishment upon the individual and society statutory basis for sentencing in Arizona and the role of the lawyer in the sentencing process

709 International Human Rights. 2 3 N
International rules and procedures governing the protection of human rights

710 Real Estate Tax Planning. 2 3 A
Discussion of topics, including but not limited to real estate investments as tax shelters a terminal acquisition finance devices refinancing techniques and nontaxable exchange

711 Real Estate Transfer. (2 3 A)
An examination of the legal aspects of the sale and purchase of real property encompassing three areas: the role of the lawyer and broker in the transaction of the sales contract and issues relating to title protection

712 Religion and the Constitution. 2 3 A
An in-depth study of the "establishment and free exercise" causes of the First Amendment to the United States Constitution.

714 Law and Social Science. 2 3 N
Investigation of the use of social science research and methods in the legal system Topics include psychology of eyewitness identification social psychology studies of decisions on making statistical evidence of discrimination, econometric studies of the deterrent effects of capital punishment and criminal predictions of violent behavior.

715 Professional Sports. 2 3 N
Unique legal problems relating to professional sports including the relationship to antitrust laws the nature of payer contracts and associated tax problems

717 Legislative Process. (2 3) N
Explore both the legal and the practical context within which the legislative process operates with a major component of the course being a legislative drafting project

721 Education and the Law. (2 3 N)
Current legal problems affecting institutions of higher education, faculty, students, and governing boards

733 Negotiation, Mediation, and Counseling. (3) N

Explores alternative models of negotiated dispute resolution, as well as the roles of lawyer and client in the negotiation process. Extensive use of simulation exercises.

735 Estate Planning II. (2-3) N

Preparation of actual estate plans and implementing legal documents for a variety of typical private clients. Both tax and nontax elements in preparation of the plans will be considered. Prerequisite: LAW 611.

736 Planning for the Business Client. (2-3) N

Planning transactions involving business organizations with special emphasis on income tax and corporate considerations.

738 Practice Court. (2-3) A

Students act as lawyers in conducting a case through all stages of trial, from commencement of the action to final judgment.

745 The Supreme Court. (2-3) N

Intensive examination of selected current decisions of the U.S. Supreme Court.

768 International Business Transactions. (2-3) N

Problems and policy considerations involved in international trade; tariffs, international monetary controls, development loans, etc.

770 Law Journal. (1-3) F, S

Academic credit for successful completion of work by a member of the staff of *Arizona State Law Journal*; 5-semester-hour maximum.

772 Internships in Law. (1-6) F, S, SS

Civil, defender, or prosecutor placement and related classroom component.

773 Internships in Law. (1-6) F, S, SS

Placement in the Law School Clinic and related classroom component.

774 Internships in Law. (1-6) F, S, SS

Placement in Prosecutor Clinic and related classroom component.

780 Moot Court. (1-3) F, S

Academic credit for successful completion of work as a member of the Moot Court Board of Directors; 3 semester-hour maximum.

781 Individual Study. (1) F, S, SS

With the approval of a faculty member, a student may research a legal subject of special interest and prepare a paper suitable for publication.

782 Individual Study. (2) F, S, SS

See LAW 781.

783 Individual Study. (3) F, S, SS

See LAW 781.

784 Moot Court Competition. (1-4) F, S

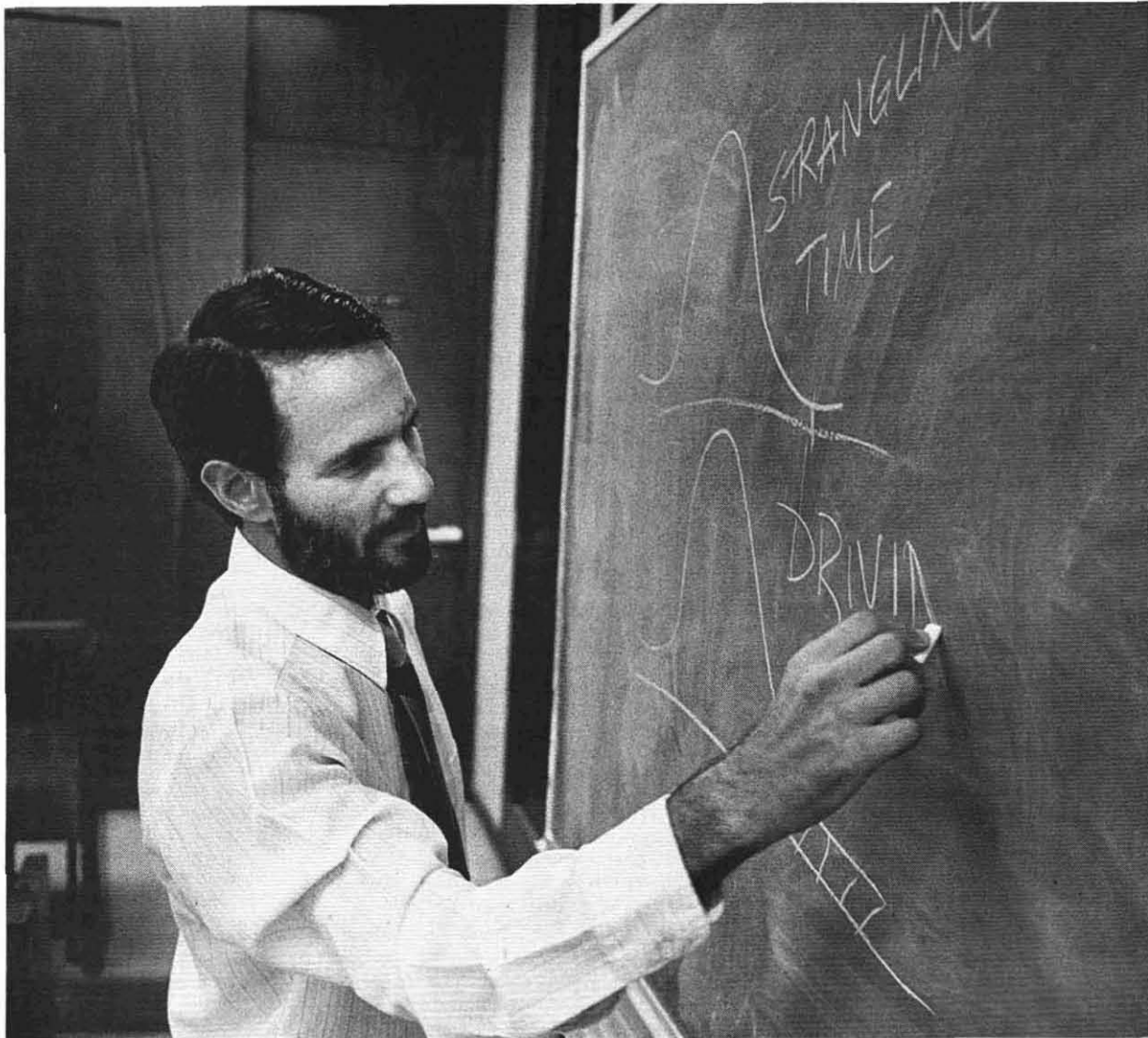
Successful participation and completion of a national moot court competition.

785 Externship. (1-12) F, S, SS

Supervised, practical lawyering in an external placement proposed by the student or established by a sponsoring agency and approved by the College of Law. In addition, an associated academic component is established by the student with a member of the faculty.

791 Seminar in Law. (1-12) F, S

Omnibus Courses: See page 40 for omnibus courses that may be offered.



College of Nursing

PURPOSE

The faculty of the College of Nursing acknowledge their responsibility to health care consumers for the preparation of individuals who provide nursing care of professional quality through teaching, research, and service. The purpose of the College of Nursing is to provide educational programs that prepare professional nurses to meet the nursing care needs of individuals, groups, and communities. To achieve this purpose, the college offers undergraduate, graduate, and continuing education programs. Within the context of a liberal education, the degree programs prepare professional nurses who

1. understand and respond to changing health and social needs and services;
2. influence nursing practice and health care through leadership and participation in professional and sociopolitical activities; and
3. utilize scientific knowledge to advance professional nursing practice.

The continuing education program provides opportunities for nurses to improve and expand their nursing practice to meet the health care needs of various populations and to further their own professional development.

ORGANIZATION

The College of Nursing recognizes the three major missions of the university, i.e., teaching, research, and service. The associate dean for academic programs is responsible for the degree programs; in addition, each degree program has a coordinator who assumes responsibility for students' progress through the programs.

The associate dean for research is responsible for research development and works with both faculty and students to facilitate research activities. The associate dean for community resources is responsible for the continuing education and service activities of the college.

The faculty are grouped under four divisions of major clinical areas within nursing: adult health/medical surgical nursing, community health nursing, psycho/social nursing systems, and parent-child nursing. Each division has a chair and each faculty member belongs to a division.

ADMISSION

In addition to meeting the university requirements for admission, students are required to have one year each of high school physics and chemistry. Two years of high school chemistry are recommended. Freshman students are classified as "prenursing" until entry into the fifth semester nursing courses.

A 2.50 prerequisite GPA is required for admission into NUR 223, the first clinical course. Moreover, admission to NUR 223 is resource dependent. Selection of students for admission is competitive, with preference given to students with the highest prerequisite GPAs.

State Board of Nursing Requirement. Students must have a high school diploma or GED certificate to be eligible to write the State Board Examination for licensure as a Registered Nurse.

CPR Certification. All students entering the clinical nursing courses must be certified in cardiopulmonary resuscitation (CPR) as evidenced by a current CPR card. This certification must be maintained while in the program. CPR is taught in the college in the course NUR 119 and is also available outside the College of Nursing.

College Health Requirements. Students enrolled in the professional Nursing major are responsible for fulfilling the requirements of the current health policies of the College of Nursing. The student is responsible for providing proof to the Student Services Office of having met these requirements before enrollment in NUR 223 Nursing Process and Hospitalized Adult. The policy includes the following requirements:

1. College of Nursing Health History Inventory and Record of Physical Examination;
2. proof of rubella immunity;
3. an annual tuberculin skin test (a Nursing student may not participate in any clinical experience without meeting this requirement);
4. hepatitis sequence (Recombivax);
5. CPR Certification; and
6. any additional tests and/or immunizations required for various hospital experiences.

ASU Health Requirements. All university students must meet university health requirements, including proof of measles (rubeola) inoculation or immunity if born after January 1, 1957. Admission may be denied or cancelled for any applicant who has been shown by the university to have either an uncompensated psychiatric illness or a physical illness that can be hazardous to the safety of other persons (see page 28).

Professional Liability Insurance. University liability insurance is limited. Therefore, it is highly recommended that students carry their own personal professional liability insurance when enrolled in clinical nursing courses.

Health and Accident Insurance. It is strongly recommended that all students carry their own health and accident insurance. Each student is personally responsible for costs related to any accident or illness during or outside of school activities.

Student Employment. Students intending to pursue the professional Nursing major on a full-time basis should expect to spend approximately 45 hours per week in class and study. Thus any additional activities or employment should be kept at a minimum.

Transfer Students. Any student enrolled in good standing at any NLN-accredited baccalaureate school of nursing currently or within the past two years may apply for admission with advanced standing.

The college does not accept for transfer credit courses (especially science courses) taken more than 10 years before the date of admission.

Transfer students must complete the application process at least one full semester before the anticipated date of admission. Transfer students must submit official transcripts, a catalog from the institution of transfer, and course outlines so that course equivalencies may be assessed. Transfer students should plan to register for classes as early as possible to avoid class closures. A minimum GPA of 2.50 is required for admission. All other admission requirements are the same as outlined on pages 28–32.

Admission of Registered Nurses. Registered Nurses have alternatives available to them in the completion of the baccalaureate degree. They are encouraged to work closely with an advisor

in planning their programs of study. NUR 306 Professional Development for Registered Nurse Students: Process, Roles and Function and NUR 314 Health Assessment for Registered Nurses are required. All other admission requirements are the same as outlined on pages 28–32. In addition, Registered Nurses must submit a photostatic copy of the current license to practice nursing.

Readmission. Students who have not been in continuous enrollment must petition for readmission to the professional nursing courses. Along with the petition, students must provide the following documents:

1. proof of current enrollment or readmission to ASU;
2. transcripts from all colleges attended;
3. application for admission to the professional nursing courses;
4. Health History/Physical Examination; and
5. proof of health requirements.

ADVISEMENT

Students are responsible for meeting the degree requirements and seeking advisement regarding their program status and progress. These responsibilities include having transcripts of all college courses taken elsewhere sent to the registrar. Advisor signatures are required on various university registration forms for validation. On entering the fifth semester, all Nursing students are assigned a faculty advisor. The faculty advisor assists students with program planning, registration, preparation of needed petitions, verification of graduation requirements, referrals to university and community resources, and assistance with career planning. All other Nursing students see advisors in the Student Services Office.

DEGREES

Bachelor of Science in Nursing

The completion of the 132-credit curriculum in Nursing leads to a Bachelor of Science in Nursing degree. The purpose of the program is to prepare beginning professional nurses who possess the theoretical foundation and the clinical competence to function in various health care settings. The graduate is prepared to deliver nursing care services to individuals, families, population

groups, and communities. The undergraduate program provides a foundation for graduate studies in nursing at the master's level.

The program objectives for the undergraduate curriculum are directed toward preparation of graduates with generalist abilities. Based on the theoretical and empirical knowledge from nursing, the humanities, and physical, biological, and behavioral sciences, graduates are prepared to

1. synthesize knowledge from the sciences and humanities with nursing theory to meet the goals of professional practice, which include health promotion, maintenance and restoration, illness care, rehabilitation, health counseling, and education;
2. provide professional nursing care to culturally diverse individuals, families, population groups, and communities, using theory-based nursing process;
3. accept individual responsibility and accountability for providing nursing care to clients and for evaluating the outcomes of that care;
4. incorporate ethical and legal aspects of nursing into nursing practice;
5. evaluate research for its application to the improvement of nursing practice;
6. assume a leadership role at the generalist level in the promotion, maintenance, and restoration of health and rehabilitation and in illness care;
7. develop cooperative and collaborative relationships with clients and with other disciplines concerned with health, health care issues, and quality of life;
8. participate in identifying and evaluating current and needed health care services and policies; and
9. continue professional development in response to trends and issues in health care, changing nursing roles, and the impact of these and other health care issues on the client.

The undergraduate program in Nursing includes 64 hours in nursing, 65 hours in other prescribed courses, and three hours free electives for a total of 132 hours for graduation as well as course work that is either pre- or corequisite to nursing courses.

Nursing—M.S.

The College of Nursing offers a program leading to a Master of Science degree, which requires a minimum of 40 semester hours. Requirements for this program are described in the *Graduate Catalog*. Persons interested in applying for admission to the program should write to the Graduate College for a *Graduate Catalog* and application form (see page 346).

DEGREE REQUIREMENTS

The undergraduate program in Nursing includes 64 semester hours in nursing and 65 semester hours in other prescribed courses, plus three semester hours in free electives, for a total of 132 semester hours for graduation. The 35 semester hours of general studies required by the university are included in the 132 semester hours.

English Proficiency *Semester Hours*

ENG 101 (3) and 102 (3) 6
or ENG 105 (3)

Students who complete ENG 105 (3) have satisfied the English proficiency requirement and do not have to take any additional English composition credits

Humanities and Fine Arts or Social and Behavioral Sciences

Elective 3

Students select one upper division three hour course from the general studies requirements list in humanities and fine arts or social and behavioral science courses.

Social and Behavioral Sciences* ... 15

PGS 100 (3), PGS 341 (3) [or CDE 232 (3)], SOC 101 (3) [or 301 (3)], 415 (3) or FAS 331 (3)]. Students select one additional three-hour course that has cultural awareness as its basic content.

Natural Science Sequence* 26–27

Students select one of the following sequences:
BIO 181 (4) and 182 (4) and ZOL 360 (4) or ZOL 201 (4) and 202 (4) and 241 (3)

In addition:

CHM 101 (4), 231 (4); FON 241 (3), MIC 205 (3), 206 (1)

* Appropriate selection of courses fulfills College of Nursing degree requirements and university general studies requirements concurrently.

Nursing Core Courses

	<i>Semester Hours</i>
NUR 119 Introduction to Nursing and Health ¹	3
NUR 204 Pharmacological Therapeutics for Nursing ²	3
NUR 211 Nurse-Client Relationships ¹	3
NUR 214 Health Assessment in Nursing Practice ¹	3
NUR 217 Basic Clinical Skills ¹	2
NUR 223 Nursing Process and Hospitalized Adult ³	6
NUR 308 Pathophysiology ²	3
NUR 327 Comprehensive Nursing Care of Children ³	4
NUR 328 Childbearing Family and Women's Health Care ³	4
NUR 329 Psychiatric/Mental Health Nursing ³	6
NUR 330 Care of Acute and Chronically Ill Adults ³	4
NUR 403 Research in Nursing Practice ²	3
NUR 406 Leadership and Management in Nursing ²	2
NUR 407 Contemporary Issues in Nursing and Health ²	2
NUR 411 Gerontological Nursing ²	2
NUR 427 Community Health Nursing ²	3
NUR 428 Management of Clients in Health Care Settings ³	4
NUR 429 Community Health Nursing: Clinical ³	4
NUR 430 Home Health Care ³	3
Total	64

¹ Nursing theory and laboratory/observation
² Nursing theory only
³ Nursing theory and clinical experience

General Studies Requirements

Literacy and Critical Inquiry Core *Semester Hours* 6

Students select one three hour course from general studies intermediate literacy requirement; NUR 403 (3) fulfills the advanced literacy and critical inquiry requirement.

Numeracy Core 6

Students select MAT 117 (3) and one three-hour course from general studies numeracy requirement in the statistics category.

Humanities and Fine Arts Core 6

Students select two three hour courses from the general studies requirements, one of which must be an upper division course.

Social and Behavioral Sciences Core* 9

PGS 100 (3) and 341 (3) and SOC 101 (3) [or 301 (3)] or PGS 100 (3) and SOC 101 (3) and 301 (3) [or 415 (3)].

Natural Sciences Core* 8

BIO 181 (4) [or CHM 101 (4)], MIC 205 (3) and 206 (1) or ZOL 201 (4)

Historical and Global Awareness

Students who do not satisfy these requirements in humanities and fine arts and social and behavioral sciences select one course in each area from the general studies requirements.

* Appropriate selection of courses fulfills College of Nursing degree requirements and university general studies requirements concurrently

General studies courses are regularly reviewed. To determine whether a course meets one or more general studies course credit requirements, see the listing of courses, pages 49–65. General studies courses are also identified following course descriptions according to the key to general studies credit abbreviations, page 48.

GRADUATION REQUIREMENTS

College requirements for graduation are consistent with those of the university. Candidates for the Bachelor of Science degree in Nursing are required to complete an approved program of study of 132 semester hours, including 53 semester hours of upper division credit. Immediately before graduation, all students, except Registered Nurse students, must take an assessment test.

ACADEMIC STANDARDS

Consideration for enrollment in NUR 223 is contingent on achieving at least a "C" in all required prerequisite courses and a minimum GPA of 2.50 in prerequisite courses. In addition, a minimum grade of "C" or better is required in all course work for the degree.

Once admitted into the professional nursing courses, students are allowed only two nursing course failures within the program. The third failure in a nursing course leads to an automatic disqualification from the College of Nursing.

Probation and disqualification is in accordance with university policies. Academic dishonesty is not tolerated in any courses and is subject to specific College of Nursing policies and procedures.

GRADING POLICY FOR NURSING COURSES

Within the undergraduate program, grades are assigned to reflect levels of achievement in relation to course objectives. Students who do not complete a required nursing course satisfactorily, receiving a grade of "D" or "E" (failing) or a mark of "W" (withdrawal), are not eligible to progress in the professional Nursing major. A required nursing course may be repeated only once.

Any petition for curriculum adjustment, course substitution, overload, readmission to a nursing course, or readmission to the professional Nursing major must be approved by the College Standards Committee

Withdrawal is in accordance with the withdrawal policy of the university. Students who withdraw from required nursing courses must complete the Interruption in Curricular Progression form. This should be done in consultation with the appropriate faculty member. In addition, students are responsible for completing the university withdrawal procedure.

An *incomplete* in a required nursing course must be satisfactorily removed before progression in the Nursing major is permitted. A grade of "I" is not allowed in clinical practice courses. See page 41 for university policy.

Audits and *pass fail* grades are not acceptable for courses in the minimum 132-semester hour requirement for graduation.

STUDENT RESPONSIBILITIES

Health. Students who appear to lack the degree of physical and mental health necessary to function successfully as a professional nurse may be required to have a health examination and to have the results made available to the Standards Committee of the College of Nursing. Students whose health, behavior, and or performance have been questioned are reviewed for continuation in clinical nursing courses by the Standards Committee. The student may appear in person before the committee and personally present information relevant to the committee's review. Additional information may also be presented in writing without making a personal appearance. The decision of the committee is final.

Professional. Professional behavior and appearance is required during all clinical nursing course activities.

Student Transportation. Students are responsible for their own transportation to and from health agencies and other selected experience settings, such as home visits to clients.

Comprehensive Assessment Test. All students who will take the professional licensing examination (NCLEX State Board Exam) are required to take a comprehensive assessment test before graduation. Arrangements for taking the test and payment of fees must be made during the student's final semester.

Laboratory Fees. In several nursing laboratory and clinical courses, students are provided an opportunity to practice and perfect nursing skills before contact with patients or clients. These courses require a heavy volume and usage of disposable equipment. Accordingly, students are assessed a fee for the following courses: NUR 119, 214 (or 314 for Registered Nurses), 217, 330, 429, and 430.

SPECIAL PROGRAMS

Continuing Education Program. This program presents a variety of non credit offerings at the main campus, at ASU West, and at off-campus locations. These offerings are designed to assist practicing professional nurses in maintaining and enhancing their competencies, to broaden their scientific knowledge base, and to develop further their skills in the changing health care environment. Programs are organized in response to both the nursing care needs of the population and the learning needs of nurses engaged in a variety of professional roles and clinical specialties. Workshops, conferences, institutes, short evening courses, and special programs are offered at times convenient to the working professional. Some offerings are multidisciplinary and are open to non Registered Nurses.

In addition to meet continuing education needs and interests, Registered Nurses may also choose to enroll as unclassified students in selected nursing credit courses offered by the College of Nursing. Registered Nurses who want more information about the degree programs or the courses that may be taken by unclassified students

should contact the Nursing Student Services Office (602 965 2987).

For descriptions of current continuing education offerings, please contact the Continuing Education Program, College of Nursing (602 965 7431).

Offerings from all programs are available at the main campus and ASU West

Program for Health and Nursing Research Office of Research. The College of Nursing Program for Health and Nursing Research Office of Research supports the conduct and development of research in all phases of nursing, with a special emphasis on clinical nursing problems, health promotion, illness prevention, and the impact of health technology on the quality and cost of health care. Program efforts are directed toward strengthening the research productivity of faculty, students, and nurse researchers in clinical settings. The college strives to develop research excellence in an effort to form a research base for improving health care through the contributions of nursing theory, clinical nursing practice, and the biomedical, behavioral, and social sciences

ROTC Students. Students pursuing a commission through either the Air Force or Army ROTC program are required to take from 12 to 20 hours in the Department of Military Science. To preclude excessive course overloads, these students should plan on an additional semester and or summer school to complete degree requirements. ROTC students must meet all of the degree requirements of the college.

ASU West. The College of Nursing offers courses of the undergraduate program through ASU West

GENERAL INFORMATION

Student Services. The Student Services Office in the College of Nursing provides academic advisement, general advisement, and referral to university resources. The staff of the Student Services Office is available to help students with a variety of concerns related to academic or personal issues. Prospective students wanting more information on College of Nursing programs or wanting to schedule an advisement appointment should contact the College of Nursing Student Services Office at 602/965 2987.

Scholarship and Financial Aid. For information regarding scholarships and loans, see pages 24–26 of this catalog. Information about scholarship and loan funds for Nursing students may be obtained from the University Financial Aid Office or the College of Nursing Student Services Office.

Student Activities. All ASU students are members of the Associated Students of ASU (ASASU) and participate in those campus activities of interest to them. The student government of the university, ASASU, has a strong presence and offers a variety of services and activities. It is the official representative of the student body in matters of governance and budgeting.

Nursing College Council. The council is a member of ASASU and serves as the governing body of all student activities in the college. The council consists of the officers of the Baccalaureate Student Nurse Organization (BSNO), Graduate Nurse Organization (GNO), Student Nurses' Association (SNA), and Nursing Students for Ethnic and Cultural Diversity. The Nursing College Council provides for communication, cooperation, and understanding among undergraduate students, graduate students, and faculty and represents the college in university and non university affairs.

Graduate Nurse Organization. GNO is the coordinating body for Nursing students in the graduate program. It provides programs, information, and orientation services for graduate students and complements their academic experiences.

Baccalaureate Student Nurse Organization. BSNO is the coordinating body for Nursing students in the baccalaureate program. It is responsible for providing information to faculty and students on student affairs and for coordinating student faculty affairs. All Nursing students are members of this organization.

Student Nurses' Association. SNA is a professional nurse organization. By being a member of SNA, the student belongs to the National Student Nurses' Association (NSNA), which is the student counterpart of the American Nurses Association for Registered

Nurses. NSNA provides means for financial assistance, career planning, a voice in Washington, an opportunity for involvement, and low cost comprehensive malpractice insurance

Nursing Students for Ethnic and Cultural Diversity. This organization was formed in 1989 to provide a network of information and support for students interested in issues of cultural awareness and diversity.

Sigma Theta Tau. The Beta Upsilon chapter of Sigma Theta Tau was chartered at the College of Nursing in 1976. Membership in Sigma Theta Tau is an honor conferred on undergraduate and graduate students who have demonstrated outstanding academic and professional achievement.

Learning Resources. In addition to learning resources provided by the university, which include a large number of nursing and science texts, references, and journals, the College of Nursing has a Learning Resources Center. This center contains a well supplied nursing laboratory, audiovisual media, a variety of computers, and computer software related to nursing and health care.

Clinical Facilities. Learning experiences with patients/clients and families are provided under the supervision of qualified faculty with the cooperation of a variety of federal, state, county, private health, and other agencies. The College of Nursing has contracts with more than 100 different agencies in the Phoenix metropolitan area and also operates its own unique nurse managed clinic in a community setting. Thus a variety of clinical laboratory facilities is available to students in this significant component of the programs. Whenever possible, students have a choice of clinical sites but are not guaranteed their choice of a clinical agency or instructor.

Nursing

PROFESSORS

LUDEMANN, MURPHY, TAYLOR

ASSOCIATE PROFESSORS

BAGWELL, BRUNER, DAHL FELLER, GRONSETH, KATZMAN, KELLER KENNEY, KILLEEN KOMNEN CH, MELVIN, MILLER, MOORE, NORTH, PERRY, R CHARDS, THEOBALD, THURBER

ASSISTANT PROFESSORS

ADAMS, BELL, DeS LVA, FINCH, GALE, GARRISON, GARRITY, GUSTAFSON, HULL, ISMEURT, LUDLOW, PR MAS SEHESTED TOBIASON, WILLIAMS, WURZELL

INSTRUCTORS

FARGOTSTEIN, RAPACZ

PROFESSORS EMERITI

BARDEWYCK BRANSTETTER, JOHNSON, KNUDSEN, SQU RES, STEFFL, STUMPF

NURSING

NUR 119 Introduction to Nursing and Health. (3) F S

Basic nursing philosophy, process and skills including health promotion content as related to nursing practice 2.5 hours lecture 1.5 hours lab

204 Pharmacological Therapeutics for Nursing. (3) F, S

Drug classifications and prototypes Psychophysiology principles of drug action Knowledge base to safe administration nursing practice Prerequisite: M C 205; NUR 119; ZOL 202 or equivalent

211 Nurse-Client Relationships. (3) F S

Focus on the therapeutic relationship and its application to nursing Concepts of anxiety loss and grief will be emphasized 2 hours lecture, 3 hours lab Prerequisite: ENG 102; NUR 119; PGS 100, SOC 101 or 301

214 Health Assessment in Nursing Practice. (3) F, S

Introductory knowledge and skills for systematic physical, psychosocial, nutritional and developmental nursing assessments for clients over life span 2 hours lecture 3 hours lab. Prerequisite: FON 241; ZOL 202 or equivalent

217 Basic Clinical Skills. (2) F S

Scientific principles, nursing concepts, and selected psychomotor skills for clinical nursing practice 1 hour lecture 3 hours lab Prerequisite: MIC 205 and 206, NUR 119; ZOL 202 or equivalent

223 Nursing Process and Hospitalized Adult. (6) F S

Theories, concepts, and practical application of the nursing process in care of the hospitalized adult with selected medical-surgical problems

ems 3 hours lecture, 9 hours lab Prerequisite: NUR 211, ZOL 202 or equivalent Prerequisite: CHM 231; NUR 204, 214

254 Health for All: Issues of World Health. (3) F, S

Introduction to issues of world health. Determinants of health and relationships of health to development and change will be explored Prerequisite: ENG 101 or equivalent. *General studies: G*

306 Professional Development for Registered Nurse Students: Process, Roles, and Function. (3) F, S

Philosophical and theoretical bases for professional nursing practice. Nursing process for decisions on making professional issues, values, and norms.

308 Pathophysiology. (3) F, S

Focuses on concepts explaining alterations in health status. A psychophysiological viewpoint provides the unifying framework Prerequisite: CHM 261 or 231.

314 Health Assessment for Registered Nurses. (3) F, S

Introductory knowledge and skills for systematic physical, psychosocial, and developmental nursing assessment over the life span. For RN's only 2 hours lecture 3 hours lab

327 Comprehensive Nursing Care of Children. (4) F, S

Nursing concepts and practice in caring for well and hospitalized children in a variety of clinical settings 2 hours lecture, 6 hours lab. Prerequisites: CDE 232 or PGS 294 ST: Child Development, NUR 223 Prerequisite: FAS 331 or SOC 415.

328 Childbearing Family and Women's Health Care. (4) F, S

Nursing concepts and practice in the reproductive and perinatal periods. Includes the impact of childbearing on family members and the relationship. 2 hours lecture 6 hours lab. Prerequisite: NUR 223 Prerequisite: FAS 331 or SOC 415.

329 Psychiatric Mental Health Nursing. (6) F, S

Guided nursing experiences with individual and groups based on theory and research. 3 hours lecture, 9 hours lab. Prerequisites: CDE 232 or PGS 294 ST: Child Development; NUR 223 Corequisite: FAS 331 or SOC 415

330 Care of Acute and Chronically Ill Adults. (4) F, S

Nursing concepts and practice in caring for hospitalized adults with complex acute and chronic medical surgical problems Theoretical bases and related nursing management. 1.5 hours lecture, 7.5 hours lab Prerequisite: NUR 308, 327, 328, 329 (one may be concurrent)

403 Research in Nursing Practice. (3) F, S
Components of the research process. Significance of research to the improvement of nursing practice and development of the profession. Prerequisites: MAT 117, NUR 223 three hours statistics. *General studies: L2*

406 Leadership and Management in Nursing. (2) F, S

Selected theoretical frameworks for organization, management, and leadership in nursing. Prerequisite: NUR 403

407 Contemporary Issues in Nursing and Health. (2) F, S

Selected contemporary issues influencing nursing and the health care system Prerequisite: NUR 403

411 Gerontological Nursing. (2) F, S

Provides perspective of biopsychosocial gerontological content applicable to nursing practice and research Prerequisite: FON 241

427 Community Health Nursing. (3) F, S

Introduction to public health theory and principles of community health nursing practice. Prerequisite: NUR 330 or instructor approval.

428 Management of Clients in Health Care Settings. (4) F, S

Application of principles of nursing management and leadership in health care settings. 1 hour lecture 9 hours lab Prerequisite: NUR 330, 406, 407

429 Community Health Nursing: Clinical. (4) F, S

Clinical experience in community health nursing roles and leadership strategies in a variety of settings. 12 hours lab. Prerequisite: NUR 427.

430 Home Health Care. (3) F, S

Issues, trends and practice in the development and delivery of home health care 1 hour lecture, 6 hours lab. Prerequisites: NUR 411, 429 instructor approval.

431 Introduction to Cardiovascular Nursing. (3) F, S

Selected aspects of cardiovascular nursing Diagnostic evaluation history and physical assessment medical and surgical interventions, and preventive and rehabilitative management Prerequisite: NUR 223 or instructor approval

432 Cardiovascular Nursing Laboratory. (1) F, S

Experiences to accompany NUR 431. Observation, direct care decision making, and planning for clients in various stages of cardiac disease. 3 hours lab. Prerequisite: NUR 223 or instructor approval. Corequisite: NUR 431

433 Abnormal Stress in the Maternity Cycle. (2-3) F, S

Clinical nursing in high risk obstetrics. Abnormal stresses for pregnant women, effects in newborns, and appropriate nursing interventions. 2 hours lecture, 3 hours lab optional. Prerequisite: NUR 328 or instructor approval.

434 Cultural Variations of Health and Illness. (2-3) F, S

Health beliefs, behaviors and interventions in selected ethnic cultures Integrating scientific and folk medicine in nursing practice. 2 hours lecture, 3 hours lab optional Prerequisite: instructor approval.

435 Nursing of Children with Developmental Disabilities. (3) F, S

Congenital and acquired physical and mental developmental disorders, including the evaluation of child and family and community resources. Prerequisite: NUR 327 or instructor approval.

438 Aging and Mental Health. (3) S

Explores and assesses psychosocial and mental health aspects of aging, geropsychiatry theory, and gerontological research applicable to practice. Prerequisite: 12 hours in Nursing major or instructor approval.

439 Aging and Mental Health Practicum. (1) S

Optional clinical practicum for students enrolled in NUR 438. 3 hours per week

440 Introduction to Computer Applications in Health Care. (3) F, S, SS

Emphasizes on applications that most directly affect nurses in staff positions. Prerequisite: senior or standing in Nursing major or instructor approval

441 School Nursing Practice. (3) S

Role of the professional nurse in planning implementation and evaluation of the school health program.

442 Sexuality in Illness and Disability. (3) F, SS

Consideration of illnesses, injuries and treatments that have implications for sexual function of patients and clients

457 Third-World Women. (3) F

Economic, social, and demographic context for understanding the roles of third world women in health family, work, education, and community. Cross-listed as FAS 494 SPF 457/WST 457. Prerequisite: 6 hours of social science credit or instructor approval. *General studies: SB, G*

494 Special Topics. 1-4) F, S, SS

Advanced study and/or supervised practice in an area of nursing. Lecture and lab to be arranged. Prerequisite: 12 hours in Nursing major or instructor approval.

500 Research Methods. (3) F, S

Research methods including research conceptualization and design in nursing Prerequisite: graduate-level inferential statistics course

501 Perspectives of Adult Health Nursing. (2) F, S

Provides students with an overview of theories, concepts and research relevant to the nursing care of adults

502 Adult Health Nursing: Theory I—Health Restoration. (2) F

Evaluates theories, models, concepts, and research applicable to the care of adults requiring nursing intervention for restoration of health Corequisite: NUR 580

503 Adult Health Nursing: Theory II—Health Promotion. (2) S

Evaluates theories, models, concepts, and research applicable to the care of adults requiring nursing interventions for promotion of maintenance of health Corequisite: NUR 580.

504 Critical Care of the Adult: Theory I. (2) F

Theoretical knowledge essential to the care of critically ill adults Behavioral and physiological concepts are addressed. Prerequisite: NUR 582. Corequisite: NUR 580

505 Critical Care of the Adult: Theory II. (2) S

Theoretical knowledge essential to the care of critically ill adults Multiple organ system dysfunctions are addressed Prerequisite: NUR 504 Corequisite: NUR 580

506 Neuroscience Nursing Theory. (2) S

Theoretical basis for assessment and management of disorders of the nervous system Prerequisite: instructor approval Corequisites: NUR 507, 580, 584

507 Therapeutics of Neurological Dysfunction. (2) S

Diagnostic and therapeutic regimens of care for patients with neurological dysfunction Prerequisite: instructor approval Corequisites: NUR 506, 584.

511 Public Health and Community Health Nursing Perspectives. (2) F S

Analysis of contemporary public health and community health nursing issues, research and conceptual/theoretical foundations

512 Community Health Nursing: Theory I. (2) F

Analysis of theories/research approaches for the study of community health nursing, community health program development, and family health care. Corequisite: NUR 580

513 Community Health Nursing: Theory II. (2) S

Analyze issues, theories, and research relevant to community health nursing leadership program planning, evaluation, and management of health care systems. Prerequisite: NUR 512. Corequisite: NUR 580

521 Community Mental Health Psychiatric Nursing Perspectives. (2) F S

Comparison of nursing theories with psychiatric/psychology theories. Applies to practice in mental health psychiatric settings and provides basis for multiple roles

522 Community Mental Health Psychiatric Nursing: Theory I. (2) F

Analysis of issues, theories, and research in restoration and promotion of mental health. Emphasizes developing conceptual framework for psychiatric nursing. Corequisite: NUR 580

523 Community Mental Health Psychiatric Nursing: Theory II. (2) S

This course assists the student in critically analyzing issues, theories, and research relevant to community mental health nursing. Prerequisite: NUR 522. Corequisite: NUR 580

532 Nursing of Children: Theory I. (3) F

Analysis of concepts, theories, and research related to nursing care of well children. Focuses on health, client, and environment. Lecture, discussion. Corequisite: NUR 580

533 Nursing of Children with Special Needs: Theory II. (3) S

Analysis of concepts, theories, and research related to nursing care of children with special problems or at risk. Lecture, discussion. Prerequisite: NUR 532. Corequisite: NUR 580

534 The Childbearing Family: Theory I. (3) F

Analysis of concepts, theories, and research related to nursing care of childbearing families. Focuses on health, client, and environment. Lecture, discussion. Corequisite: NUR 580

535 Childbearing Family with Special Needs: Theory II. (3) S

Analysis of concepts, theories, and research related to nursing care of childbearing families with special needs and high risk. Lecture, discussion. Prerequisite: NUR 534. Corequisite: NUR 580

541 Nursing Leadership Perspectives. (2) F

Critical analysis of historical, contemporary, and futuristic projections of concepts, theories, styles, and issues in nursing leadership roles. Seminar, discussion

542 Nursing Administration Theory I. (2) F

Principles, objectives, and methods of managing nursing services analyzed. Roles, strategies, and theories for managing human and financial resources are explored. Lecture, discussion. Prerequisite: admission to the graduate program

543 Nursing and Health Care Finance. (3) F S

Provides an understanding of finances in nursing and health care accounting, language, concepts, budgeting, rates, reimbursement, and capital financing are analyzed. Lecture, discussion.

544 Nursing Administration Theory II. (2) S

Synthesis of knowledge and skills gained in previous courses to develop advanced nursing role. Legal, economic, sociopolitical, ethical, and professional influence analyzed. Seminar, case study analysis. Prerequisites: NUR 541, 542, 543

551 Theory Development. (3) F S

Purpose is to provide the student with opportunities to analyze, evaluate, and develop concepts relevant to nursing

552 Contemporary Issues: Health Care and Nursing. (3) F, S

Analysis of health policy, economics, and program planning for nursing health profession as a social, political, socioeconomic, and demographic factors

562 Health Promotion. (2) F

First didactic nurse certification course. Focuses on health care concepts and strategies to promote and maintain health of the child, adult, and family. Prerequisite: instructor approval. Corequisite: NUR 580.

563 Health Management. (2) S

Second didactic nurse certification course. Analysis of common self-management health problems with integration of health assessment for clinical decisions on making. Prerequisite: instructor approval. Corequisite: NUR 580

571 Teaching in Nursing Programs. (2) S

Analysis of theories, issues, and research related to teaching in nursing. Focuses on the process of teaching/learning

576 Computer Applications in Health Care. (3) F, S

Analysis of current and developing computer applications in health care. Emphasizes on nursing applications in administration, education, and practice. Prerequisites: NUR 440 or equivalent; graduate standing in Nursing or related field.

578 Gestalt Therapy I. (3) F, S

An introduction to theory and methodology of Gestalt therapy and its uses for mental health promotion and restoration

579 Gestalt Therapy II. (3) F, S

Focus is on further development of Gestalt therapy and its application in working with various client populations. Prerequisite: NUR 578

580 Practicum (Electives). (1–4) N

Clinical application of theories, concepts, and principles such as health promotion, health management, health maintenance, teaching, management, and special clinical studies.

580 Advanced Nursing Practicum I, II. (2–6) F, S

Clinical application of theories, concepts, and principles. Tracks within the areas of concentration include the following:

- (1) Adult Health Nursing
- (2) Critical Care Nursing
- (3) Neuroscience Nursing
- (4) Community Health Nursing
- (5) Community Mental Health Psychiatric Nursing

(6) Nursing of Children

(7) Childbearing Family

(8) Nursing Administration

Conferences. Prerequisites: admission to the graduate program, instructor approval.

581 Family Systems Theory in Health Care. (3) F, S

Critical analysis of issues and research relevant to family systems theory. Emphasizes on relationship between theory and practice

582 Advanced Human Physiology. (3) F

Analyzes major theories and concepts of human physiology. Interrelationship of physiology and health is explored

583 Pathophysiology. (3) S

Manifestation of a deranged human physiology and disease. Systems theory is used to analyze the relationships of disease and physiology

584 Human Neuroanatomy, Physiology, and Pathophysiology. (3) S

Normal neuroanatomy, neurophysiology, including embryology. Pathophysiological basis of nervous system dysfunction. Prerequisite: instructor approval. Corequisites: NUR 506, 507

585 Stress Reduction. (3) F

Theory, application, and evaluation of mind/body relaxation methods including physiological effects. Research findings emphasized. Daily student practice. Prerequisite: graduate standing or instructor approval

588 Qualitative Methods in Nursing Research. (2) SS

Provides an introduction to the use of qualitative approaches, discovery procedures, analysis, interpretation of data, and contribution to theory building

591 Seminar. (2–4) N

Advanced topics, including curriculum development, health promotion, etc. Prerequisite: instructor approval in selected courses.

598 Special Topics. (2–4) N

Special study including issues in health care and organizations, management in nursing, ethical issues, values, etc. Prerequisite: instructor approval in selected courses

599 Thesis. 1–6) F, S, SS

Research proposal, development, data collection, and analysis thesis writing, and thesis oral defense. Six hours required.

Omnibus Courses: See page 40 for omnibus courses that may be offered

HUMAN DEVELOPMENT**HDE 395 Overview of Aging.** (3) F

Multidisciplinary introduction to gerontology. Explores the characteristics, experiences, problems, and needs of older persons. Cross-listed as SOC 318. *General studies SB.*

586 Origins of Human Behavior. (3) F, S

Critical examination of theories, issues, and research in the developmental period of infancy through adolescence. Prerequisite: course in child development.

588 Development in Adulthood and Aging. (3) F, S

Critical examination of theories and research of adulthood and aging.

Omnibus Courses: See page 40 for omnibus courses that may be offered.

College of Public Programs

Anne L. Schneider, Ph.D.
Dean

PURPOSE

The College of Public Programs offers a wide range of undergraduate and graduate course work, both on and off campus, to full-time students and as part of continuing education. Each academic unit of the college not only assumes responsibilities in preparing its own majors, but provides a variety of service courses for the rest of the university. The college is committed to providing excellence in teaching, research, and public service. Consequently, the units work closely with numerous public, quasi-public, and private agencies at the national, regional, state, and local levels.

ORGANIZATION

The College of Public Programs is composed of five academic units: the Department of Communication, the Walter Cronkite School of Journalism and Telecommunication, the School of Justice Studies, the Department of Leisure Studies, and the School of Public Affairs. Each academic unit is administered by a chair or director.

The general administration of the college is the responsibility of the dean, who is responsible to the university president through the senior vice president and provost.

ADMISSION

Freshmen. Any incoming freshman (0–24 semester hours) who meets the minimum university admission requirements as detailed on pages 27–38 is admitted to any chosen undergraduate academic unit of the college as a *pre-major* in that respective academic unit.

Major Status Admission. Entry to any undergraduate academic unit of the college with status as a major requires the completion of at least 56 semester hours with a minimum cumulative GPA of 2.50 plus whatever additional requirements the respective academic unit imposes. When a student has completed course work at ASU, the GPA is computed on ASU courses only and must be based on a *minimum* of nine semester hours of courses with grade options of “A,” “B,” “C,” “D,” or “E.”

Most upper-division courses in the college are not open to pre-majors. Pre-majors should check the catalog information in their major fields to determine any course enrollment restrictions.

Students should refer to the section of the catalog with reference to their preferred areas of study for retention requirements and/or continued enrollment in their major courses.

Transfer Students. Any person applying for admission or transfer to an academic unit of the college is admitted as a major of that unit if the student has met the specific requirements as listed in the section for the respective academic unit.

Transfer Credit. In most cases, course work successfully completed at a regionally accredited four-year institution of higher education is accepted into the college’s respective academic unit.

Course work successfully completed at an accredited two-year institution of higher education (community or junior college) transfers as lower-division credit up to a maximum of 64 semester hours.

Successful completion is defined for purpose of transfer as having received a grade comparable to an “A,” “B,” or “C” at ASU. The acceptance of credits is determined by the director of Admissions, and the utilization of credits toward degree requirements is at the discretion of the individual academic unit.

ADVISEMENT

A student who has been admitted to the College of Public Programs is assigned an academic advisor from the academic unit of the student’s major area of study. Questions on advisement should be directed to the student’s academic advisor or to the Student Services Office of the College of Public Programs.

Course Load. A normal course load per semester is 15–16 semester hours. The maximum number of hours for which a student can register is 18 semester hours unless an overload petition has been filed and approved by the Department/School Standards Committee and the Undergraduate Standards Committee of the College.

Overload petitions are not ordinarily granted to students who have a cumulative GPA of less than 3.00 and who do not state valid reasons for the need to register for the credits. Students who register for semester hours in excess of 18 and do not have an approved overload petition on file have courses

HONORS
COLLEGE

ARCHITECTURE

LIBERAL ARTS

BUSINESS

EDUCATION

ENGINEERING

FINE ARTS

LAW

NURSING

PUBLIC
PROGRAMSSOCIAL
WORKEXTENDED
EDUCATIONGRADUATE
COLLEGE

randomly removed through an "administrative drop" action

Specific degree requirements are explained in detail under the respective school and department sections.

Baccalaureate Degrees

The College of Public Programs offers academic instruction in four areas. Successful completion of a four-year program of 126 semester hours is specified by the respective academic unit.

Graduate Degrees

Master's degree programs are offered by five academic units of the College of Public Programs. Specific requirements are listed under the respective school or department section.

Interdisciplinary Programs

Information on all graduate degree programs in the College of Public Programs is detailed in the *Graduate Catalog*.

Doctor of Public Administration.

The D.P.A. degree program is interdisciplinary in nature and is offered by faculty from various colleges. The program is administered by an executive committee appointed by and responsible to the dean of the Graduate College. The purpose of the program is to prepare skilled professional public administrators for high-level positions in the public sector.

Justice Studies—Ph.D. A Ph.D. degree program in Justice Studies reflects a law and society perspective and integrates philosophical, legal, and ethical approaches with social science and policy science methodologies. This program is interdisciplinary in nature, and participating faculty are appointed by the dean of the Graduate College to serve as members of the ASU Committee on Law and Social Sciences. Students may develop an individualized area of substantive specialization through consultation with their program committees and/or may choose from the areas of concentration identified with the program. The areas of concentration are as follows:

College of Public Programs Degrees and Majors

Major	Degree	Administered by
Baccalaureate Degrees		
Broadcasting Emphases: broadcast journalism, production, sales/management	B.A., B.S. ¹	School of Journalism and Telecommunication
Communication	B.A., B.S.	Department of Communication
Journalism Emphases: news editorial, photojournalism, public relations	B.A., B.S. ¹	School of Journalism and Telecommunication
Justice Studies	B.S.	School of Justice Studies
Recreation	B.S.	Department of Leisure Studies
Graduate Degrees		
Communication	M.A.	Department of Communication
Communication Concentrations: communicative development, intercultural communication, organizational communication	Ph.D.	Committee of Faculty
Justice Studies	M.S. ²	School of Justice Studies
Justice Studies Concentrations: criminal and juvenile justice; dispute resolution; law, justice, and minority populations; law, policy, and evaluation: women, law, and justice	Ph.D. ³	Committee on Law and Social Sciences
Mass Communication	M.M.C.	School of Journalism and Telecommunication
Public Administration Concentrations: public information management, public management, public policy analysis and evaluation, urban management and planning	M.P.A.	School of Public Affairs
Public Administration	D.P.A. ³	Committee on Public Administration
Recreation Concentrations: outdoor recreation, recreation administration, social/psychological aspects of leisure, tourism and commercial recreation	M.S.	Department of Leisure Studies

¹ Applications are not being accepted to this program

² Graduate students in the School of Justice Studies and the Department of Anthropology are able to receive a concurrent M.S. degree in Justice Studies and M.A. degree in Anthropology

³ This program is administered by the Graduate College. See the "Graduate College" section of this catalog

1. criminal and juvenile justice,
2. dispute resolution,
3. law, justice, and minority populations;
4. law, policy, and evaluation; and
5. women, law, and justice.

Communication—Ph.D. The Ph.D. degree program in Communication prepares students for the scholarly study of message-related behaviors. The program offers the following concentrations:

1. communicative development (the influence of communication on maturation processes, such as relational development);
2. intercultural communication interaction among members of different cultures; and
3. organizational communication (the exchange of messages in formal and informal organizations).

As an interdisciplinary program, faculty from a variety of departments, who are appointed by the dean of the Graduate College, participate in teaching and advising Ph.D. students.

BACCALAUREATE DEGREE REQUIREMENTS

English Proficiency

Students must demonstrate reasonable proficiency in written English by achieving a grade of "C" or better in both ENG 101 and 102 or in ENG 105 or its equivalent. Should a student receive a grade lower than "C" in any of the courses, it must be repeated until specified proficiency is demonstrated. Transfer students from colleges outside Arizona should consult the college Student Services Office in Wilson Hall to assure completion of this requirement.

Writing Competence Requirement

In addition to ENG 101 and 102 or their equivalent, one of the following courses in written composition is required of all undergraduate majors: BUS 233, 301, ENG 215, 216, 217, 218, 301; JRN 201. This course may be counted as fulfilling the university general studies literacy and critical inquiry (L1) requirement if it is on the university approved list.

Communication Requirement

One of the following courses is required for all undergraduate majors:

COM 100, 225, 230, 241, 259. It may be included within the university general studies requirements, the College of Public Programs requirements, or the department/school degree program where appropriate.

Computer Science Requirement

A computer science course is required for all undergraduate majors. Any numeracy (N3) course from the university general studies list is acceptable. It may be included within the numeracy requirement or department school degree program where appropriate.

Foreign Language Requirement

The Walter Cronkite School of Journalism and Telecommunication is the only academic unit of the college that has a foreign language requirement in order to complete work successfully for the Bachelor of Arts degree in either Journalism or Broadcasting. Refer to the degree requirement section of the school for detailed information.

Pass/Fail Option

Students enrolled in the College of Public Programs do not receive credit for any pass/fail courses taken at ASU.

Students who have completed pass/fail courses before admission in the college or at another institution must petition their acceptance through the College Standards Committee.

The College of Public Programs does not offer any courses for pass/fail credit.

Limitation on Physical Education Activity Hours

No more than eight hours of physical education activity courses may be counted within the minimum 126 hours required for graduation.

College Course Requirements

In addition to the university general studies requirements, the College of Public Programs requires the following.

Humanities and Fine Arts. Zero to three semester hours minimum are required for a total of nine semester hours when combined with the university general studies requirement of six to nine semester hours.

Architecture

Architectural Philosophy and History, APH

Art

Art History, ARS
Studio Art, ART

Communication

COM 210, 222, 225, 241, 271, 341, 344, 421, 422, 441, 442

Dance

Dance History, DAH
Dance Performance, DAN

English

ENG (other than First Year Composition). Reading courses from community colleges are *not* included.

Foreign Languages

FLA, CHI, FRE, GER, GRK, HEB, IDN, ITA, JPN, LAT, POR, RUS, SPA, THA

Honors

HON 171, 172

Interdisciplinary Humanities

Humanities, HUM

Music

General Music electives, MUS
Music History and Literature, MHL
Music Performance, MUP
Music Theory and Composition, MTC

Philosophy

History and Philosophy of Science, HPS
Philosophy, PHI

Religious Studies

REL

Theatre

History, Literature and Theory, THE
Theatre Performance and Production, THP

Social and Behavioral Sciences. Nine to 12 semester hours minimum are required for a total of 18 when combined with the university general studies requirement of six to nine semester hours.

Anthropology (Social and Behavioral)

ASB

Business

Advertising, ADV
Business Administration, BUS
Business Law, BLW
Decision and Information Systems, CIS
Economics, ECN
Finance, FIN
Management, MGT
Marketing, MKT
Quantitative Business Analysis, QBA

Communication

All Communication courses *other* than those listed above under humanities and fine arts requirements.

Design

DSC

Engineering

Analysis and Systems, ASE
 Industrial and Management Systems
 Engineering, IEE
 Society, Values and Technology,
 STE

Geography (Cultural)

GCU

History

HIS

Journalism and Telecommunication

Journalism, JRN
 Mass Communication, MCO
 Telecommunication, TCM

Justice Studies

JUS

Leisure Studies

REC

Planning (Urban)

PUP

Political Science

POS

Psychology (Social and Behavioral)

PGS (includes general introductory
 courses)

Sociology

SOC

Women's Studies

WST

To satisfy the above college course requirements in both social and behavioral sciences and humanities and fine arts, students may choose from the university general studies list or supplement from courses listed above.

Students may not use courses from their major department/school to satisfy the above college course requirements.

GENERAL STUDIES REQUIREMENTS

All undergraduate students in the College of Public Programs are required to complete the university general studies requirements in order to be eligible for graduation in any of the undergraduate curricula offered by the college.

General studies courses are regularly reviewed. To determine whether a course meets one or more general studies course credit requirements, see the listing of courses, pages 49–65. General studies courses are also identified following course descriptions according to the key to general studies credit abbreviations, page 48.

Department and School Course Requirements

Students should refer to the respective department or school section of the catalog for more information on requirements.

GRADUATION REQUIREMENTS

Graduation requirements for the College of Public Programs include the following:

1. department/school course requirements;
2. college degree requirements; and
3. university general studies requirements.

Undergraduate Credit for Graduate Courses.

In order to enable undergraduate students to enrich their academic development, the Graduate College and the individual academic units of the College of Public Programs allow qualified students to take graduate level courses for undergraduate credit. In order to qualify for admission to a graduate level course, the student must have senior status (87 or more semester hours successfully completed) and a cumulative GPA of 3.00 or higher. In addition, permission to enroll must be given before registration and must be approved by the instructor of the course, the student's advisor, the department chair or school director, and the dean of the college in which the course is offered.

ACADEMIC STANDARDS AND RETENTION

Good Standing. Any premajor or major student of the respective academic units of the college is considered in good standing if the student maintains a cumulative GPA of 2.00 or higher in all courses taken at ASU.

Probation. Any student who does not maintain good standing status as described above may be placed on probation. A student on academic probation is required to observe any limitations or rules the college may impose as a condition for retention.

Disqualification, Reinstatement, and Appeals. The terms of disqualification, reinstatement, and appeals are identical with those of the university as set forth on pages 43–44 of this catalog.

All academic discipline action is the function of the Student Services Office,

WILSN 203, under the direction of the dean of the college. Students having academic problems should contact this office for advisement (602/965 1034).

SPECIAL PROGRAMS**University Honors College**

The College of Public Programs participates with the University Honors College, which affords superior undergraduates opportunities for special classes taught by selected faculty and limited in size and for special advisement, preferential preregistration, and a senior honors thesis. Participating students can major in any academic program. A full description of the requirements and the opportunities offered by the University Honors College can be found on pages 73–75 of this catalog.

For more information, students should contact the College Student Services Office, WILSN 203, and the University Honors College.

Accelerated Degree Programs

Selected academic units within the College of Public Programs provide inter- and intradisciplinary programs leading to the completion of the baccalaureate degree and the master's degree within a five-year period. These are not new degree programs, but rather the articulation of required course work that allows the student with exceptional ability to obtain both the undergraduate and graduate degree in a shorter than normal time frame. Completion of the master's degree should require two semesters and intermediate summer course work beyond the baccalaureate degree.

Master's Degree Requirements. Participation in an accelerated degree program option in no way implies a guarantee of admission into any graduate degree program. The student must make application and meet all requirements for regular admission to the selected master's program as defined in the *Graduate Catalog* for the respective College of Public Programs discipline.

College of Public Programs Council.

The council is a unit of ASASU and serves as the coordinating body of student activities in the college. The council fosters communication, cooperation, and understanding among undergraduate students, graduate students, faculty, and staff. As the official representative student organization to the

dean and college administration, the council appoints student members to faculty committees, cosponsors events with the college alumni association, and represents students at college and university functions.

Communication

Charles R. Bantz
Chair
 (STAUF A412) 602/965-5095

PROFESSORS

ARNOLD, BANTZ, GOYER HECHT,
 JAIN, KASTENBAUM,
 PERR LL, K. VALENTINE

ASSOCIATE PROFESSORS

BULEY, CARLSON, CRAWFORD,
 DAVEY, MARTIN, MAYER, MILLER,
 PETRONIO, STIFF, C. VALENTINE

ASSISTANT PROFESSORS

ALBERTS, COREY, CORMAN,
 GONZÁLEZ, NAKAYAMA, TROST

LECTURER

OLSON (Director of Forensics)

PROFESSORS EMERITI

DAVIS RICE, RICHARDS,
 STITES, WILLSON

PURPOSE

The Department of Communication exists to advance the understanding of message related human behavior, for the purpose of improving communicative interactions. Teaching, research, and service are directed to the continued development of knowledge and application of principles of communication. Courses of study are designed to provide students with relevant programs adapted to individual academic and professional goals.

GENERAL INFORMATION

A minimum GPA of 2.50 is required for enrollment in all upper division courses and COM 207. A minimum GPA of 2.25 is required for enrollment in COM 110, 241, 250, and 263.

Communication Major Requirements. Undergraduate students may be admitted to major status after meeting all of the following requirements:

1. completion of at least 56 semester hours with a minimum cumulative GPA of 2.50 computed on ASU courses only and based on a *minimum* of nine semester hours of courses with grade options of "A," "B," "C," "D," or "E";
2. completion of university First Year Composition requirements (see page 66) with a minimum grade of "C" in each; and
3. completion of 12 hours of Department of Communication core course requirements (COM 100, 207, 225, 308) with a minimum grade of "C" in each.

DEGREE REQUIREMENTS

B.A. and B.S. Degrees

Of the minimum required 54 hours (12 hours of departmental core courses plus the 42 hours noted below), at least 30 hours must be 300 or 400-level courses. In addition to university, college, and department core course requirements, all majors must complete a combination of required and optional courses consisting of at least 42 hours.

Of the minimum 42 hours, 18 hours must be taken consisting of three pairs from the following list of five pairs of courses:

1. COM 110 Elements of Interpersonal Communication and COM 410 Interpersonal Communication Theory and Research;
2. COM 241 Introduction to Oral Interpretation and COM 441 Performance Studies;
3. COM 250 Introduction to Organizational Communication and COM 450 Theory and Research in Organizational Communication;
4. COM 263 Elements of Intercultural Communication and COM 363 Intercultural Communication Processes; and
5. COM 321 Rhetorical Theory and Research and COM 421 Rhetoric of Social Issues.

Of the minimum 42 hours, 24 additional hours must be taken in interest area courses, at least 12 hours of which must be in the Department of Communication. All courses outside the department must be at the 300 or 400 level. A minimum grade of "C" is required in each course, except for a maximum of six hours of "Y" credit

available to qualified students in COM 281, 382, and/or 484.

In addition to the above listed requirements, students seeking the Bachelor of Arts or Bachelor of Science degree must satisfy the university general studies requirements as noted on pages 45-65 and College of Public Programs general studies requirements as noted on page 320. Communication courses may *not* count toward general studies requirements for the intermediate level (L1) of literacy and critical inquiry core courses, the humanities and fine arts core courses, nor the social and behavioral science core courses.

Students should consult their advisors for current information concerning College of Public Programs and Department of Communication lists of courses applicable to general studies requirements and for information concerning differences in requirements for the B.A. and B.S. degrees.

SECONDARY EDUCATION— B.A.E.

Communication. An academic specialization in communication is offered to students pursuing the Bachelor of Arts in Education degree with a major in Secondary Education. As the major teaching field, the academic specialization in communication consists of a minimum of 43 hours in communication (including COM 480). Students must complete all courses required by the university and the College of Public Programs. Students must complete the Department of Communication core courses (COM 100, 207, 225, 308), COM 480, at least one hour of COM 281 in either Forensics or Oral Interpretation, and three pairs of the following five pairs of courses: COM 110 and 410, 241 and 441, 250 and 450, 263 and 363, 321 and 421. Students must also take three of the following courses: COM 222, 230, 325, and 329. Students should consult the College of Education to ascertain the general studies requirements for this degree.

As the minor teaching field, the academic specialization in communication consists of a minimum of 31 semester hours in communication. Students must take COM 100, 225, 281, 480, and two of the following three pairs of courses: COM 110 and 410, 241 and 441, 321 and 421. Students must also take three of the following courses:

COM 222, 230, 325, and 329. In addition, COM 207 may be taken, since it is a prerequisite for many communication courses.

Communication Internships

Internships consist of supervised field experiences and are available to qualified upper level undergraduate (COM 484) and graduate (COM 584) students. Internships must receive prior approval from the departmental coordinator of Internship Programs *before* student registration for the course. In ternships may be taken once or repeated for credit up to a total of 12 hours, but not more than six hours may be applied toward the major.

DEPARTMENTAL GRADUATE PROGRAMS

In addition to offering a Master of Arts degree program, the Department of Communication also houses the interdisciplinary Doctor of Philosophy degree program in Communication. Consult the *Graduate Catalog* for more information.

COMMUNICATION

COM 100 Introduction to Human Communication. (3) F, S, SS

A top cs oriented introduct on to basic theo ry as dimens ons, and concepts of human commun catve interact on and behav or *General studies: SB*

110 Elements of Interpersonal Communication. (3) F, S, SS

Demonstrat on and pract ce of communicat ve techniques n estab sh ng and ma ntaining nterpersona re at onships

172 Introduction to American Sign Language. (3) F, S

L ngu st c pr nc p es express ve recept ve sk l s, term nology and sign systems of Amer can S gn Language

207 Introduction to Communication Inquiry. (3) F, S, SS

Bases of inqu ry nto human communicat on, nclud ng introduct on to notions of theory ph osophy prob ems, and approaches to the study of commun cat'on Prerequisite: COM 100

210 Issues in Interpersonal Communication. (3) F, S

Explorat on of theoret ca eth ca, and ph losoph ca approaches to commun cat on n hu man relat onsh ps. Prerequisite: COM 110

215 Listening. (3) N

Study of theory and practice of effect ve sten ng behav ors nclud ng ntens ve sk l exer ces

222 Argumentation. (3) A

Ph losophical and theoret ca foundat ons of argumentat on nclud ng a companson of mode s of advocacy and ev dence *General studies: L1.*

225 Public Speaking. (3) F, S, SS

Verba and nonverba commun cat on n plat form speak ng D scuss on and pract ce n voca and phys ca de livery and n purposeful organ zat on and deve opment of pub c commun cat on *General studies: L1*

230 Small Group Communication. (3) F, S, SS

Prnc ples and processes of sma group commun cat on, attitudes and sk l s for effect ve part cpat on and eadersh p n sma groups sma l group prob em solv ng, and decs on mak ng. *General studies: SB*

241 Introduction to Oral Interpretation. (3) F, S, SS

The commun cat on of terary matena s through the mode of performance Verba and nonverba behav or, nterface of nterpreter w th terature and audience, and rhetor ca and dramat c analys s of literary modes. *General studies: L1.*

250 Introduction to Organizational Communication. (3) F, S, SS

ntroduct on to the study of commun cat on n organ zat ons nclud ng dent f cat on of van ab es, ro es and patterns nf uenc ng commu n cat on n organzat ons Prerequisite: COM 207. *General studies: SB*

251 Interviewing. (3) F, S

Prnc ples and techn ques of nterv ew ng, nclud ng pract ce through rea and smu ated nterv ews n nformatonal persuas ve and emp oye re ated situat ons Not open to freshmen

259 Communication in Business and the Professions. (3) F, S, SS

Interpersona , group and pub c commun cat on n bus ness and profess ona organ za t ons. Not open to freshmen and not ava abe for cred t toward the major

263 Elements of Intercultural Communication. (3) F, S

Bas c concepts, prnc ples and sk l s for mprov ng commun cat on between persons from d fferent m nonty, rac al, ethn c and cultura backgrounds *General studies: SB, G*

271 Voice Improvement. (3) N

ntens ve personal and group experience to mprove norma vocal usage, nclud ng art culat on and pronuncat on

272 Intermediate American Sign Language. (3) F, S

Emphas s on ncreas ng vocabu ary and speed, development of greater fluency n American S gn Language, nclud ng f nger spel ng and nonverba communicat on Survey of deafness Prerequisite: COM 172

275 Nonverbal Communication. (3) F, S, SS

The effects of space, tme body movement, env ronment, objects, and vo ce qual ty on human commun cat on and nteract on. Not open to students w th credit n COM 294 ST-Beyond Words

281 Communication Activities. (1-3) F, S, SS

Nongraded part cpat on n forens cs or nterpretat on cooccur cu ar act v ttes Maximum 3 semester hours each semester. Prerequisite: instructor approva

294 Special Topics. (3) F, S, SS

Prerequisite: nstructor approval.

308 Empirical Research Methods in Communication. (3) F, S, SS

Exam nat on of emp rca research methods n commun cat on nclud ng expermenta , survey, descr pt ve, and other quantat ve approaches. Prerequisite: COM 207 *General studies: L2*

312 Communication, Conflict, and Negotiation. (3) F, S

Theor es and strateg es of commun cat on relevant to the management of confl cts and the conduct of negotat ons Prerequisite: COM 100 or nstructor approva .

316 Gender and Communication. (3) F, S

ntroduct on to gender re ated communication. Verbal, nonverbal, and para ngu st c differences and sm ant es are exam ned w th soc a psych olog ca and hstoric perspec tves.

320 Communication and Consumerism. (3) A

Cr t ca eva uat on of messages des gned for publ c consumpt on Perce v ng, evaluat ng and respond ng to pol tical, soca , and com merc al commun cat on *General studies: SB.*

321 Rhetorical Theory and Research. (3) F, S, SS

Hst or ca deve opment of rhetonca theory and research n commun cat on, from class cal antqu ty to the present Prerequisite: COM 207 *General studies: L2 HU.*

325 Advanced Public Speaking. (3) F, S

Soc a and pragmat c aspects of pub c speak ng as a commun catve system strateg es of rhetor ca theory and the presentat on of forms of pub c commun cat on Prerequisite: COM 225 or nstructor approva

329 Persuasion. (3) F, S, SS

Var ab es wh ch nf uence and modify attitudes and behav ors of message receivers nclud ng analys s of theor es research and current prob ems. Prerequisite: COM 207 or nstructor approval. *General studies: SB*

341 Social Contexts for Performance. (3) N

Adaptat on and performance of terature for the commun ty outside the un versity. Research nto the practca uses of performed literature Prerequisite: COM 241 or nstructor approva .

344 Performance of Oral Traditions. (3) N

Cultura bel fs and va ues stud ed through ethnograph c research and performance of persona narrat ves, fo k ore, myths egends, and other ora trad t ons Prerequisite: COM 241 or nstructor approval *General studies: HU.*

363 Intercultural Communication Processes. (3) F, S, SS

Processes and prob ems of commun cat on between peop e from different rac a ethn c, and cultura backgrounds n both domest c and nternat onal sett ngs Prerequisite: COM 263 or instructor approva *General studies: SB, G*

371 Language, Culture, and Communication. (3) A

Cu tura nf uences of language on commun cat on nclud ng soc al funct ons of language b l ngual sm bicultural sm, and b d a ect sm Prerequisite: COM 263 or nstructor approval *General studies: G.*

372 Advanced American Sign Language. 3 S

American Sign Language and English concepts and dramatic expressions; emphasis on American Sign Language principles; cultural aspects, and socio-educational trends. Prerequisite: COM 272

382 Classroom Apprenticeship. 1 3 F S SS

Nongraded credit for students extending their experience with a content area by assisting with classroom supervision in other COM courses (maximum 3 semester hours each semester). Prerequisite: instructor approval.

394 Special Topics. 1-4 F, S SS

Prerequisite: instructor approval.

410 Interpersonal Communication Theory and Research. (3) F, S SS

Survey and analysis of major research topics, paradigms, and theories dealing with message exchanges between and among social peers. Prerequisites: COM 110, 207, and 308 or instructor approval. *General studies SB*

411 Communication in the Family. (3) A

A broad overview of communication issues found in marriage and family, focusing on current topics concerning communication in the family. Prerequisites: COM 110 and 207 or instructor approval.

414 Crisis Communication. 3 N

Role of communication in crisis development and intervention. Prerequisite: instructor approval.

417 Communication and Aging. 3 N

Critical study of changes in human communicative patterns through the later adult years, with attention on intergenerational relationships and self-concept functions. Prerequisite: instructor approval.

421 Rhetoric of Social Issues. 3 A

Critical rhetoric study of significant speakers and speeches on social issues of the past and present. Prerequisite: COM 321 or instructor approval. *General studies HU*

422 Advanced Argumentation. (3) N

Advanced study of argumentation on theories and research as applied to public forum, adversary, scholarly, and legal settings. Prerequisite: COM 222 or instructor approval.

430 Leadership in Group Communication. (3) N

Theory and process of leadership in group communication, emphasizing philosophical foundations, contemporary research, and applications to group situations. Prerequisite: COM 230 or instructor approval. *General studies SB*

441 Performance Studies. (3) S

Theory, practice, and criticism of texts in performance. Emphasis on the interaction between performer, text, audience, and context. Prerequisite: COM 241 or instructor approval.

442 Interpretation and the Mass Media. (3) N

The relationship of modern media (radio, TV, and film) to oral interpretation and literature. Prerequisite: COM 241 or instructor approval.

445 Narrative Performance. (3) N

Theory and practice of performing narrative texts (e.g., prose fiction, oral histories, dramatic essays, letters). Includes scripting, directing, and the rhetoric of analysis of story. Prerequisite: COM 241 or instructor approval.

446 Interpretation of Literature Written by Women. 3 N

Students explore, through performance and critical writing, literature written by women. Prerequisite: COM 241 or instructor approval.

450 Theory and Research in Organizational Communication. 3 F, S, SS

Critical review and analysis of the dominant theories of organizational communication and the primary research strategies. Prerequisites: COM 250 and 308 or instructor approval. *General studies SB*

451 Employee Participation Processes in Organizations. 3 A

Principles, concepts, and leadership for implementation of Quality Circles and similar employee involvement processes. Prerequisites: COM 230 and 250 or instructor approval.

453 Communication Training and Development. 3 F, S

Examination of the procedures and types of communication training and development in business, industry, and government. Prerequisites: COM 250 and 308 or instructor approval.

456 Political Communication. 3 F S

Theory and research related to political campaign communication. The persuasive process of political campaigning, the role of the media, the candidate and image creation. Cross-listed as MCO 456. Prerequisites: COM 250 and 308 or instructor approval. *General studies SB*

457 Communication and Information Diffusion. 3 F

Role of communication in diffusion of information. Principles and practices for the systematic dissemination of information to implement change in various social systems. Prerequisites: COM 250 and 308 or instructor approval. *General studies SB*

465 Intercultural Communication Workshop. 3 N

Experimental, student-based study of communication between members of different cultures designed to help students improve their intercultural communication skills. Prerequisite: instructor approval.

472 Development of Language as Communicative Behavior. (3) N

Development of language and interpersonal communicative behaviors of children through adolescence, including expressive and receptive competencies and interactions with others. Prerequisite: instructor approval. *General studies SB*

480 Methods of Teaching Communication. 3 N

Analysis, organization, and presentation of textual and other classroom materials. Prerequisite: instructor approval.

484 Communication Internship. 1 12) F S SS

Prerequisite: instructor approval.

501 Research Methods in Communication. (3) F

Critical analysis of systems of inquiry in communication, focusing on the identification of variables and approaches to conducting research in communication. Prerequisite: instructor approval.

504 Theories and Models in Communication. (3) F

Theory construction, metatheoretical concerns, models, construct definition, and comparative analysis of current theories in communication. Prerequisite: instructor approval.

508 Quantitative Research Methods in Communication. 3 S

Empirical research designs, measurements, and statistical strategies and techniques in analyzing and evaluating experimental and descriptive research in communication. Prerequisite: instructor approval.

509 Qualitative Research Methods in Communication. 3 S

Qualitative research methods including interview, field methods, and other nonquantitative techniques for analyzing communication. Prerequisite: COM 501 or instructor approval.

510 Interpersonal Communication Theory and Research. (3) A

Contemporary theories and research in interpersonal communication. Prerequisites: COM 501 and 504 or instructor approval.

512 Death, Society, and Human Experience. 3 N

Examines dying, death, bereavement, and suicide from both individual and socio-cultural perspectives in terms of options for communication and action in death-related situations. Prerequisite: instructor approval.

521 Rhetorical Criticism of Oral Discourse. (3) N

History and significance of rhetorical theory and criticism in the analysis of oral discourse. Prerequisite: COM 501 or instructor approval.

529 Theories of Persuasion. 3 A

Analysis of representative theories and models of persuasive processes and the requirements for communicative behavior. Prerequisites: COM 501 and 504 or instructor approval.

531 Theories of Small Group Communication. 3 A

Theory and research in small group interaction and decision making, focusing on communication variables which affect small group output. Prerequisites: COM 501 and 504 or instructor approval.

541 Research Perspectives in Interpretation. 3 N

Supervised research in the historical and contemporary relationships between the interpreter, the text, and the audience. Prerequisites: COM 501 and 504 or instructor approval.

555 Communicative Processes in Organizations. 3 A

Systematic analysis of communicative interactions between organizational structure, information flow, and human behaviors in the organizational setting. Prerequisites: COM 501 and 504 or instructor approval.

563 Intercultural Communication. 3 A

Analysis of contemporary theory and research concerning the effects of a variety of cultural variables on communication between people. Prerequisites: COM 501 and 504 or instructor approval.

575 Language and Message Systems. 3 N

Sign systems; personal function and contextual aspects of message systems; measurement of "meaning." Prerequisites: COM 501 and 504 or instructor approval.

584 Communication Internship. 1 12) F S
SS

596 Proseminar in Communication. 0) F, S
Discuss on of research projects w th the fac
ulty Prerequ site adm ss on to the graduate
program

**600 Research Methods: Multivariate Statis
tical Analysis of Data in Communication.**
3 F

Stat st ca ana y s s of commu cat on research
data. Multivariate procedures used n commu
n cat on research and methods of causa
analysis Prerequ site. prior graduate stat st cs
course or nstructor approval.

**601 Multidisciplinary Perspectives in Re
search in Communication.** (3) F

Crt ca review of approaches aspects, con
cepts and ssues assoc ated w th research n
commu cation Prerequ site nstructor ap
proval

**604 Theory Construction in Communi
cation.** (3) F

Rev ew and ana y s s of ph losoph cal prob
lems nherent n commu cat' ve research and
of meta-theor es des gned to dea w th these
prob ems Prerequ site COM 504 or nstructor
approva

**608 Multivariate Statistical Analysis of Data
in Communication.** (3) S

Stat st ca ana y s s of commu cat on research
data Mu tivar ate procedures used n commu
n cat on research and methods of causa
ana y s s Prerequ sites COM 501 508 or
equ va ents.

**609 Advanced Qualitative Research Meth
ods in Communication.** 3 F

Ana y s s of ssues n the pract ce of qua tat ve
commu cat on research nc ud ng data gath
ereng fe dwork ssues ana y s s strateg es
and report ng resu ts Prerequ site COM 509
or nstructor approva

**691 Seminar: Theory Construction in Com
munication.** (3) F

Review and ana y s s of ph osoph ca prob
ems inherent n commu cat' ve research and
meta theor es des gned to dea w th these
prob ems. Prerequ site COM 504 or nstructor
approva .

**700 Research Methods: Issues of Interdis
ciplinary Research in Communication.** (3)
S

Log c of nqu ry and prob ems n the ph oso
phy of nterd sc p nary commu cat on re
search. Des gn of qua tative and quantitat ve
research re ab ty va id ty Prerequ sites
COM 501 or equ va ent) and 600 or nstructor
approva

**780 Practicum: Research in Communi
cation.** (3) S

Guided pract ce n the conduct of commu ca
t on research Top c def cat on procedures
formats and ethics of publ shng Prerequ
sites COM 691 700 nstructor approva

Omnibus Courses: See page 40 for omnibus
courses that may be offered

Walter Cronkite School of Journalism and Telecommunication

Douglas A. Anderson

Director

(STAUF A231) 602 965-5011

PROFESSORS

ANDERSON, BENNETT,
CRONKITE HALVERSON

ASSOCIATE PROFESSORS

CRAFT, GALICIAN, GODFREY HOY,
LENTZ, MERRILL, SYLVESTER

ASSISTANT PROFESSORS

ALLEN BRAMLETT SOLOMON,
FIELDING MATERA,
RUSSELL, YOUM

CLINICAL ASSOCIATE

PROFESSORS
TULE, LEIGH

INSTRUCTOR

CASAVANTES

PROFESSORS EMERITI

BROWN CROWDER, ELL S, M LNER,
RANK N SILVER, SMITH

MAJOR REQUIREMENTS

All students enrolling in courses in the Walter Cronkite School of Journalism and Telecommunication must complete a minimum of 30 semester hours with at least a 2.50 cumulative GPA before they are permitted to enroll in school courses at the 200 level.

All students intending to take school courses beyond the 100 level also must complete an English proficiency exam with a passing score. The exam is administered by the school.

Upper division courses in the school are open to majors or to those students with a minimum cumulative GPA of 2.50. Certain upper-division courses are open only to majors.

To become a major in either Journalism or Broadcasting, a student must complete at least 56 semester hours with a minimum cumulative GPA of 2.50. The student must become a major (2.50 GPA) before the 87th semester hour is earned, or else the student is disqualified from taking courses in this school.

To ensure that students receive a broad academic background, no more than 36 semester hours in courses in the

major may apply to the 126 semester hours required for graduation. At least 18 hours of major courses required by the school, including one writing course, must be taken at ASU. A student must receive a grade of "C" or higher in all courses taken in the major and in the required related field area. Specific areas that may be used to fulfill the related field requirement are listed on the curriculum check sheets for each major available in the school. Courses elsewhere in the university that duplicate or are closely related to school subject matter may be restricted by the school.

B.A. REQUIREMENTS

All students are required to complete 16 semester hours of courses in a foreign language or the equivalent to the intermediate level.

Broadcasting. This major consists of 42 semester hours, of which 30 must be in school courses and 12 in a related field. Students must take a required core of courses: MCO 110, 402; TCM 200, 201, 235. The student also must choose one major professional emphasis area from the following three: broadcast journalism, production analysis, sales/management.

These courses are in addition to other degree requirements. See "University Degree Requirements," pages 66-67.

Journalism. This major consists of 42 semester hours of which 30 must be in school courses and 12 in a related field. Students must take a required basic core, consisting of JRN 201, 301, and 313, MCO 110 and 402, and either MCO 418, 421, 450, or JRN 412. The student also must choose one major professional emphasis area from the following three: news editorial, photo-journalism, or public relations.

These courses are in addition to other degree requirements. See "University Degree Requirements," pages 66-67.

Related Field. Each student is required to complete a 12 semester hour related field to complement the courses taken in the major emphasis areas.

See the curriculum check sheets for each major for the full details and approved related field areas.

B.S. REQUIREMENTS

The Bachelor of Science program is under review by the faculty and is not

available as an option for students entering under this catalog.

SECONDARY EDUCATION— B.A.E.

Journalism. The academic specialization in journalism as a major teaching field consists of 45 semester hours. The following courses are required: JRN 201, 301, 313, 351, 480; MCO 110, 402. An additional 27 hours, including 15 hours in school course offerings, must be taken on approval by the advisor in consultation with the student. The remaining courses may be in closely related fields.

The academic specialization in journalism as a minor teaching field consists of 24 semester hours. The following courses are required: JRN 201, 301, 313, 351, 480; MCO 110. The remaining courses are to be selected in consultation with a journalism advisor.

GENERAL STUDIES

The student should carefully check the university general studies requirements found on pages 45–65.

The school requires the student to accumulate a total of 54 semester hours beyond general studies. The student is advised to review carefully the appropriate school curriculum check sheet to be sure courses taken move the student toward graduation with the least amount of delay and difficulty.

The School of Journalism and Telecommunication has additional general studies requirements, described below.

Humanities and Fine Arts. Three to six semester hours are required for a total of 12 semester hours when combined with university general studies.

Social and Behavioral Sciences. Nine to 12 semester hours are required for a total of 18 when combined with university general studies.

Additional courses may be taken in each of the groups and/or from the electives listed to complete the total of 54 semester hours required by the school.

Within the program there are specific course requirements. Students are required to take one course in each of the following areas: communication (applied speech), computer science, economics, English composition (beyond the freshman level), English literature, history, mathematics (numeracy requirement), two natural (physical) sci-

ence lab courses, philosophy, political science (either POS 110 or 310), psychology, and statistics.

GRADUATE PROGRAM

Master of Mass Communication. The curriculum for the M.M.C. degree is designed to help students achieve in intellectual and professional growth, to prepare students for positions in the mass media, and to provide a background to enable those currently in the media to advance their careers. Information on the Master of Mass Communication program is detailed in the *Graduate Catalog*.

MASS COMMUNICATION

MCO 110 Introduction to Communication. (3) F, S, SS
Organization, function, and responsibilities of the media and adjunct services. Primary emphasis on newspapers, radio, television, and magazines. Not open to students with credit for MCO 120. Prerequisites: complete first Freshman English course with "C" grade, major

120 Media and Society. (3) F, S
Role of newspapers, magazines, radio, television, and motion pictures in American society. Not open to students with credit for MCO 110. Designed for nonmajors. *General studies: SB.*

402 Communications Law. (3) F, S, SS
Legal aspects of the rights, privileges, and obligations of the press, radio, and television. *General studies: L2.*

418 History of Communications. (3) F, S
American journalism from its English and colonial origins to the present day. Development and influence of newspapers, magazines, radio, television, and news gathering agencies. *General studies: SB, H.*

421 News Problems. (3) S
Trends and problems of the news media. Emphasis on editorial decisions in the process of news. Prerequisite: 9 hours of mass communication journalism/telecommunication courses or instructor approval.

430 International Communication. (3) F, S
Comparative study of communication and media systems. Information gathering and dissemination under different political and cultural systems. *General studies: G.*

450 Visual Communication. (3) F, S
Theory and tradition of communication through the visual media with emphasis on the continuity of traditions common to modern visual media. *General studies: HU.*

456 Political Communication. (3) F, S
Theory and research related to political campaign communication. The persuasive process of political campaigning, the role of the media, the candidate, and image creation. Cross-listed as COM 456. Prerequisites: COM 250 and 308 or instructor approval. *General studies: SB.*

460 Race, Social Change, and Media. (3) S
A readings seminar designed to give students a probing examination of the interface between African Americans and the mass media in the United States.

503 Press Freedom Theory. (3) S
Examination of philosophical and legal aspects of press freedom. Emphasis on First Amendment theory evolution from 1791 to present.

510 Research Methodology in Mass Communication. (3) S
Identification of research problems in mass communication. Overview of questionnaire construction. Attention to survey history, content analysis, experimental, and other research methods.

520 Mass Communication Theories and Process. (3) F
Analysis of various theoretical models of mass communication with emphasis on the applications of these theories to various professional communication needs.

522 Mass Media and Society. (3) S
Mass media as social institutions, particularly interaction with government and public. Emphasis on criticism and normative statements.

530 Media Ethics. (3) F
Ethical conventions and practices of print and electronic media as they relate to the government and private sectors of the society.

Omnibus Courses: See page 40 for omnibus courses that may be offered.

JOURNALISM

JRN 201 Journalism Newswriting. (3) F, S, SS
Writing news for the print media. Prerequisites: MCO 110 or 120; successful completion of English proficiency requirement; demonstrated typing ability of 30 words per minute. *General studies: L1.*

301 Reporting. (3) F, S
Fundamentals of news gathering, interviewing, and in-depth reporting. Prerequisites: JRN 201 major. *General studies: L2.*

313 Introduction to Editing. (3) F, S
Copyediting and headline writing. Electronic editing on personal computer terminals. Prerequisites: JRN 301 major.

351 Photojournalism I. (3) F, S
Taking, developing, and printing pictures for newspapers and magazine production on a media deadline basis. Students should have their own cameras. Prerequisite: JRN 201 or instructor approval.

401 Public Relations Techniques. (3) F, S
Theory and practice of publicity, public relations, and related techniques and procedures. Prerequisites: JRN 301 or TCM 315, major.

412 Editorial Interpretation. (3) N
The press as an influence on public opinion. The role of the editor in analyzing and interpreting current events. Prerequisite: JRN 301.

413 Advanced Editing. (3) F, S
Theory and practice of newspaper editing layout and design, picture, and story selection. Prerequisite: JRN 313.

414 Business and Industrial Publications. (3) F, S

Theory and practice of layout, typography, and design for magazines, brochures, and industrial publications. Prerequisite: JRN 401.

415 Writing for Public Relations. (3) F, S
Development of specific writing techniques for the practitioner in public relations agencies and divisions of major organizations. Prerequisite: JRN 401.

420 Reporting Public Affairs. (3) F, S
Instruction and assignments in reporting the courts, schools, government, city hall, social problems, and other areas involving public issues. Prerequisite: JRN 301

422 Business Reporting. (3) N
Analysis and reporting of economic and consumer affairs. Prerequisites: 3 hours of economics. JRN 301

440 Magazine Writing. (3) F, S
Writing and marketing magazine articles for publication. Prerequisite: JRN 301 or instructor approval

451 Photojournalism II. (3) F, S
Theory and practice of photojournalism with emphasis on shooting, editing, and layout for the media. Prerequisite: JRN 351

452 Photojournalism III. (3) F, S
Advanced theory and practice of photojournalism with emphasis on the photo essay and illustrations in black and white and color. 2 hours lectures, 2 hour lab. Prerequisite: JRN 451

460 Print Media Management. (3) S
Problems and functions involved in the management and marketing of a newspaper or magazine. Interaction of management with the organization and community. Prerequisite: JRN 201 or instructor approval

465 Precision Journalism. (3) S
An advanced writing course with focus on reporting polls and surveys and other numerical data based stories as well as on understanding the concepts that underlie polls and surveys. Lecture/lab. Prerequisite: JRN 301 or instructor approval

480 Methods of Teaching Journalism. (3) F
Methods of instruction, organization, and presentation of appropriate content in journalism. Prerequisite: 6 hours of journalism at 300 level and above or instructor approval

Omnibus Courses: See page 40 for omnibus courses that may be offered

TELECOMMUNICATION

TCM 200 Fundamentals of Radio-Television. (3) F, S, SS
Structure of telecommunications in the United States: history, regulation, organization, with emphasis on broadcasting. Relationship to advertising, research, and government agencies. Prerequisites: MCO 110 or 120; successful completion of English proficiency requirement

201 Radio-Television Writing. (3) F, S, SS
Writing for electronic media: news and continuity. Prerequisites: MCO 110 or 120; successful completion of English proficiency requirement demonstrated typing ability of 30 words per minute. *General studies: L1.*

235 Production Techniques. (3) F, S, SS
Introduction to basic concepts of audio and video production. Operation of portable cameras, recorders, microphones, editing and postproduction equipment will be introduced. Prerequisites: TCM 200, successful completion of English proficiency requirement

300 Advanced Broadcast News Writing. (3) F, S
Technique and practice in news writing for broadcast and cable applications. Prerequisite: TCM 201

315 Broadcast News Reporting. (3) F, S
News and information practices of networks, stations, and industry. Practice in writing, reporting, and editing with emphasis on audio. Prerequisites: TCM 201, 235. *General studies: L2*

330 Advanced Broadcast Reporting. (3) F, S
News and information practices of networks, stations, and industry. Advanced practice in writing, reporting, and editing with emphasis on video. Prerequisite: TCM 315.

332 Broadcast Programming. (3) F, S, SS
Programming theory and evaluation, regulation, ethics, and responsibilities and basics of audience psychographics and effects. Prerequisite: TCM 200

336 TV Studio Production. (3) F, S
Introduction of multi-camera production in the studio. Teamwork and group production are emphasized through assignments covering a variety of program types. Prerequisites: TCM 235; major

343 Broadcast Announcing. (3) F, S
Techniques of radio and television announcing. Prerequisites: TCM 201, 235

431 Advanced Radio-TV Writing. (3) F, S
Technique and practice in nonnews writing for radio and television. Emphasis on creative and commercial approaches to copywriting and copy presentations. Prerequisite: TCM 201

433 Broadcast Sales and Promotion. (3) F, S
Basics of electronic media marketing practices including commercial time sales techniques and radio/TV promotion fundamentals. Prerequisite: TCM 200.

435 Cable TV and Emerging Telecommunication Systems. (3) F, S
Structures and utilization of cable, industry and instructional events on satellite and videocassettes. Prerequisite: TCM 200

437 Advanced TV Production. (3) F, S
Emphasis on individual production projects of the student's own concept, organization, utilization, production, field, and postproduction techniques. Prerequisite: TCM 336

472 Broadcast Station Management. (3) F, S
Management principles and practices including organization, procedures, policies, personnel problems, and financial aspects of station management. Prerequisite: TCM 332

480 Television News Practicum. (1) (3) F, S
Writing, reporting, and production of the television newscast. Prerequisite: TCM 330

Omnibus Courses: See page 40 for omnibus courses that may be offered

School of Justice Studies

Rita Mae Kelly
Director
(WILSN 331) 602 965-7682

REGENTS' PROFESSORS ALTHE DE, PALUMBO

PROFESSORS
HAYNES HEPBURN, JOHNSON
KELLY, KENNEDY, LAUDERDALE,
MUSHENO, SCHNEIDER

ASSOCIATE PROFESSORS
BORTNER, CAVENDER, FERRARO,
HERNANDEZ, JURK, SCHADE, ZATZ

ASSISTANT PROFESSORS
GOLDBERG, LUJAN PINO, RIDING, N

PROFESSORS EMERITI
BRUNS, MELICHAR, SHUMAN

PURPOSE AND PHILOSOPHY

The school provides an interdisciplinary setting for studying justice from a social science perspective. Primary components of justice studies include theories of justice, social and economic justice, criminal justice, juvenile justice, and justice for women and minority populations. The curriculum focuses on examination of social science research, critical analyses of existing institutional arrangements for meting out justice, and the exploration of alternatives.

DEGREES

Justice Studies—B.S.

The curriculum for the Bachelor of Science degree in Justice Studies provides interdisciplinary social science courses relevant to law and justice for students working in the justice field, those anticipating justice-related careers (including the legal profession), and interested nonmajors.

Justice Studies—M.S.

The faculty in the School of Justice Studies offer a program leading to the Master of Science degree with a major in Justice Studies. The study of justice is an interdisciplinary problem-oriented field of scholarship, research, and teaching. It embraces those aspects of social and behavioral sciences which are relevant to an understanding of law, justice, crime, and social deviance and

which entail a critical examination of the systems that have evolved for handling attendant problems. The Master of Science degree has been designed to prepare students for professional positions in justice related agencies, for teaching in community colleges, and for further study and research in the justice field. Information on the Master of Science degree in Justice Studies is detailed in the *Graduate Catalog*. For more information, call 602/965-6008.

Concurrent M.A. in Anthropology and M.S. in Justice Studies

Graduate students in the School of Justice Studies and the Department of Anthropology are able to receive a concurrent Master of Science degree in Justice Studies and Master of Arts degree in Anthropology. The principal purpose of the program is to prepare individuals with combined and complementary knowledge and skills for basic and applied research and administrative and educational activities related to justice studies and anthropology.

Students have to be admitted separately to each program, following the guidelines set forth by the Graduate College, the Department of Anthropology, and the School of Justice Studies. Additional information on the M.A. in Anthropology and the M.S. in Justice Studies may be obtained from the Department of Anthropology and the School of Justice Studies.

Admission to Undergraduate Program

The Bachelor of Science degree in Justice Studies is an upper division program. Upon admission to the university, Justice Studies students are classified as premajors. Major status is required for graduation, and premajors are not allowed to take 400 level JUS courses.

Justice Studies students may earn major status by

1. earning a minimum of 56 semester hours;
2. earning a minimum cumulative GPA of 2.50 (calculated on semester hours earned at ASU); and
3. completing, with a minimum grade of "C" in each and a 2.50 GPA for all of the following classes: ENG 101 and 102 *or* ENG 105; JUS 105 (or 305), 301, 302, and 303, and the College of Public Programs writing competence requirement

(JUS 105 or 305 is a pre- or corequisite for JUS 301, 302, and 303. MAT 117 or equivalent is a pre-requisite for JUS 302).

Upon completion of these requirements, the School of Justice Studies administratively assigns the premajor to major status.

For Justice Studies students to take a non-core 300 level JUS course, they must have at least a "C" in each of the JUS core courses: JUS 105 (or 305), 301, 302, and 303 and a minimum average of 2.50 for these four classes.

For nonmajors to take a non-core 300 level JUS course, they must have (1) major or professional status in a discipline or (2) a minimum of 56 hours (junior status) and a minimum cumulative GPA of 2.00. Nonmajors are ineligible to take JUS 301, 302, and 303.

For nonmajors to take a 400 level JUS course, they must have (1) major or professional status in a discipline or (2) a minimum of 56 hours (junior status) and a minimum cumulative GPA of 2.50.

Academic Advisement. Justice Studies students admitted as premajors are advised by the school's academic advisor. All students are encouraged to seek advisement in order to formulate an appropriate educational plan. Justice Studies majors may also be advised by the school's faculty.

A comprehensive discussion of degree requirements for the Bachelor of Science degree in Justice Studies is contained in the school's *Undergraduate Advisement Guide*, available in WILSN 342 and via requests by mail or phone (602 965 7727). Every Justice Studies undergraduate receives the *Advisement Guide* as well as an evaluation of transfer work, if any, by the school's advisement staff upon admission or readmission to the university.

DEGREE REQUIREMENTS

The School of Justice Studies awards a Bachelor of Science degree upon the successful completion of a curriculum consisting of a minimum of 126 semester hours including university general studies requirements, College of Public Programs requirements, justice studies courses, and electives. Additionally, the student must

1. earn major status;
2. earn a minimum of 50 semester hours of upper division courses,

3. complete a minimum of 30 semester hours, including 24 in justice studies courses, at ASU;
4. earn a grade of "C" or better in all justice studies courses taken at ASU that apply to the justice studies component of the curriculum (i.e., nonelectives); and
5. meet the university's residency and scholarship requirements

A comprehensive discussion of degree requirements for the B.S. in Justice Studies is contained in the school's *Undergraduate Advisement Guide*.

General Studies Program. To assure the breadth and depth of their education, all Justice Studies undergraduates must complete the university general studies requirements and additional fundamental requirements prescribed by the College of Public Programs and the School of Justice Studies. For descriptive information on these requirements, refer to "University General Studies Program Requirement" on pages 45-65, "Baccalaureate Degree Requirements" on pages 319-320, and the *Undergraduate Advisement Guide*, available in WILSN 342 and via requests by mail or phone (602 965 7727).

Justice Studies Program. The required justice studies component consists of 51 semester hours, of which 15 must be taken in a related field approved by the school. JUS 105 (or 305), 301, 302, and 303 are required for all degree candidates. Through advisement, a group of justice studies courses may be recommended to ensure a comprehensive exposure appropriate to the student's interests. For specific information in this area, refer to the *Undergraduate Advisement Guide*.

Electives. Students are encouraged to utilize the unique opportunities afforded by the university to pursue personal and educational interests, whether in the form of a broad sampling of other disciplines or the deeper probing of a single field. Any course offered by the university may be used as an elective.

Transfer of Community College Credits. Credits transferred from accredited community colleges are accepted as lower division credits up to a maximum of 64 semester hours. The acceptance of credits are determined by

the director of Admissions, and the applicability of credits toward degree requirements is determined by the faculty of the School of Justice Studies.

Special Program Option. The School of Justice Studies participates in the accelerated degree program of the College of Public Programs, by which eligible students may complete the bachelor's and master's degrees on an accelerated schedule. See "Accelerated Degree Programs," page 320.

JUSTICE STUDIES

JUS 100 The Justice System. (3) F S SS
Overview of the justice system. Roles of law enforcement personnel, the courts, and correctional agencies. Philosophy and theoretical views in historical perspective. *General studies SB.*

105 Introduction to Justice Studies. 3 F S SS

Introductory overview to the study of justice from a social science perspective. Primary topics include justice theories and justice research. Not open to students with credit in JUS 305. This course is appropriate for freshmen and sophomores. Lecture, discussion

200 Concepts and Issues of Justice. (3) F S, SS

Issues relating to justice policies, perspectives, techniques, roles, institutional arrangements, management, uses of research, and innovative patterns. *General studies SB*

294 Special Topics. 1-3) F, S, SS

Topics chosen from various fields of justice studies. Pre- or corequisite: JUS 105 or 305 or instructor approval

301 Research in Justice Studies. (3) F S SS

Focuses on developing and evaluating research designs, data collection, and the relationship between validity and reliability. Methods for conducting research are also stressed. Pre- or corequisites: JUS 105 or 305 or instructor approval. Open to Justice Studies students only.

302 Basic Statistical Analysis in Justice Studies. (3) F, S, SS

Introduction to the fundamentals and application of descriptive and inferential statistics, with emphasis in the justice area. Prerequisites: JUS 105 or 305 or instructor approval. The university mathematics requirement. *General studies N2*

303 Justice Theory. (3) F S, SS

An examination of classic and contemporary philosophies and theories of justice, including legal, social, and criminal justice. Prerequisite: Justice Studies major. Pre- or corequisite: JUS 105 or 305 or instructor approval

305 Introduction to Justice Studies. (3) F S SS

Introductory overview to the study of justice from a social science perspective. Primary topics include justice theories and justice research. Not open to students with credit in JUS 105. This course is appropriate for juniors and seniors. Students will complete additional assignments in order to receive upper division credit. Lecture, discussion

306 The Police Function. (3) F S SS

Aternative objectives, strategies, programs, institutional arrangements, roles, perspectives, and interagency relationships of the police. Lecture, discussion. Pre- or corequisite: JUS 105 or 305 or instructor approval.

308 The Adjudication Function. (3) F S SS

History and development of courts, trial by jury, and other dispute resolution mechanisms. Selection and removal of judges and jurists. Organization, structure, and jurisdiction of courts. Trial and nontrial processes of the judiciary. Lecture, discussion. Pre- or corequisite: JUS 105 or 305 or instructor approval

310 The Correctional Function. (3) F, S, SS

Aternative correctional objectives, strategies, programs, institutional arrangements, roles, perspectives, and interagency relationships. Lecture, discussion. Pre- or corequisite: JUS 105 or 305 or instructor approval

311 Prevention of Delinquent and Criminal Behavior. (3) F S SS

Theories of prevention and individual, group, and community approaches. Intervention at appropriate stages; contemporary law enforcement and corrections practices. Lecture, discussion. Pre- or corequisite: JUS 105 or 305 or instructor approval.

320 Community Relations in the Justice System. (3) F S, SS

Focus on developing an informed plan and policy for incorporating research findings about the surrounding community within various justice services and agencies. Topics include social stratification, minority groups, and victimology. Lecture, discussion. Pre- or corequisite: JUS 105 or 305 or instructor approval

329 Domestic Violence. (3) F S SS

Legal aspects of domestic violence in context of history, theory, and treatment aspects of domestic violence, including child abuse, women battering, incest, marital rape, and elder abuse. Lecture, discussion. Pre- or corequisite: JUS 105 or 305 or instructor approval.

335 Organized Crime. (3) F S

The nature of organized crime and its legal activities. Theories of containment, and efforts by justice agencies to counter its dominance in society. Lecture, discussion. Pre- or corequisite: JUS 105 or 305 or instructor approval

340 Juvenile Justice. (3) F S SS

A critical examination of the history and development of the juvenile court and the juvenile justice system. Lecture, discussion. Pre- or corequisite: JUS 105 or 305 or instructor approval.

360 Law and Social Control. (3) F S, SS

Resolution of social issues through the application of law as an agent of social control. Nature, sanctions, and myths of law. Categories of law and schools of jurisprudence. Lecture, discussion. Pre- or corequisite: JUS 105 or 305 or instructor approval. *General studies SB*

370 Women, Work, and Justice. (3) F S, SS

Examination of gender inequality in the workplace, including the nature of women's work, theoretical issues, and models for promoting gender justice at work. Lecture, discussion. Pre- or corequisite: JUS 105 or 305 or instructor approval

394 Special Topics. (1-3) F, S, SS

Topics chosen from various fields of justice studies. Lecture, discussion. Pre- or corequisite: JUS 105 or 305 or instructor approval

404 Imperatives of Proof in the Justice System. (3) F S SS

Problems and means of establishing identity and fact in relation to arrest, detention, adjudication, sentencing, and correctional case management. Lecture, discussion. Pre- or corequisites: JUS 105 (or 305) and a minimum cumulative GPA of 2.50 (or major status) or instructor approval

422 Women, Law, and Social Control. (3) F S SS

An examination of social, economic, and legal factors that are relevant to mechanisms of social control of women, including formal legal control and informal control through violence. Pre- or corequisites: JUS 105 (or 305) and a minimum cumulative GPA of 2.50 (or major status) or instructor approval.

435 White Collar Crime. (3) F S, SS

Overview of major issues in business professions and official rule violations, including consumer fraud, securities violations, unethical professionalism, and political corruption. Lecture, discussion. Pre- or corequisites: JUS 105 or 305 and a minimum cumulative GPA of 2.50 (or major status) or instructor approval

440 Organization and Administration of the Justice System. (3) F, S, SS

Introduction to basic research theories and their application to criminal justice management. Emphasis on supervisory and middle management theory and policy development. Lecture, discussion. Pre- or corequisites: JUS 105 or 305 and a minimum cumulative GPA of 2.50 (or major status) or instructor approval.

460 Feminism and Justice. (3) F S, SS

Explores feminist thought and critiques traditional political theories. Examines issues of racism, sexuality, and the law. Lecture, discussion. Pre- or corequisites: JUS 105 (or 305) and a minimum cumulative GPA of 2.50 (or major status) or instructor approval

461 Substantive Criminal Law. (3) F, S, SS

Criminal liability. Crimes against persons, property, and society. Governmental sanctions of individual conduct as formulated by legislatures and the courts. Lecture, discussion. Pre- or corequisites: JUS 105 (or 305) and a minimum cumulative GPA of 2.50 (or major status) or instructor approval.

462 Procedural Criminal Law. (3) F S, SS

The criminal process. Constitutional and legal problems associated with arrest, search and seizure, and due process of law. Lecture, discussion. Pre- or corequisites: JUS 105 (or 305) and a minimum cumulative GPA of 2.50 (or major status) or instructor approval

463 Discretionary Justice. (3) F, S, SS

Use and abuse of discretion in all phases of the justice system and society. Key issues and manifestations of discretion. Theoretical and empirical linkages between discretion and discretion. Lecture, discussion. Pre- or corequisites: JUS 105 (or 305) and a minimum cumulative GPA of 2.50 (or major status) or instructor approval. *General studies L2, SB*

469 Political Deviance and the Law. (3) F S SS

An examination of the controversies created by political and deviant behavior, including a critical view of law as an agent of social control. Lecture, discussion. Pre- or corequisites: JUS 105 (or 305) and a minimum cumulative GPA of 2.50 (or major status) or instructor approval. *General studies SB*

474 Legislation of Morality. (3) F, S SS
Understanding basic questions and contemporary issues related to law and morality. Process of creating and enforcing morality statutes (e.g., prostitution). Prerequisite: JUS 105 (or 305) and a minimum cumulative GPA of 2.50 (or major status) or instructor approval. *General studies: L2*

484 Internship. (3–6) F, S, SS
Assignments in a justice-related placement designed to further the student's integration of theory and practice. Internships are arranged through consultation of students with placements. Students must consult with the school for appropriate application and registration procedures. May be taken for a total of 12 hours credit, of which a maximum of 6 are applied to the major. Prerequisite: JUS 105 (or 305) and a minimum cumulative GPA of 2.50 (or major status) or instructor approval.

494 Special Topics. (1–3) F, S, SS
Topics chosen from various fields of justice studies. Lecture, discussion. Prerequisite: JUS 105 (or 305) and a minimum cumulative GPA of 2.50 (or major status) or instructor approval.

498 Pro-Seminar. (1–3) F, S, SS
Small group study and research for advanced students. May be repeated for credit up to a maximum of 9 hours, no more than 3 applied to the major. Prerequisites: JUS 105 or 305 and major status and a minimum cumulative GPA of 3.00 or instructor approval.

499 Independent Study. (1–3) F, S, SS
Original study or investigation in the advanced student's field of interest under the supervision of a faculty member. May be repeated for credit up to a maximum of 6 hours, applicable to the major. Readings, conferences, tutorials. Prerequisites: JUS 105 or 305; instructor approval; Justice Studies students must have major status; minimum cumulative GPA of 3.00; minimum GPA in JUS courses of 3.00; senior standing.

500 Justice Research Methods. (3) F, S, SS
Theories and methods of research with emphasis on development of designs most relevant to justice data and problems.

501 Justice System, Theory, and Issues. (3) F, S
Analysis of the justice structure and process within various theoretical frameworks. Issues such as discretion, diversion, and plea negotiations.

502 Primary Management in Justice Agencies. (3) S
Concepts of modern management and their application to justice-related agency supervision and management.

503 Crime and Social Causation. (3) S
Theories of deviance and crime as they relate to social policies and specific responses of the justice complex.

509 Statistical Problems in Justice Research. (3) F, S
Methodological problems of research design and statistical methods specific to justice studies.

510 Understanding the Offender. (3) F
Survey of learning personality and biological theories of causation and their relevance to understanding criminal and delinquent behavior.

514 Justice Policy. (3) F
Assessment of the policies of justice policy as well as an understanding of the basic tools available to social scientists for analyzing the formulation, implementation, and evaluation of justice policy.

520 Qualitative Theory and Data Collection. (3) F
The basic theoretical rationale and perspectives for justice-related qualitative research, e.g., symbolic interactionism. Techniques for data collection e.g., ethnography and depth interviewing.

521 Qualitative Data Analysis and Evaluation. (3) S
Analysis of qualitative data, e.g., field notes, depth interview transcripts, document analysis, coding, and retrieval with a microcomputer: qualitative evaluation.

540 Justice Administration. (3) S
Administrative policies and practices used in justice agencies and their application to the various facets of the justice administration process.

541 Justice Planning: Innovation and Change. (3) S
Normative factors in planning for standards and goals in the justice system. Application of innovation and change techniques in an interdependent system.

547 Program Evaluation. (3) F, S, SS
Nature and role of program evaluation; types, program monitoring, impact and process assessment, evaluation assessment, methods, utilization, and politics of evaluation. Lecture, lab. Cross-listed as PAF 547. Prerequisite: JUS 500 recommended.

560 Women and Crime. (3) F
Nature and extent of female crime, causation theories, and the treatment of females in the law and justice system.

570 Juvenile Delinquency. (3) F
Study of delinquency, including causation theories. Alternative definitions of delinquency, official statistics, and the critique and analysis of the interaction between social institutions and youth.

571 Juvenile Justice System. (3) S
Graduate-level introduction to juvenile justice system: childhood development, philosophical orientation, organizational structure, and contemporary controversies.

579 Political Deviance. (3) F
The seminar examines the politics of deviance by integrating the study of conflict with aspects of social organization especially state formation.

584 Internship. (3 or 6) F, S, SS
Assignments in a justice agency designed to further the student's integration of theory and practice. Placements are arranged through consultation with students and agencies.

591 Seminar. (1–3) F, S, SS
Topics chosen from various fields of justice studies. May be repeated for credit.

610 Law and the Social Sciences. (3) S
Normative conceptualizations of law; law and the administrative state, impacts of law on society; discretion: street-level bureaucrats, and the living law.

620 Justice Research and Methods. (3) F
Concept development: research design, data collection strategies, legal research, and building computer databases relevant to the study of justice.

630 Data Analysis for Justice Research. (3) F
Bivariate and multivariate techniques of data analysis and hypothesis testing for justice-related research and use of information and statistical programs.

640 Theoretical Perspectives on Justice. (3) F
Analysis of philosophical perspectives of justice linkages between social science theory and justice constructs: application of justice to social issues.

Omnibus Courses: See page 40 for omnibus courses that may be offered.

Leisure Studies

Maria T. Allison
Chair
(GHALL 204) 602/965-7291

PROFESSORS
ALLISON, CHEATHAM, HALEY
ASSOCIATE PROFESSORS
TEYE, YOSHIOKA
ASSISTANT PROFESSORS
MADRIGAL, VIRDEN
PROFESSOR EMERITUS
GREEY

DEPARTMENTAL MAJOR REQUIREMENTS

Freshmen enrolling in the Department of Leisure Studies and students transferring from other departments within the university must have completed 56 semester hours with a minimum 2.50 cumulative GPA before being officially admitted with major status to the Bachelor of Science degree program in Recreation. As part of this minimum requirement, students must successfully complete REC 160 and both ENG 101 and 102 or ENG 105 (or the English Proficiency Examination) with a grade of "C" or better.

Transfer students who have completed 56 semester hours or more at another institution must remove any of the above course or scholastic deficiencies before being admitted with major status to the Bachelor of Science degree program in Recreation.

Students must complete the university general studies requirements and the College of Public Programs' course requirements in addition to major requirements. General studies courses may not be used concurrently toward the general studies requirement and related requirements within the major core.

RECREATION—B.S.

The Bachelor of Science degree program in the Department of Leisure Studies centers around the systematic study of leisure related phenomena, including human behavior and development, resource use, environmental and social issues, and public policy. It is a professional program that features full exposure of students to a multifaceted concept of leisure and the quality preparation of these students for professional level entry into leisure service occupations.

This multidisciplinary degree program is designed to provide the student with the competencies necessary for employment in management positions in such diverse leisure delivery systems as municipal recreation and park departments, county park departments, YMCA's, Boys and Girls Clubs of America, visitor and convention bureaus, senior centers, retirement communities, resorts, and other components of the tourism commercial recreation industry. Graduates have also been employed by state offices of tourism, state parks departments, and various federal recreation resource agencies.

PROGRAM REQUIREMENTS

This 63 hour Bachelor of Science degree program consists of 30 hours of major core courses and 33 hours of recreation related course work. The major core courses appear below. All upper-division courses require a minimum cumulative GPA of 2.50 for admission. REC 160, 330, 462, and 463 must be taken in sequence and not concurrently.

	<i>Semester Hours</i>
REC 120 Social Psychology of Play	3
REC 160 Leisure and Society	3
REC 330 Programming and Marketing Leisure Services	3
REC 364 Recreation for Special Populations	3
REC 462 Administration of Leisure Services	3
REC 463 Senior Internship	12
REC 498 Pro Seminar	3
Total	30

Of the required 33 hours of related course work, 15 hours may be freely chosen from a list of recreation related courses offered by the Department of Leisure Studies. The remaining 18 hours must be selected from a departmental master list of approved university courses. The student must choose

two courses from each of the following designated areas:

- 1 human behavior (includes courses in anthropology, psychology, and sociology);
2. communication sciences (includes courses in communication, English, and mass communication); and
3. management and public administration (includes courses in management, marketing, political science, and urban planning).

Certificate Programs. In addition to the Bachelor of Science degree in Recreation, two departmentally sponsored certification programs are offered in the areas of tourism/commercial recreation (12 hours of course work) and youth agency administration/American Humanics (14 hours of course work). The above certificate course work can be included in the 15 required recreation related hours that must be taken from the list of recreation courses offered by the Department of Leisure Studies.

Tourism and Commercial Recreation Certificate. This certificate of completion program provides an academic approach to the tourism/commercial recreation industry. By focusing on both conceptual and practical aspects in tourism/commercial recreation, this certificate program endeavors to familiarize the student with current professional problems and opportunities.

Required courses in this program are as follows:

	<i>Semester Hours</i>
REC 305 Introduction to Travel and Tourism	3
REC 372 Tourism Destination Development	3
REC 458 International Tourism	3
REC 494 Special Topics	3
Total	12

**Youth Agency Administration/
American Humanics Certificate Program.** This certificate of completion program features professional affiliation with and certification by American Humanics, Inc., the national leader in education for youth and human service agency administration. American Humanics represents such agencies as the American Red Cross, Big Brothers/Big Sisters, Boys and Girls Clubs of America, the Boy Scouts of America,

Camp Fire, 4 H, Girls Clubs of America, the Girl Scouts of the USA, Junior Achievement, the United Way, YMCA, and YWCA.

This program provides an academic approach featuring unique issues of voluntary, not for profit agency management and includes active participation by agency professionals who offer workshops, seminars, field trips, and cooperative education experiences.

	<i>Semester Hours</i>
REC 300 Fund Raising	3
REC 310 Volunteerism	3
REC 320 Youth and Human Service Workshop	4
REC 420 American Humanics Institute	1
REC 430 Youth Agency Administration	3
Total	14

Additional Department Requirements. Two hundred hours of recreation leadership experience are required before enrollment in REC 463 Senior Internship. Students are not permitted to take additional course work during their senior internship placement period. Approval of internships for main campus students must be requested from the Department of Leisure Studies office on the main campus.

A student must attain a grade of "C" or higher in all courses within the major, including the related area. Specific courses that may be used to fulfill the related requirements are listed in a brochure available in the department.

RECREATION

REC 120 Social Psychology of Play. (3) F, S, SS

An introduction to the psychological, social, and cultural foundations of play and leisure behavior. *General studies* SB.

150 Outdoor Pursuits. (3) SS
Theories and practical applications related to outdoor recreation pursuits. Interdisciplinary approach to wilderness issues and philosophy culminating in an outdoor experience. Field trip required.

160 Leisure and Society. (3) F, S, SS
Analysis of the human relationship to leisure. Historical survey of philosophical, psychological and socioeconomic bases for development of systems that provide leisure programs. *General studies* SB.

210 Leisure Delivery Systems. (3) N
Systematic study of delivery of leisure services in public commercial and independent sectors. Particular emphasis placed on the urban setting. Prerequisites: REC 160 Recreation major or premajor

300 Fund Raising. (3) F
Methods, techniques, and directed experience in fund raising for voluntary youth and human services agencies. Budget control and accountability.

305 Introduction to Travel and Tourism. (3) F, S

An examination of the components of the travel and tourism industry at the state, national, and global levels.

310 Volunteerism. (3) F
Administration of volunteer service programs. Study and analysis of the volunteer personnel process.

320 Youth and Human Service Workshop. (1) F, S

Forum for exchange between students and professional agency personnel. Variable topics, guest speakers. Prerequisite: instructor approval.

330 Programming and Marketing Leisure Services. (3) F, S

Foundations for effective marketing and programming of leisure services in the public, not-for-profit, and private sectors. Prerequisites: REC 160; Recreation major. *General studies: L2.*

340 Outdoor Survival. (3) F, S, SS
Interdisciplinary approach to outdoor survival, including attitudes, psychological stress, physiological stress, preparation, hypothermia, navigation, flora, and wildlife. Field trips required.

360 Recreation Resource Management and Policy. (3) N

Management and decision making in recreation resource agencies. Policy analysis and use conflicts. Prerequisite: Recreation major.

364 Recreation for Special Populations. (3) F, S

Concepts, methods, settings involving recreational services as applied to special groups in American society; e.g., youthful and adult offenders, alcoholics, drug addicts, mentally retarded, mentally ill, and physically handicapped. May include field experience. Prerequisite: Recreation major.

370 Outdoor Recreation Systems. (3) F
Introduction to outdoor recreation resource delivery systems; history of wilderness and outdoor recreation resources; the role of outdoor recreation in society; outdoor recreation agencies; related environmental issues. Prerequisite: junior standing or instructor approval.

372 Tourism Destination Development. (3) F

Application of economic and regional development concepts/theories to destination product development. Prerequisites: REC 305; Recreation major.

380 Leisure and the Environment. (3) S
An examination of relationships between the environment and leisure behavior. Issues include open space, crowding, area design, and attachment to place.

400 Therapeutic Recreation. (3) A
Principles, practices of program development, evaluations, professional roles, and support services related to therapeutic recreation service. Off-campus labs. Prerequisites: REC 364; Recreation major.

415 Tourism Transportation Systems. (3) F, S

Examination of the role of various modes of transportation in domestic and international tourism development. Prerequisite: REC 305.

420 American Humanics Institute. (1) F, S
Mini-intensive national management institute for voluntary youth and human service agency personnel. Out-of-state conference required. Prerequisite: instructor approval.

430 Youth Agency Administration. (3) S
Analysis of administrative structure, decision-making, and program delivery within voluntary youth and human service agencies.

440 Areas and Facilities. (3) N

Public, private, and commercial recreation areas and facilities. Survey of design, function, aesthetics, and relationships.

450 Recreation and Aging. (3) N

Organized recreation services and facilities for the aged. Socioeconomic considerations affecting delivery of comprehensive leisure services to the elderly. Off-campus lab. Prerequisite: instructor approval.

458 International Tourism. (3) F

A global examination of international tourism and its significance as a vehicle for social and economic development. *General studies: G.*

460 Issues in Therapeutic Recreation. (3) A

Contemporary problems/issues confronting the therapeutic recreation field: professional development, programs and services, legislation, philosophical and research issues. Off-campus lab. Prerequisites: REC 364; Recreation major.

462 Administration of Leisure Services. (3) F, S

Basic principles of administration and their application in successful administrative situations. Analysis of administrative function, structure, and policies. Prerequisites: REC 330; Recreation major.

463 Senior Internship. (6 or 12) F, S, SS

Supervised guided experience in selected agencies. Prerequisites: REC 462; senior standing; Recreation major.

500 Research Methods I. (3) S

Introduction to recreation research methods, with emphasis on methodological questions, research issues, and techniques relevant to contemporary social research. Prerequisite: approved statistics course, 500 level or above.

540 Recreation Services for the Aged. (3) N
An applied orientation to the social/psychological theories of recreation and the aged.

552 Historical and Philosophical Foundations of Leisure. (3) F

An analysis of the fundamental historical and philosophical concepts, issues, and problems confronting the leisure studies profession.

555 Social and Psychological Aspects of Leisure Behavior. (3) A

An empirical and theoretical analysis of social, cultural, and psychological foundations of leisure behavior.

558 Integrative Seminar. (3) A

Advanced exploration and assessment of current trends within the leisure studies profession. This course has variable topics, including, but not limited to: cross-cultural analysis of leisure, urban recreation, planning and resources, sociocultural dimensions of tourism development, wilderness management. Prerequisite: REC 552.

569 Current Issues in Tourism. (3) F

General survey of the tourism literature with an emphasis on relevant theories, concepts, and current research.

570 Social Aspects of Outdoor Recreation Management. (3) S

An analysis of the social aspects of natural resource recreation management and planning. Prerequisite: REC 370 or equivalent.

Omnibus Courses: See page 40 for omnibus courses that may be offered.

School of Public Affairs

N. Joseph Cayer

Director

(WILSN 208) 602/965-3926

PROFESSORS

BECKER, CAYER, COOR, DANEKE,
HALL, MANKIN, MONTIEL,
MUSHENO, MUSHKATEL,
PERRY, WESCHLER

ASSOCIATE PROFESSORS

BROWN, PIJAWKA

ASSISTANT PROFESSORS

ALOZIE, CAMPBELL, LAN, REED

PROFESSOR EMERITUS

SACKTON

The faculty in the School of Public Affairs offer a graduate program leading to the professional degree Master of Public Administration (M.P.A.). The M.P.A. degree is accredited by the National Association of Schools of Public Affairs and Administration (NASPAA) Commission on Peer Review and Accreditation and is listed on the Annual Roster of Accredited Programs in conformity with NASPAA standards. The faculty also participate in the interdisciplinary degree program leading to the Doctor of Public Administration. Consult the *Graduate Catalog* for information about these programs. The basic aims of the school are as follows:

1. to offer professional education programs leading to graduate degrees in Public Administration and to encourage mid-career education for public administrators by offering evening course work at the ASU

main campus, the ASU Downtown Center, and the state government complex;

2. to maintain a research program designed to identify problems, disseminate information, and propose solutions to major public problems; and
3. to provide a high level of public service in meeting needs in Arizona and the nation.

ADVANCED PUBLIC EXECUTIVE PROGRAM (APEP)

APEP is designed to provide the public sector executive with analytical approaches and skills that help mobilize ideas, people, and resources in support of public programs. To meet these objectives, APEP uses interdisciplinary faculty teams to provide a series of short courses, seminars, and other training devices to help public managers become more effective and efficient.

MORRISON INSTITUTE FOR PUBLIC POLICY

Created by a grant from Marvin and June Morrison in 1981, the institute acts as a liaison among government officials, university faculty, and the private sector to identify and provide analysis of timely public-policy issues. In fulfilling this role, Morrison Institute conducts descriptive and original research, conferences, and consultations and produces publications on a wide range of topics, including urban growth, natural resources, education, government systems, health care, social services, the quality of life, and economic development. The institute also sponsors a Legislator's Institute annually and is active in providing research for city and state town hall projects.

PUBLICATIONS DIVISION

The division is a resource unit created to encourage faculty research on current topics of public interest through its publications program. Its purpose is the dissemination of research on public policy and public administration to academics, public managers, officials, and concerned citizens, with a focus on issues of special importance to Arizona.

The program publishes policy, research, and management papers and a semiannual newsletter on the activities of the School of Public Affairs. The

division also supports the other research units of the school by publishing their work or providing technical assistance

PUBLIC AFFAIRS

PAF 500 Research Methods I. (3) F, S
Presentation of multivariate statistics, computer applications and introduction to major research design issues. Prerequisite: an approved course in statistics

500 Research Methods II. (3) F, S
Advanced treatment of design and measurement issues with emphasis on applied research projects by students. Prerequisite: PAF 500

501 Statistics in Administration. (3) F, S
Application of statistical methods to problems in finance, personnel, survey and planning

502 Computers in Administration. (3) A
Experience in use of computer technology for public administration problem solving

503 Organization Theory. (3) N
Organization theories and current research emphasis with application to public administration administrative organizations.

504 Comparative Administration. (3) N
Literature on comparative public administration theory, bureaucracies and their impact on the political development process. Selected nations will be studied

505 Intergovernmental Relations. (3) N
Evolution, growth, present status and characteristics of the U.S. federal system of government. Federal state relations, state-local relations, regionalism, councils of government, interstate cooperation, grants in aid and revenue sharing

506 Regional Cooperation, Programs, and Associations. (3) N

Inter- and intrastate regional politics and administrative cooperative devices and bodies

507 Bureaucracy and Public Affairs I. (3) F, S
Analyses of the conceptual and contextual elements of public administration and policy.

508 Bureaucracy and Public Affairs II. (3) F, S

Analyses of public administration concepts applied to management situations including personnel, finance, budgeting decisions making, and implementation

509 Organization Change and Development. (3) N
Exploring the nature and management of change and development as a tool to achieve organizational goals; effecting planned change

510 Governmental Budgeting. (3) F, S
Legal, social, economic and political nature of governmental budgets and the budgetary process. Theories and social consequences of budget decisions making and practices of budget control

511 Governmental Finance Management. (3) A
Sources of funding, management of funds and debts and general pattern of expenditures, states, counties, cities, and districts. Prerequisite: PAF 510

512 Public Affairs Economics. (3) A
Role of economics in public affairs with examples from transportation, urban form. Roadside project, housing and use, food control, growth, and aspects of energy economics

520 Public Management. (3) A
The management process in government and public agencies, with emphasis on the executive leadership within the public sector.

521 Public Personnel Management. (3) A
History of the civil service, recruitment, selection, position and wage classification, motivation analysis, productivity, public unionism and ethics in public service.

522 Public Labor Relations. (3) A
Role of public unionism, managerial policy toward unionism, conflict resolution, impact of unionism on budgets, personnel policies and public policy

523 Public Information Systems. (3) A
Systems analysis concepts and theory as applied to administration. Alternative modes of information organization and their impact on public decision making.

524 Community Conflict Resolution. (3) N
Interdisciplinary approach to understanding the dynamics of community conflict. Strategic considerations in policy design and advocacy; potential reactions to conflict. Relevant models and research findings generated by both case studies and comparative methods.

525 Public Program Management. (3) A
Governmental service programming formulation, financing, operating, evaluation, and reporting. Analysis of interagency relationships and the role and conduct of research in the programming process.

526 Public Sector Human Resource Development. (3) A
Concepts and techniques of organizational development in the public sector including staffing, supervisor training, executive development, resource planning, and employee training

530 Management of Urban Government. (3) A
Administrative practices and behavior within the urban political-administrative environment. Functional areas such as citizen participation, urban planning, urban transportation, and the conflicts between urban politics and administrative efficiency.

531 Comparative Urban Administration. (3) N
Development of urban governments with different cultures, social and political milieu. Cities within developing countries as well as in the developed countries of Europe and North America

532 Urban Planning Administration. (3) A
Historical and present day uses of urban planning and procedures for its implementation on basic principles and practices

533 Politics of Urban Planning. (3) A
Urban planning policy issues frequently faced by local, state, and federal government. Consideration of the relationships between the political leader, the professional planner, and the citizen

535 The City and County Manager. (3) A
The manager's role and resources in the differing forms of administrative and community sectors

- 540 Public Policy Analysis.** (3) A
Theories which attempt to explain public policy formulation. Application of social science to policy issues.
- 541 Topics in Public Policy Analysis.** (3) A
May be repeated for credit. Topics may include but are not limited to the following:
(a) Aging
(b) Art
(c) Education Policy
(d) Environmental Public Policy
(e) Health
(f) National Public Policy
(g) Public Safety
(h) Recreation
(i) Transportation
(j) Welfare
- 542 Science, Technology, and Public Affairs.** (3) N
The influence of science and technology on governmental policy making, scientists as administrators and advisors, governmental policy making for science and technology, government as a sponsor of research and development.
- 543 Public Management of Land.** (3) N
Description and analysis of urbanization processes. An emphasis is placed on the application of urban theories to developing urban centers, with a focus on Maricopa County.
- 544 Preparation of Reports in Public Administration.** (3) N
Intensive practice in written and oral presentation of reports to conferences covered with problems in public administration. Visual aid techniques.
- 545 Research Data Management.** (3) N
Techniques and problems associated with data management in a research environment. Database management systems, security and integrity, accessibility, and cost.
- 546 Database Management Systems in Public Administration.** (3) N
Concept and use of modern database management systems in an administrative organization. Advantages and disadvantages of this approach.
- 547 Program Evaluation.** (3) N
Various methodologies available for the evaluation of public policies and programs. Cross-listed as JUS 547.
- 548 Women, Politics, and Public Policy.** (3) N
Explores how political philosophy, politics, and public policy affect and are affected by women.
- 549 Minority Communities and Public Policy.** (3) A
Examines public policy issues of concern to or affecting Black, Latino, and American Indian communities, as well as those groups' impact on the policy process. Seminar.
- 550 Survey Research in the Public Sector.** (3) N
Design and implementation of survey research methods, with an emphasis on public sector applications. Prerequisites: PAF 500 and 501 or JUS 500 and 509 or instructor approval.
- 551 Urban Planning Evaluation.** (3) N
Concepts, principles, and methods employed by public planners in the analysis of urban problems involving multiple criteria decisions. Prerequisite: formal graduate-level course work in statistics and planning.
- 552 Urban Housing Policy.** (3) N
Comprehensive consideration of the revitalization of American cities with major emphasis upon the housing process and related institutions and services.
- 553 Social Impacts of Planning.** (3) N
Analyzes the planning needs of various social groups in urban settings and the appropriate mechanisms of public sector planning for multiple publics.
- 554 Urban Growth Administration.** (3) N
Examines the process of urban growth and change. Partnership roles played by public and private sectors in management are emphasized.
- 555 Environmental Policy and Management.** (3) N
Analysis of environmental policy and planning issues and principles related to the analysis and management of natural and urban/regional resources.
- 556 Urban Policy Making.** (3) A
Analysis of the opportunities and costs of influencing public policy and the roles of officials and bureaucracies in decision making.
- 560 Information Management.** (3) A
Concepts and theory of information and information technology in public sector organizations.
- 570 Advanced Public Policy Analysis.** (3) A
Course emphasizes the structure of policy problems, forecasting policy alternatives, optimizing resources, and reducing uncertainty in policy making. Prerequisite: PAF 540.
- 591 Seminar.** (1-12) F, S
Topics may include but are not limited to the following:
(a) General Public Administration
(b) Public Finance Administration
(c) Public Management
(d) Urban Affairs and Urban Planning
(e) Public Policy Analysis
(f) Information Management
(g) Business and Government
(h) Emergency Management
(i) Planning Workshop. (3) N
Practical team research and field experience. Emphasis on the synthesis of public sector planning methodologies, concepts, and techniques applied to a local planning problem.
- 600 Research Design and Methods.** (3) F
Advanced methods of research design and analysis. Prerequisites: formal graduate level course work in statistics and in research methods.
- 601 Seminar: Policy Analysis and Program Evaluation.** (3) S
Normative and conceptual issues of policy formulation, implementation, and evaluation; empirical approaches and methods of program evaluation and policy analysis.
- 602 Seminar: Foundation of Public Administration.** (3) F
Ethical, social, legal, and philosophical foundations of public administration.
- 603 Seminar: Organization and Behavior in the Public Sector.** (3) S
Structure, organization, conduct, and performance of public sector institutions in the administration of public policy. Prerequisite: PAF 602.
- Omnibus Courses:** See page 40 for omnibus courses that may be offered.



School of Social Work

Peter M. Kettner, D.S.W.
Interim Dean

PURPOSE

The purpose of the School of Social Work is to prepare professional social work practitioners who are committed to understanding and serving those most in need of help, who are willing to devote their careers to finding the most effective methods of intervention, who place the highest values on excellence, and who take pride in their practice.

The mission of the School of Social Work is the training of professional social workers for beginning level generalist practice and for clinical, administrative, and community practice focused on those populations who are most oppressed and most in need of the services social workers have to offer. A special emphasis is placed on working with ethnic minorities of the Southwest.

The school is totally committed to the university's mission to be competitive with the best public research universities in the country. Faculty members have active research agendas under way that venture into a wide variety of topics, including work with children, with drug and alcohol abusers, with the developmentally disabled, in human services planning, and in many other areas of interest.

ORGANIZATION

The School of Social Work has no separate departments or units. Generally speaking, curriculum planning, faculty teaching areas, and student advising tend to cluster around four programmatic areas: the Bachelor of Social Work (B.S.W.), the Master of Social Work direct practice concentration (M.S.W. DP), the Master of Social Work planning, administration and community practice concentration (M.S.W. PAC), and the Doctor of Philosophy (Ph.D.) with a major in Social Work. Some faculty teach in more than one of these programmatic areas.

ADMISSION

Bachelor of Social Work

The Bachelor of Social Work degree program is divided into the pre Social Work major and the Social Work major.

The pre Social Work major consists of freshman and sophomore students who have been admitted to the university and have declared Social Work as their major, as well as students transfer

ring to the School of Social Work from other colleges within the university and other universities or junior colleges who have not completed the admission requirements to the program. Students transferring from other universities or community colleges as premajors should follow the procedure outlined on pages 27 and 30-31 of this catalog. Students transferring from other colleges within the university must obtain a Change of College form from the School of Social Work Student Services Office, WHALL 137.

Admission Procedure for Social Work Majors. This procedure is for students who have 54 semester hours or more and have taken SWU 271, 291, 301, and 310. Students wishing to enter the Social Work major are required to apply for admission to the program in addition to obtaining an official Certificate of Admission to the university. Students are eligible to apply for admission to the Social Work major during the last semester of the sophomore year. It is expected that applicants have completed 54 semester hours and the required Social Work courses by the end of the semester in which they are applying. Students are admitted to the major at the beginning of the term following the semester during which they apply.

A student may obtain a Social Work major application packet at the School of Social Work Student Services Office, WHALL 137, or request that one be mailed to his or her home address by calling 602/965-6081.

Applicants are reviewed for admission for the fall and spring semesters. Students applying must have a Certificate of Admission to the university in their files by November 1 for spring admission and March 1 for fall admission. Students should allow at least four additional weeks to receive acceptance. All other application materials (i.e., application form, additional statement, and two letters of reference) must be returned to the School of Social Work Student Services Office, Arizona State University, Tempe, Arizona 85287 1802, by November 1 for spring admission or March 1 for fall admission. Failure to meet these deadlines may result in the applicant having to wait for the next admissions period. Applicants are notified by mail of the committee's decision within five weeks after the application deadline. Those

applicants who have been denied admission may request a conference to discuss the decision and to obtain guidance in the development of future plans.

Criteria for Admission. Admissions are based on the following criteria:

1. A minimum cumulative GPA of 2.00 is required.
2. A minimum cumulative GPA of 2.75 in core Social Work courses (SWU 271, 291, 301, and 310) and a grade of "C" or better in all Social Work courses are required.
3. Lower-division general studies requirements described by the university and as part of the B.S.W. program must be completed.
4. The applicant's educational and career goals must be compatible with the educational objectives of the school.
5. Before admission to the major, applicants must have a minimum of 240 hours experience in social work-related settings. Personal life experience (e.g., family or work background) may be substituted if it is described well in a social work context.
6. Three references are required for each applicant. Two references should be from persons who have known the applicant in a professional capacity. The third reference should be from the applicant's SWU 310 instructor and is used in the field placement process.

Admission is selective and based on available resources. Not all students who meet minimum requirements are admitted to the program.

Leave of Absence. Occasionally, for health or personal reasons, B.S.W. majors find it necessary to interrupt their studies. Students considering such requests meet with an advisor to look at alternatives and then meet with the director of Admissions to process the request and a feasible educational plan. A student may request a leave of absence from the Social Work program for a period of one year. (This leave applies only to the Social Work program and not to the university. No leave of absence is granted from the university.) Requests for a leave of absence must be made in writing. Except when recommended by the Committee

on Academic and Professional Standards, the student must be in good standing in the program at the time the request is made. Students should be aware that nonattendance at the university for one or more semesters requires reapplication to the university. Failure to request a leave of absence by B.S.W. majors results in removal from the program.

Readmission. Undergraduate students (premajor and major) who have previously attended ASU but have not been enrolled at this institution for one or more semesters are required to apply for readmission following university procedures as outlined on page 37. Students who were previously B.S.W. majors may, in addition, be required to reapply for major status.

Transfer Credit. Credits transferred from any accredited junior or community college are accepted up to a maximum of 64 semester hours. Community college students planning to transfer at the end of their first or second years should plan their community college courses to meet the requirements of the ASU curriculum selected. Students attending Arizona community colleges are permitted to follow the degree requirements specified in the ASU catalog in effect at the time they begin their community college work, providing their college attendance is continuous.

Courses transferred from community colleges are not accepted as upper-division credits earned at ASU. Arizona students are urged to refer to the *Arizona Higher Education Course Equivalency Guide* for the transferability of specific courses from Arizona community colleges. Copies of the guide are available in the Student Services Office, WHALL 137. In choosing courses at a community college, students should be aware that a minimum of 50 hours of work taken at the university must be upper-division credits. While attending a community college, students are encouraged to elect general studies and lower-division courses in the major field.

Direct transfer of courses from other accredited institutions to the School of Social Work is subject to the existence of parallel and equal courses in the school's curriculum. Transfer credit is not given for courses in which the low-

est passing grade ("D") or a failing grade ("E" or "F") was received.

Credit for "life experience" is not given in lieu of course requirements. A minimum of 30 semester hours earned in resident credit courses at ASU is required for graduation.

Master of Social Work

Applications to the M.S.W. program are accepted from November 1 to March 1 preceding the fall semester to which the applicant is seeking admission. All applicants are reviewed for admission for the fall semester only.

Regular Admission. Applicants must be acceptable to both the Graduate College and the School of Social Work. Among other considerations for acceptance by the Graduate College, the applicant must have a minimum GPA of 3.00 (4.00 = A) in the last two years of work leading to the bachelor's degree. The applicant's score on the aptitude examination—the Graduate Record Examination or Miller Analogies Test—is also considered in making decisions regarding admission.

Provisional Admission. Applicants with lower test scores or grades below minimum levels may be considered for provisional admission if there is counterbalancing evidence suggesting the potential of outstanding performance in the Master of Social Work program. Normally, final determination of removal of provisional status is made by the time the student has completed 12 hours of approved graduate study. The provisional student does not begin field work until this status has been changed. However, the student carries the same academic load as a regularly admitted student and is expected to meet the same standards for continuation in the program.

Application Procedure. The following items should be submitted to the Admissions Office, Graduate College, Arizona State University, Tempe, Arizona 85287-1003:

1. the application for admission to the Graduate College;
2. two transcripts from each institution where the applicant has attended previously; and
3. test scores from either the Graduate Record Examination or the Miller Analogies Test.

The following items should be submitted to the Admissions Committee, Graduate Program, School of Social Work, Arizona State University, Tempe, Arizona 85287 1802:

1. application to the Graduate Social Work program;
2. statement of educational and career goals in sufficient detail to indicate compatibility with the educational objectives and capabilities of the School of Social Work; and
3. three letters of reference using the reference letter forms provided by the School of Social Work.

Transfer Credit. Upon recommendation of the Admissions Committee, the first year of graduate study (up to 30 graduate semester hours) earned at another CSWE-accredited school of social work may be transferred toward the M.S.W. degree. A full transcript from the school at which the credit was obtained is required.

A maximum of nine graduate semester hours earned as an unclassified student in the ASU School of Social Work may be transferred. Up to six semester hours of prior graduate work in another ASU program or another university may transfer as elective credit if approved by the program director. A combination of credit earned as an unclassified student in other programs or universities may not exceed nine semester hours.

Consideration for acceptance of prior graduate credits must be applied for at the time of admission. The grades for all transfer credit must be a "B" or better.

Work offered toward a master's degree must be completed within six consecutive years. The six years begin with the first course included on a student's approved program of study.

Waiver Exams. The number of hours required to complete the M.S.W. degree ranges from 40 to 60 semester hours, with 60 hours representing the standard program. Admitted students may acquire credits toward the degree by (1) transferring in credit (see policy on transfer credit) or (2) waiving up to 20 hours of foundation course work as a result of successfully passing examinations offered in August of the year the student enters the graduate program. Waiver examinations are available for all foundation level courses.

Admitted students may waive, without examination, the courses listed below. B.S.W. students from other accredited programs must submit their course content material (course description, syllabus, and outline) and grades for review by an advisor and the M.S.W. director for an equivalency review. The following courses may be waived:

1. SWG 502 if the student has at least a 3.50 GPA for both SWU 301 and 402;
2. SWG 531 if the student has at least a 3.50 GPA for both SWU 331 and 432; and
3. SWG 533 if the student has at least a "B" in SWU 474.

With the exception of students transferring in the first year of graduate study from an accredited graduate program in Social Work, no student may be exempted from more than 20 hours of course work by either examination or a combination of transfer credit and examination. In the event that the student passes examinations in more than 20 hours of course work, the student replaces waived required courses with elective course work to complete the requisite 40 hours.

Part-Time Program. A limited number of students are admitted each year to a planned part-time program. Students interested in this option must specifically apply to the part time program. This program is completed in accordance with the plan developed. At least one academic year (i.e., two consecutive semesters, excluding summer school, of at least nine semester hours each) must be taken on a full-time basis. A maximum of one year of field education can be done by special arrangement in the agency where the student is employed.

Social Work—Ph.D.

In general, an applicant for the Doctor of Philosophy degree with a major in Social Work should hold a Master of Social Work degree from an accredited school of social work and have demonstrated professional growth in the practice of social work. Exceptions to this general requirement may be made for applicants with an advanced degree in a related field and exceptional practice or research experience in social work.

Admission to the Ph.D. program requires completion of all admission re-

quirements and procedures set forth by the Graduate College and test scores from the Graduate Record Examination (verbal and quantitative). Applications are accepted up to March 1 preceding the fall semester to which the applicant is seeking admission. Students are admitted only in the fall semester.

Application Procedure. The following should be submitted to the Admissions Office, Graduate College, Arizona State University, Tempe, Arizona 85287 1003:

1. the application for admission to the Graduate College;
2. two transcripts from each institution where the applicant has attended previously; and
3. test scores from the Graduate Record Examination.

The following should be submitted to the Admissions Committee, Graduate Program, School of Social Work, Arizona State University, Tempe, Arizona 85287 1802:

1. application to the Doctor of Philosophy program;
2. statement of educational and career goals in sufficient detail to indicate compatibility with the educational objectives and capabilities of the School of Social Work;
3. examples of written work or published materials; and
4. three letters of reference, using the reference letter forms provided by the School of Social Work.

ADVISEMENT

Bachelor of Social Work

Students are responsible for meeting the degree requirements and seeking advisement regarding their program status and progress. Upon entrance to the School of Social Work, each student is assigned an advisor. The advisor assists students with program planning, registration, preparation of needed petitions, verification of graduation requirements, referrals to university and/or community resources, and assistance with career planning. Advisor signatures are required on university registration forms.

Master of Social Work

A faculty advisor is assigned to each enrolled student at the beginning of his or her first semester of graduate work. Faculty advisors are available to assist

students with career and professional concerns. An advisor in the Student Services Office of the School of Social Work provides technical assistance in filing Programs of Study, course selection, and any other academic issues.

Social Work—Ph.D.

At the time of matriculation, each student is assigned an advisor who is a member of the Doctoral Advisory Committee and is appointed by the dean of the School of Social Work.

The advisor helps the student with educational planning and refers the student to other faculty members. The advisor discusses research interests with the student and refers the student to those faculty members who seem best qualified in the substantive field in which the student has an interest. Students are expected to use their own initiative in developing relationships with faculty at the School of Social Work and the university at large who share their theoretical and research interests.

DEGREES

Bachelor of Social Work

The school's undergraduate curriculum leads to a Bachelor of Social Work (B.S.W.). The Bachelor of Social Work degree program is accredited by the Council of Social Work Education. The principal objective of the undergraduate curriculum is to prepare students for beginning level generalist practice in social work. The program is also designed to prepare students for culturally sensitive practice and to provide preparation for graduate training in social work. It also offers social welfare content in general studies courses for College of Liberal Arts and Sciences students. During the freshman and sophomore years, students concentrate on obtaining a strong background in liberal arts and sciences and are classified as premajors until they are officially admitted to the major. Entrance into the Social Work major from the premajor is not automatic (see "Admission," pages 334–336).

Junior and senior Social Work majors focus on Social Work courses in social policy and services, human behavior in the social environment, social work practice, research, and field instruction in community agencies. In addition, majors take elective courses in related areas.

The B.S.W. level practitioner is seen as a generalist. The curriculum focuses

on such roles as advocacy, referral, case management, and problem-solving functions with individuals, groups, families, organizations, and the community.

Master of Social Work

The Master of Social Work program prepares professional social workers for advanced direct practice, administrative, and community practice positions. The program puts major emphasis on preparing social workers capable of responding effectively to the needs of the special populations in the Southwest: the ethnic minority groups of the region, the aged, urban and rural poor, dependent and neglected children, the disabled, and women who are victims of poverty, discrimination, and violence in its curriculum and its practicum assignments.

The M.S.W. program is a two-year, 60 hour program that includes a foundation year and a concentration year. In the foundation year, all students complete the same course work and field education requirements. In the concentration year, students select either direct practice (DP) or planning, administration and community practice (PAC).

Social Work—Ph.D.

The doctoral program of the School of Social Work prepares students to contribute to the field of social welfare and the profession of social work through research, teaching, and other scholarly activities.

The program seeks to broaden the student's knowledge of the field of social work and the supporting social and behavioral sciences, to deepen the student's understanding of the area of specialization, and to enable the student to make a contribution to that area through scholarship and research.

Most students specialize in theory and research in social development, social treatment, or some combination of both. Social development includes social administration, social planning, social policy, and community development. Social treatment includes direct practice with individuals, families, or small groups.

Students may construct programs that combine social development and social treatment and may develop specializations in various specialization areas, e.g., child welfare, aging, mental health, and medical care.

DEGREE REQUIREMENTS

All candidates for graduation in the Bachelor of Social Work curriculum are required to present at least 126 semester hours, of which at least 50 hours must consist of upper division courses. A minimum cumulative GPA of 2.00 is required for graduation.

Course Load. A normal course load per semester is 15–16 semester hours. The maximum number of hours for which a student can register is 18 semester hours unless an overload petition has been filed with and approved by the director of the Undergraduate Program.

Overload petitions are not ordinarily granted to students who have a cumulative GPA of less than 3.00 and who do not state valid reasons for the need to register for the credits. Students who register for semester hours in excess of 18 and do not have an approved overload petition on file have courses randomly removed through an "administrative drop" action.

English Proficiency. Students must demonstrate reasonable proficiency in written English by achieving a grade of "C" or better in both ENG 101 and 102 or in ENG 105 or its equivalent. Should a student receive a grade lower than "C" in any of the courses, the course must be repeated until the specified proficiency is demonstrated. Transfer students from colleges outside Arizona should consult the Student Services Office in the School of Social Work, WHALL 137, to assure completion of this requirement.

Undergraduate Student Enrollment in Graduate Classes. Undergraduate students at ASU in their senior year may enroll in a maximum of six graduate semester hours in the School of Social Work, providing they have an overall GPA of 3.00 or higher at the time of enrollment and have secured the required signatures for approval. If the course is not used to meet an undergraduate graduation requirement, it may be eligible for use in a future graduate program on the same basis as work taken by a nondegree graduate student.

Field Instruction. Field instruction for the B.S.W. program is offered concurrently with classroom study. Students are assigned to a social service agency and work under the supervision of an

experienced and certified social work professional. Field instruction permits testing theory in practice and gives a base of experience to class discussions. Qualified agencies in several Arizona communities are utilized for field instruction.

B.S.W. students work in one placement for 16 hours a week, for a total of 480 hours over two semesters. In assigning the placement, the school takes into account the student's educational needs and career goals. Generalist social workers need to be familiar with the methods of working with individuals, families, and groups, as well as in organizations and communities and with all ages and ethnic groups. The faculty are committed to establishing the capabilities necessary for high quality, social work generalist practice

B.S.W. field instruction agencies are located primarily in the Phoenix metropolitan area. Specially arranged, more distant placements may require up to a two hour drive. Although car pools are possible, personal transportation is strongly recommended while attending school

Bachelor of Social Work

Requirements for the Bachelor of Social Work degree are as follows:

	<i>Semester Hours</i>
First year Composition	6
General studies requirement	44
Social Work core requirement	45
Electives	31
Total	126

First-Year Composition Requirement

Students are required to take both ENG 101 and 102 (six semester hours) or ENG 105 (three semester hours). See the statement on English proficiency, page 33.

Those students taking ENG 105 must complete three additional hours in any subject to total 126 semester hours for graduation.

Social Work Core Requirement

	<i>Semester Hours</i>
SWU 271 Introduction to Social Work	3
SWU 291 Community Resources	3
SWU 301 Human Behavior in the Social Environment I	3
SWU 310 Social Work Practice I	3
SWU 331 Social Policy and Services I	3

SWU 402 Human Behavior in the Social Environment II	3
SWU 410 Social Work Practice II*	3
SWU 411 Social Work Practice III*	3
SWU 412 Field Instruction I*	5
SWU 413 Field Instruction Seminar I*	1
SWU 414 Field Instruction II*	5
SWU 415 Field Instruction Seminar II*	1
SWU 420 Practice Oriented Research	3
SWU 432 Social Policy and Services II	3
SWU 474 Ethnic Cultural Variables in Social Work	3
Total	45

* Majors only.

SWU 412 and 414 each require 16 hours weekly per semester in the field. Students must file an application for field work before registration for the courses.

No credit is granted toward fulfilling major core requirements in any course in the student's major unless the grade in that course is at least a "C."

Electives

Students are required to take 31 semester hours of courses in areas related to social work. The practice model of the program is a social work generalist. Each student is encouraged to consult with an advisor in selecting electives. Economics, education, psychology, and sociology are only a few of the academic units offering knowledge of value to the professional social work practitioner

General Studies Requirements

To meet university general studies requirements and to assure breadth and depth in the student's education, all Social Work students must complete a total of 44 semester hours of general studies courses with the designated minimum semester hours in each of the following general studies core areas. Students may choose the requirements for the catalog under which they entered the university or the following:

	<i>Semester Hours</i>
Literacy and critical inquiry*	6
Numeracy*	6
including a course in statistical analysis	
Humanities and fine arts*	6
including PHI 101 Introduction to Philosophy (3) or PHI 111 Introduction to Moral and Social Philosophy (3)	

Social and behavioral sciences*	18
Topical, indigenous series that pertains to a 20th century focus on (a) ethnic minorities of the Southwest (3) and on (b) women (3)	
ECN 111 Macroeconomic Principles (3)	
PGS 100 Introduction to Psychology (3)	
POS 110 Government and Politics (3) or POS 310 American National Government (3)	
SOC 101 Introductory Sociology (3) or SOC 301 Principles of Sociology (3)	
Natural science*	8
including a course in human biology with lab (e.g. ZOL 120, 201, 202) 4	
Total	44

* For requirements in this area, see pages 45-48, "The University General Studies Program Requirement."

General studies courses are regularly reviewed. To determine whether a course meets one or more general studies course credit requirements, see the listing of courses, pages 49-65. General studies courses are also identified following course descriptions according to the key to general studies credit abbreviations, page 48.

Global and Historical Awareness. A minimum of one course must be taken in each awareness area. Courses may concurrently satisfy a requirement in the general studies core area. For a complete listing of courses that satisfy these areas, contact Student Services, WHALL 137.

Master of Social Work

The standard program consists of 60 hours, including both classroom instruction and field practicum. It is divided into a foundation year (core curriculum) and a concentration year. During both years, students spend two days a week in a practicum setting. The foundation curriculum is the same for all students and must be completed before entering the concentration year. The required foundation courses are as follows:

	<i>Semester Hours</i>
SWG 501 Human Behavior in the Social Environment I	3
SWG 502 Human Behavior in the Social Environment II	3
SWG 510 Direct Practice I	3
SWG 511 Direct Practice II	3

SWG 520	Practice Oriented Research	3
SWG 531	Social Policy and Services I	3
SWG 533	Ethnic Minorities and Social Work	3
SWG 541	Field Practicum I	3
SWG 542	Field Practicum II	3
SWG 580	Community and Organizational Change	3
Total		30

In the second year, students concentrate in either direct practice or planning, administration and community practice. Six to nine hours of electives are available for students either to take additional hours in their concentration or to increase knowledge and skill in such areas as health, mental health, family and child welfare, or aging.

The required concentration courses are as follows:

Direct Practice

	<i>Semester Hours</i>
SWG 606 Psychopathology	3
SWG 611 Social Work with Families	3
SWG 620 Research Methods in Social Work	3
SWG 621 Integrative Seminar	3
SWG 632 Social Policy and Services I	3
SWG 641 Advanced Practicum Direct Practice I	3
SWG 642 Advanced Practicum Direct Practice II	3
Electives	6
One of the following five approved advanced courses	3
SWG 613 Social Work with Individuals (3)	
SWG 614 Social Work with Families in Transition (3)	
SWG 616 Social Work with Chemically Dependent Families (3)	
SWG 617 Assessment Treatment with Children and Adolescents (3)	
SWG 618 Family Violence (3)	
Total	30

Planning, Administration and Community Practice

	<i>Semester Hours</i>
SWG 622 Community Research in Social Work	3
SWG 623 Agency Research in Social Work	3
SWG 632 Social Policy and Services II	3
SWG 643 Advanced Practicum: Planning Social Work Administration and Community Practice I	3
SWG 644 Advanced Practicum: Planning, Social Work Administration, and Community Practice II	3

SWG 680	Program Planning in Social Services	3
SWG 681	Social Work Administration or SWG 682 Community Participation Strategies (3)	3
Electives		9
Total		30

Electives may be selected from offerings at the School of Social Work or courses offered through other instructional units with the recommendation of the advisor and approval by the director of the graduate program. The total semester hours for each concentration equal 30.

Field Education. Every student is assigned to a field education placement in both the foundation and concentration years. Field education requirements include 16 hours a week for a total of 240 per semester under the supervision of an experienced and certified social work professional. Field experiences are designed to be consistent with course work at the foundation and concentration levels.

Field education placements are made in what is considered to be the best educational interests of the student and may require a considerable amount of travel. For this reason it is necessary that M.S.W. students have a car available for use for their field placement.

Social Work—Ph.D.

Completion of the program requires at least 36 semester hours of course work beyond the master's degree and a minimum of 24 SWG 792 Research and SWG 799 Dissertation semester hours. Each student must complete all core requirements: statistics (six hours), research methods (six hours), social work seminars (12 hours), directed electives (12 hours), comprehensive examinations, and research and dissertation (24 hours). In addition, based on an educational assessment by the Doctoral Advisory Committee, a number of "leveling" courses may be required to bring the student to an acceptable level of specific knowledge.

	<i>Semester Hours</i>	
SWG 720	Research Issues in Social Work	3
SWG 721	Empirical Social Work Practice	3
SWG 722	Integrative Research Seminar	3

SWG 740	Philosophy of Science	
	Issues in Social Work	3
	Research methods	6
	Statistics	6
Total		24

The remaining 12 semester hours are negotiated by the student and his or her advisory committee and reflect the student's short- and long-term career interests. In most instances, these courses are taken in other instructional units within the university.

GRADUATION REQUIREMENTS

Each Social Work major must file an undergraduate program of study for graduation within the semester that he or she earns the 87th credit. A minimum of 126 semester hours, a minimum of 50 semester hours in upper division courses, a minimum of 480 hours in field education, and a minimum GPA of 2.00 are required for graduation with a B.S.W. degree. To be acceptable as graduation credit, all course and field work in the major must show an earned grade of "C" (2.00) or higher.

In order to qualify for graduation from the M.S.W. or Ph.D. program, a student must have a minimum overall GPA of 3.00, with no grade below "C" in any required course.

Comprehensive Examinations. Arizona State University requires a comprehensive examination for graduation in all professional master's programs that do not have a thesis requirement. All Social Work students must pass a comprehensive examination, administered by the School of Social Work, before graduation.

ACADEMIC STANDARDS

In order to remain in good academic standing, the student must maintain a minimum overall GPA of 2.00 (B.S.W.) and 3.00 (M.S.W. and Ph.D.) at the end of each semester. Most courses in the program are sequential; successful completion of each course in the sequence is required to enroll in the following course. Students may not enroll in any second year required courses until all foundation courses have been completed successfully.

Retention and Disqualification

The following policies govern retention and disqualification.

Probationary Status. A student must maintain a minimum overall cumulative GPA of 2.00 (B.S.W.) and 3.00 (M.S.W. and Ph.D.). A student is placed on probationary status automatically when (1) the GPA is less than the minimum at the end of any semester or (2) a grade of "D" or "E" is received for any major core requirement, regardless of the GPA.

Students may also be put on probation for reasons other than grades.

Probationary status requires completion of a plan written and signed by the student and advisor, with copies for the student, advisor, program director, field director, and file that indicates when and how deficiencies will be made up. This plan must contain a provision to bring the GPA up to minimum standards by the end of the succeeding semester or at the completion of 12 hours of letter graded course work, whichever comes later. Probationary students may be denied registration in the absence of such a plan.

Once a Social Work student is on academic probation, the student remains in that status until the overall GPA reaches the retention level (2.00 [B.S.W.] and 3.00 [M.S.W. and Ph.D.]) or until the student is disqualified from the university.

Termination from the Program. A student is terminated from the program under any one of the following circumstances:

1. A student fails to carry out the plan developed during a probationary semester.
2. The student receives an "E" grade (failure) in field practicum.
3. The student does not accept or is not accepted by three or more field agencies if, in the judgment of faculty and field staff, the placements can provide appropriate field experiences without undue inconvenience to the student.
4. The student does not adhere to professional expectations and standards (see the *Student Code of Conduct*, *NASW Code of Ethics*, and *CSWE Curriculum Policy Statement*).
5. A student appears to lack the degree of physical and/or mental health necessary to function successfully as a social worker. Such a student may be required to undergo a medical examination and

make the results available to the Committee on Academic and Professional Standards of the School of Social Work. The responsibility for reviewing and determining the qualification of students whose behavior and/or performance are in question is vested in the Standards Committee. The committee's decision may require the dismissal or disqualification of a student from the program.

Reinstatement. A disqualified student who desires to be reinstated may submit an application for reinstatement. A disqualified student normally is not reinstated until at least one semester has elapsed from the date of disqualification. The burden of establishing fitness is on the disqualified student, who may be required to take aptitude tests and submit to other examinations before being readmitted.

Continuous Evaluation. While students are subject to the university's general retention policy, they are evaluated in the school on broader criteria than mere GPA. Students are reviewed for evidence of competency in social work and are continuously evaluated as they progress in the program. Prospective Social Work candidates who do not meet the established criteria are guided toward a program that is compatible with their interests and abilities.

Appeal Procedures

Students who feel they have been unjustly treated in academic or other matters relating to their career as students may appeal by following the guidelines set forth in the *Policy and Procedures Manual* for the School of Social Work, available in the Student Services Office, WHALL 137.

STUDENT RESPONSIBILITIES

Students are expected to support and maintain the highest professional standards as spelled out in the *Student Code of Conduct* and the *National Association of Social Workers Code of Ethics*.

Regular attendance is expected in all classes and in field education and is a critical factor in evaluation of performance.

Students' rights are protected through appeal to the Committee on Academic and Professional Standards or through consultation with the departmental ombudsperson.

SPECIAL PROGRAMS

Tucson Component. The School of Social Work offers the full M.S.W. foundation year (30 hours) and some M.S.W. concentration year courses in Tucson. Students are required to commute to Tempe during both semesters of their concentration year. Every effort is made to schedule courses so that only one day per week is required for travel, but it is possible that two days of travel may be required to meet specialized student requests or needs

Social Work

Peter M. Kettner
Interim Dean
(WHALL) 602/965-3304

PROFESSORS

COUDROGLOU, DALEY
FIGUEIRA McDONOUGH, HUDSON,
KETTNER, LEWIS, MacEACHRON,
MORONEY WONG

ASSOCIATE PROFESSORS

ASHFORD, FAUSEL LeCROY
LEYBA, MAGEL, MONTERO,
NETTING NICHOLS,
NICHOLS CASEBOLT

ASSISTANT PROFESSORS

ANGULO, APPLEWHITE, LIE
McMURTRY, PAZ SCHILT

PROFESSORS EMERITI

ALDRIDGE, CRANMER,
ENGELHARDT, HARWARD, HILL,
LUNDBERG, POLENZ WOODMAN

SOCIAL WORK (SWU)

SWU 271 Introduction to Social Work. (3) F S

Analysis of contemporary social welfare services and professional social work. Designed for freshmen sophomores considering this major. Prerequisites: PGS 100; SOC 101

291 Community Resources. (3) F S

Generalist social work roles including case management in relation to the purpose, structure, and delivery system of community welfare agencies. Includes 40 hours of observational experience in local agencies. Prerequisites: SOC 101; PGS 100. Pre- or corequisites: SWU 271.

301 Human Behavior in the Social Environment I. (3) F, S

Introduction to interaction of bio-psycho-social-cultural systems and the effect on behavior focused on southwestern ethnic and cultural groups. Prerequisites: PGS 100; SOC 101; Human Biology course. Pre- or corequisites: SWU 271, 291. *General studies: L2 SB.*

310 Social Work Practice I. (3) F, S

Introduction to social work methods emphasizing the following skills: role playing, video training, cross-cultural interviewing, communication patterns, and recording. Prerequisites: SWU 271, 291. Pre- or corequisite: SWU 301.

331 Social Policy and Services I. (3) F, S

History, philosophy, and values of social welfare function and role of social welfare in society, development of the social work profession and practice. Prerequisites: ECN 111, POS 110 or 310; SWU 271, 291. *General studies.* H

402 Human Behavior in the Social Environment II. (3) F, S

Sequencing study of life span development and behavior which forms base for social work practice. Prerequisite: SWU 301. *General studies.* SB.

410 Social Work Practice II. (3) F, S

Introduction to generalist social work major areas of knowledge, values and skills basic to the social work helping process focused on individuals and small groups. Prerequisites: PH 101 or 111; SWU 301, 310, Social Work major. Corequisites: SWU 412, 413.

411 Social Work Practice III. (3) F, S

Applications of theoretical frameworks to social work practice at family and community levels. Prerequisites: SWU 410, 412, 413. Social Work major. Corequisites: SWU 414, 415. Pre- or corequisite: SWU 420.

412 Field Instruction I. 5 F, S

Sixteen hours a week of supervised practice in an approved placement. Corequisites: SWU 410, 413.

413 Field Instruction Seminar I. (1) F, S

Field focused seminar including practice evaluation. 1.5 hours a week. Prerequisite: Social Work major. Corequisites: SWU 410, 412.

414 Field Instruction II. (5) F, S

Sixteen hours a week of supervised practice in an approved placement. Prerequisites: SWU 410, 412, 413. Social Work major. Corequisites: SWU 411, 415.

415 Field Instruction Seminar II. (1) F, S

Field focused seminar, including practice evaluation on 1.5 hours a week. Corequisites: SWU 411, 414.

420 Practice-Oriented Research. (3) F, S

Application of scientific principles to field practice: problem formulation, intervention procedures and impact assessment in social work. Prerequisites: SWU 310, an approved course in data analysis techniques or instructor approval.

432 Social Policy and Services II. (3) F, S

Contemporary social policy, and economic issues. Special emphasis on poverty and inequality in the Southwest. Analysis and development of social welfare policies and programs. Prerequisite: SWU 331.

474 Ethnic Cultural Variables in Social Work. (3) F, S

A basic conceptual approach to understanding ethnic/cultural variables of southwestern ethnic minorities and how these factors influence social work practice. Prerequisite: SWU 331 or instructor approval. *General studies.* C

Omnibus Courses: See page 40 for omnibus courses that may be offered.

SOCIAL WORK (SWG)**SWG 501 Human Behavior in the Social Environment I.** (3) F

Explores the salient features of human behavior theories, discusses relevant research and appraises the strengths and weaknesses of the theories.

502 Human Behavior in the Social Environment II. (3) S

Examines human development through the life span and the behavior of individuals and families in transactions with their environments.

510 Direct Practice I. (3) F

Basic social work methods with an emphasis on the problem solving process as it pertains to individuals, families, and small groups. Prerequisite: social work major.

511 Direct Practice II. (3) S

Theory and methods of direct practice with groups and selected practice models. Lecture, lab. Prerequisite: SWG 510.

520 Practice-Oriented Research. (3) S

Accelerated course in application of scientific principles to field practice: problem formulation, intervention procedures and impact assessment. Prerequisites: Social Work major, an approved course in statistics.

531 Social Policy and Services I. (3) F

Conceptual, analytical, and historical perspectives on the social welfare institution. Emphasis on poverty and inequality. Principles of policy analysis.

533 Ethnic Minorities and Social Work. (3) S

Explores ethnic/cultural variables significant to southwestern ethnic minority populations and ways in which these factors affect social work practice.

541 Field Practicum I. (3) F, S

With SWG 542, two consecutive semesters (480 hours) of supervised social work practice in an approved placement. Pre- or corequisite: SWG 510.

542 Field Practicum II. (3) F, S

See SWG 541. Pre- or corequisite: SWG 511.

580 Community and Organizational Change. (3) F

Examines communities and human service organizations as social systems. Introduces strategies for initiating planned change.

605 Substance Abuse. (3) N

Psychological and sociocultural determinants of substance abuse. Overview of social policies and treatment approaches. Prerequisite: SWG 502 or instructor approval.

606 Psychopathology. (3) F

Theories and concepts of mental health and illness. Attention to the development of environmental, interpersonal, psychosocial, stress factors in human behavioral dynamics. Prerequisite: SWG 501 or instructor approval.

611 Social Work with Families. (3) F

Practice applications of major family system approaches to changing or preventing family dysfunction. Prerequisite: SWG 511.

612 Social Work with Groups. (3) S

Practice applications of knowledge and skills to social work with groups. Prerequisite: SWG 511.

613 Social Work with Individuals. (3) S

Theory and practice applications of knowledge and skills to social work with individuals. Prerequisites: SWG 606, 611.

614 Social Work with Families in Transition. (3) S

Analyzes the psychosocial dynamics of families disrupted by divorce, separation, or death of a parent. Offers different social work interventions. Prerequisite: SWG 611 or instructor approval.

616 Social Work with Chemically Dependent Families. (3) S

The dynamics of the chemically dependent family are examined and clinical approaches for intervening in the family system and sub-systems are presented. Lecture, lab. Prerequisite: SWG 511 or instructor approval.

617 Assessment and Treatment with Children and Adolescents. (3) S

Theory, research and intervention that focus on children and adolescents. Prerequisite: SWG 511.

618 Family Violence. 3 S

Theory, research, intervention, and prevention strategies relevant to child maltreatment, partner abuse and elder abuse. Lecture seminar. Prerequisite: SWG 511.

620 Research Methods in Social Work. (3) F

Conceptual foundations and methods of non-theoretical research in social work. Includes problem identification, hypothesis formulation, measurement sampling, and experimental design. Prerequisite: SWG 520.

621 Integrative Seminar. (3) S

Explores the fit between theoretical frameworks and practice with clients. Requires presentation of empirical studies with clients. Prerequisite: SWG 620. Corequisites: SWG 641 or 642.

622 Community Research in Social Work. (3) F

Application of research design techniques to assessing need and measuring effectiveness of community wide programs. Prerequisite: SWG 520. Corequisite: SWG 680.

623 Agency Research in Social Work. (3) S

Application of research design techniques to data collection in human service agencies, including use of statistical analysis for program evaluation. Prerequisite: SWG 622.

624 Program Evaluation in the Human Services. (3) N

Development of understanding and skills in the conduct of program and project evaluation. Prerequisite: SWG 620 or instructor approval.

632 Social Policy and Services II. (3) S

Development of advanced knowledge and skills in social welfare policy analysis, policy formulation and advocacy and intervention for policy change. Prerequisite: SWG 531.

641 Advanced Practicum: Direct Practice I. (3) F, S

With SWG 642, two consecutive semesters (480 hours) of supervised social work practice in an approved placement related to the student's career goal. Prerequisites: SWG 541, 542. Pre- or corequisite: SWG 611.

642 Advanced Practicum: Direct Practice II. (3) F, S

See SWG 641. Prerequisites: SWG 541, 542, 611. Pre- or corequisite: SWG 614 or 616 or 617 or 618.

643 Advanced Practicum: Planning, Social Work Administration, and Community Practice I. (3) F, S

With SWG 644, two consecutive semesters (480 hours) in social work practice in an approved placement related to the student's career goal. Prerequisites: SWG 541, 542. Pre- or corequisite: SWG 680.

644 Advanced Practicum: Planning, Social Work Administration, and Community Practice II. (3) F, S

See SWG 643. Prerequisite: SWG 643. Pre- or corequisite: SWG 681 or 682.

680 Program Planning in Social Services. (3) F

The social services planning process includes needs assessment, goals and objectives, program design, budgeting, management information systems, and program evaluation. Prerequisite: SWG 580.

681 Social Work Administration. (3) S

Administrative skill building and theory application within human service nonprofit social work settings. Prerequisite: SWG 680.

682 Community Participation Strategies. (3) S

Course reviews strategies to involve citizens and the consumers of social and human services in community decision making systems. Participation is viewed as means to facilitate the empowerment of oppressed peoples. Prerequisite: SWG 680 or instructor approval.

683 Developing Grants and Fund Raising. (3) N

Identification of potential funding sources, technical and interpersonal/political aspects of proposal development, and fund raising. Prerequisite: SWG 580 or instructor approval.

720 Research Issues in Social Work. (3) F

Introduction to research issues in selected fields of study in social work, with a focus on both substantive and methodological issues within each area of study.

721 Empirical Social Work Practice. (3) S

Application of scientific principles to problem formulation, assessment, and intervention procedures with an emphasis on the direct use of scientific tools in the conduct and evaluation of practice at all levels.

722 Integrative Research Seminar. (3) F

Application of research concepts and methods to specific interests of students; integration of theory, research methods, and statistics as applied to social work topics.

730 Social Policy Issues in Social Welfare. (3) F

Historical backgrounds of current policy issues; law as expression of social policy; legislative, executive, and judicial roles in formulating policy.

731 Social Welfare Policy Analysis and Development. (3) F

Methods of policy analysis, critique of social welfare policies against proposed models, and case studies of policy development emphasizing southwestern populations. Prerequisite: SWG 730.

740 Philosophy of Science Issues in Social Work. (3) F

Philosophical assumptions of social science, social work practice, and policy are examined in conjunction with presuppositions underlying various frames of reference in the behavioral and social sciences.

741 Social Work Administration in a Systems Context. (3) S

Case studies of social work administration from initial conceptualization of policy through implementation at national, state, and local levels. Prerequisite: SWG 740.

Omnibus Courses: See page 40 for omnibus courses that may be offered.



College of Extended Education

Bette F. DeGraw, D.P.A.
Interim Dean

The College of Extended Education seeks to make the university's resources available throughout Maricopa County, the state, and the region. The demand for extended education continues to expand because a maturing, information- and knowledge-based society demands increased access to educational opportunities. As a major urban institution, Arizona State University embraces extended education as an integral part of its mission. The units described herein compose the College of Extended Education.

American Language and Culture Program

The American Language and Culture Program (ALCP) features an intensive, noncredit course of study designed for adult international students who desire to become proficient in English as a second language for academic, professional, and/or personal reasons. Applicants must be at least 18 years of age and must possess a high school diploma or its equivalent. All conditions of the U.S. Immigration and Naturalization laws pertaining to full-time study in the United States must be met by all applicants. Beginning students are required to take an English placement test before the beginning of classes. Certificates of achievement are awarded on completion of the course. Admission to the program does not constitute regular admission to ASU.

Beginning, intermediate, and advanced courses provide instruction in grammar, pronunciation and speaking, listening comprehension, writing and composition, and reading and vocabulary. Academic advising and orientation to Arizona and the United States are integral parts of the program.

Program-wide social activities each term include a major field trip, a dinner, a picnic, a cultural activity, visits to museums, historical sites, and musical presentations.

Advanced level ALCP students may be permitted to enroll concurrently in up to two ASU credit classes with the approval of the director. Several special classes are offered through the ALCP. Classes in conversation, speech improvement, and the Test of English as a Foreign Language (TOEFL) are offered on alternate terms.

The fall and spring semesters are divided into two eight-week cycles. Students may enroll for one or more cycles. An eight-week summer session

of study is also offered. Inquiries concerning admission requirements, enrollment, and fee schedules should be sent to the ALCP, Irish Hall, Arizona State University, Tempe, Arizona 85287-3106. ALCP also has a study center in Hachioji-Shi, Tokyo, Japan. For more information, call 602/965-2376.

Arizona Prevention Resource Center

The Arizona Prevention Resource Center is a partnership between the ASU College of Extended Education, the Governor's Office of Drug Policy, and the Arizona Departments of Education and Health Services. The center was developed in response to the growing awareness of alcohol and drug abuse problems nationwide and in Arizona. Further, the integrated approach the center uses is regarded as the best way to respond to the problem.

The following broad programs and activities are being developed by the center:

1. training programs concerning drug abuse education and prevention for teachers, counselors, other educational personnel, parents, local law enforcement officials, judicial officials, other public service personnel, community prevention professionals and health educators, and community leaders;
2. the development and distribution of educational and informational materials to provide public information (through the media and otherwise) for the purpose of promoting health and decreasing problems related to alcohol and other drug abuse;
3. technical assistance to help schools, community-based organizations, agencies, and consortia in the planning and implementation of drug abuse prevention, early intervention, treatment referral, and education programs;
4. other activities to encourage the coordination of drug abuse education and prevention programs with related community efforts and resources, including the establishment of an outcome indicator database as part of a comprehensive evaluation system and of an annual inventory of programs; and

HONORS
COLLEGE

ARCHITECTURE

LIBERAL ARTS

BUSINESS

EDUCATION

ENGINEERING

FINE ARTS

LAW

NURSING

PUBLIC
PROGRAMSSOCIAL
WORKEXTENDED
EDUCATIONGRADUATE
COLLEGE

5. a statewide planning component including involvement and facilitation of a strategic planning process for substance abuse prevention, education, and treatment in Arizona.

For more information, call 602/965 9666.

Center for Lifelong Learning

The Center for Lifelong Learning at ASU Sun Cities educational facility is located at the Bell Plaza Professional Building South, 17220 Boswell Blvd., Sun City, Arizona, in the nation's largest retirement community. The courses offered are predominantly non credit and include a curriculum tailored specifically to the interests of the retirement community. Each year more than 150 courses from approximately 30 disciplines are taught. Weekly lectures also are available throughout the year in a variety of subjects.

The ASU on Wheels Educational Tours program provides more than 30 single-day trips and twelve or more multiple day tours each year. Travels are made throughout Arizona and bordering states with courses in Southwest history, geology, sociology, and economics offered en route. Multiple day tours include stays at Lake Powell, Canyon de Chelly, northern Arizona and southern Utah areas, southern Arizona, New Mexico, and Durango, Colorado. Tour groups also travel to Alaska, Canada, Florida, and Texas.

Programs for the retirement community are in the process of expansion throughout Maricopa County. For more information, call 602/965 5600 or 602/972 7398.

Division of Conferences and Institutes

The Division of Conferences and Institutes offers a variety of conferences, workshops, and seminars by working with campus departments, professional associations, community organizations, and business, governmental, and other agencies. Complete conference services and assistance are offered to any campus group wishing to conduct an education program or professional meeting. Services include general conference planning, program development, budgeting, site selection, promotion and publicity, hotel/motel liaison, and overall logistical support for any and all phases of the conference. The office also aids in the development of

guidelines, checklists, and general operating procedures that serve to ensure coordination and smooth operation of continuing education activities sponsored by the various campus departments. For more information, call 602/965-5757.

Division of Instructional Programs

As a convenience to students, off campus courses are organized and scheduled in locations conducive to enrollment in the metropolitan area and various locations throughout the state.

Credits earned off campus are recorded on a student's permanent record in the same manner as those earned on campus, and both are equivalent in all academic considerations. All academic standards of the university, including policies related to admission and registration, apply to off-campus courses. It is the responsibility of the student to be aware of all applicable policies before registering. It is the responsibility of each dean to determine what courses to offer off campus and to make faculty assignments.

The 1992-93 fee for off campus courses is the same as the per semester hour fee on the main campus. (See in-state and out of state rates in the current *Schedule of Classes*). Any combination of on-campus and off-campus resident credit courses resulting in a combined registration of seven or more semester hours requires that the student pay full time, in state registration fees or full time out of state registration fees and the appropriate tuition. Full time and part time students who have paid registration fees and tuition must also pay additional fees if they enroll in off campus credit courses that commence after the 21st calendar day of the start of each semester. For more information, call 602/965 9797.

Downtown Center

The Downtown Center, located at the Phoenix Mercado, is specifically designed to extend Arizona State University into the central Phoenix community, to help address urban challenges, to serve the governments of Arizona, and to enhance public policy-making capacity.

The center provides instruction and community service, carries out applied research, and promotes economic and cultural development. Graduate and upper-division courses of interest to

government, business, and the professional community are offered. Interactive instructional television courses in engineering, business, liberal arts, and non laboratory sciences are also offered.

The Joint Urban Design Program is located in the Downtown Center. A collaborative effort of the ASU College of Architecture and Environmental Design, the Downtown Center, and the City of Phoenix, the program directs institutional and public resources toward developing an understanding of issues that affect the urban quality of Phoenix. The Joint Urban Design Studio conducts urban design research with the City of Phoenix. The Urban Data Center and the Advanced Public Executive Program, part of the College of Public Programs, School of Public Affairs, are also located at the Downtown Center. For more information on the above programs call 602/965 3046.

The center's Personal Computer Training Program is a microcomputing training center offering classes in the latest versions of software and courseware. A full range of short, streamlined courses in progressive levels is offered. The Executive Level Training Program is for top level managers and provides an overview of several software applications used in the work environment. For more information, call 602/965 9200.

PRIME (Project to Improve Minority Education) is housed at the Downtown Center with evaluation support services located at the Hispanic Research Center. The program is designed to increase the pool of college-eligible minority students, who have historically been underrepresented in higher education, by providing instructional and support services to seventh through 12th grade students and their families at targeted Arizona schools. For more information, call 602/965 8510.

Independent Study By Correspondence

College credit correspondence courses are specifically designed for the student unable to attend classes in person. They are offered for students who seek to fulfill degree objectives and for those who wish to increase occupational, professional, and intellectual skills.

To enroll in correspondence study, write to Arizona State University, Independent Study by Correspondence,

Tempe, Arizona 85287-1811, for an enrollment form and a brochure of courses. Students admitted to ASU must obtain the approval of their advisors and the deans or chairs of the standards committees of the colleges in which they are enrolled before enrolling in correspondence study. Approval is required of any continuing student whether or not enrolled for courses during the summer sessions or vacation periods. Student athletes must obtain approval from the faculty athletics representative in order for correspondence credit to be used to meet the NCAA "satisfactory progress" requirement. Unclassified undergraduate or graduate students are not required to obtain approval. Correspondence courses may not be used for courses in which the student has received a grade of "D," "E," or "I."

Correspondence courses generally consist of eight lessons per semester hour, which may include proctored tests, midterms, or special projects. Eight to 10 hours are normally required to prepare each assignment. All courses require a proctored final exam.

A student may not take a final exam less than seven days from date of registration for a one-unit course, 14 days for a two-unit course, and 21 days for a three-unit course.

Students may take one correspondence course initially, with the expectation of completion within a calendar year. However, when one-half the lessons are completed, enrollment in a second course is possible. Students may not register for more than two correspondence courses at once.

A maximum of 30 semester hours earned in correspondence and/or by comprehensive examination may be applied toward the baccalaureate degree at ASU. Correspondence courses are not applicable as graduate credit.

A correspondence fee is required of all students, including full-time students who have paid registration fees and tuition. Tuition waivers do not apply to correspondence study.

A student may enroll in an off-campus or correspondence course without making formal application for admittance to the university or for degree candidacy. High school seniors may enroll in off-campus or correspondence courses under the provisions stated in "Admission before Graduation from High School," page 29. For more in-

formation, call 602/965-6563 or 1-800-533-4806.

Distance Learning Technology

The Distance Learning Technology office facilitates distance learning through technology. The office assists academic departments in the development, acquisition, production, scheduling, marketing, and delivery of televised courses. Delivery systems for the courses include public television, cable television, Instructional Television Fixed Service (ITFS), satellite, computer, and videotape.

Televised university courses allow students to receive instruction at convenient locations, such as their places of employment or their homes. By attending these video classes, students can overcome problems of scheduling and commuting that might otherwise prevent them from seeking further education.

Use of the university's satellite earth station facilities is coordinated by Distance Learning Technology. The satellite uplink is available for the transmission of courses and video conferences nationwide. The downlink is connected via the broadband to allow reception of nationally distributed teleconferences in various specially equipped classrooms on campus. For more information, call 602/965-6738.

Planning and Development

The Planning and Development office has as its mission the expansion of existing programs and the development

of new programs for the College of Extended Education, the community and state.

The office works with college units, as well as community and statewide groups, to conceptualize new programs to seek out potential funding sources and to develop grant applications. The office also provides technical assistance to other college directors and statewide groups regarding program development and grant writing.

Facilitation of the statewide strategic planning and implementation process regarding substance abuse prevention, education and treatment has been a major focus of the office. In addition, two national leadership and policy development programs are coordinated by this office: the Education Policy Fellowship Program in collaboration with the Washington-based Institute for Educational Leadership and the State Education Policy Seminars in collaboration with the Education Commission of the States.

The Education Policy Fellowship Program is a year-long program that offers an opportunity for mid-career individuals from a variety of agencies, organizations, and disciplines throughout the state to think and learn about public policy and leadership. The State Education Policy Seminars is developing the Arizona Policy Forum, an opportunity for key Arizona policy and decision makers to learn about and discuss leading edge policy issues. For more information, call 602/965-9777.



Graduate College

Brian L. Foster, Ph.D.
Dean

The Graduate College at Arizona State University provides students with opportunities to study beyond the bachelor's degree in a wide variety of academic disciplines and professions. ASU offers 50 doctoral and more than 90 master's degree programs. The Graduate College fosters an atmosphere of academic excellence and a spirit of scholarship, research, and artistic accomplishment. Its objectives are to educate future leaders in the arts, in the creation of new knowledge, and in the application of our accumulated knowledge to human affairs.

GRADUATE DEGREES AND MAJORS

The Graduate College enrolls students in programs leading to both professional and research oriented advanced degrees. The Master of Arts, Master of Science, and Doctor of Philosophy degrees are awarded to students completing programs that culminate in research. The Doctor of Philosophy degree is the highest university award, conferred on candidates who have proved their ability as scholars and original researchers.

Professional graduate programs emphasize training that leads to professional practice. In these degree programs, students develop a high order mastery of a comprehensive body of knowledge and the ability to organize and carry out significant investigations in their professional field. Professional degrees usually are named Master of (professional field) and Doctor of (professional field). The professional doctoral degree is the highest university award to candidates completing academic preparation for professional practice. Professional degrees offered through the Graduate College include the following:

- Master of Accountancy
- Master of Architecture
- Master of Business Administration
- Master of Computer Science
- Master of Counseling
- Master of Education
- Master of Environmental Planning
- Master of Fine Arts
- Master of Health Services Administration
- Master of Laws
- Master of Mass Communication
- Master of Music
- Master of Natural Science
- Master of Public Administration

- Master of Science in Design
- Master of Science in Engineering
- Master of Social Work
- Master of Taxation
- Master of Teaching English as a Second Language
- Master of Technology Education Specialist
- Doctor of Education
- Doctor of Musical Arts
- Doctor of Public Administration

Faculty members offering a specific graduate degree program may be members of a single academic unit (such as a department, school, or college), or they may form an interdisciplinary committee consisting of faculty from various academic units. The Graduate College awards degrees upon the recommendation of the faculty offering the graduate degree programs.

Interdisciplinary Study

Although most graduate programs are administered by academic units, a diverse group of interdisciplinary programs falls directly under the supervision of the Graduate College. Many majors are in fields that are still emerging as recognized academic disciplines and, therefore, do not customarily form the academic basis for departments. Other fields of study are inherently interdisciplinary and do not fit well with conventional disciplines around which departments are formed. Curricula must reflect intrinsically broad disciplinary affinities, and faculty must be drawn from more than one department.

The Graduate College oversees nine interdisciplinary/intercollegiate graduate programs and has joint responsibility with the College of Education for another. These include the following:

- Adult Development and Aging Program (Certificate in Gerontology)
- Creative Writing (M.F.A.)
- Curriculum and Instruction (Ph.D.) (jointly administered with the College of Education)
- Exercise Science (Ph.D.)
- Humanities (M.A.)
- Justice Studies (Ph.D.)
- Public Administration (D.P.A.)
- Science and Engineering of Materials (Ph.D.)
- Speech and Hearing Science (Ph.D.)
- Statistics (M.S.)

Each of these programs utilizes resources and faculty from more than one

Graduate Degrees, Majors, and Concentrations Offered

Master of Accountancy	Religious Studies	Master of Fine Arts
Master of Architecture	School Library Science ^{1,2}	Art
Master of Arts	Secondary Education ¹	Ceramics
Anthropology	Social and Philosophical Foundations of Education	Drawing
Archaeology	Comparative and international education	Fibers
Bioarchaeology	History of education	Intermedia
Linguistics	Philosophy of education	Metals
Museum studies	Political foundations of education	Painting
Physical anthropology	Sociology of education	Photographic studies
Social-cultural anthropology	Sociology	Photography
Art	Spanish	Printmaking
Art education	Comparative literature	Sculpture
Art history	Language and culture	Wood
Communication	Linguistics	Creative Writing
Educational Administration and Supervision ¹	Literature	Dance
Educational Psychology ¹	Special Education ¹	Theatre
Elementary Education ¹	Theatre	Scenography
Bilingual education	Master of Business Administration	Theatre for youth
Child development	Master of Computer Science	Master of Health Services Administration
Communication arts	Master of Counseling	Master of Laws²
Curriculum	Master of Education	Master of Mass Communication
Early childhood education	Counselor Education	Master of Music
Indian education	Counseling and student personnel	Choral Music
Mathematics	Educational Administration and Supervision	Choral music
Multicultural education	Educational Media and Computers	General music
Reading	Business education	Instrumental Music
Science	Educational Psychology ¹	Performance
Social studies	Elementary Education ¹	Music theatre musical direction
English	Bilingual education	Music theatre performance
Comparative literature	Child development	Performance pedagogy
English linguistics	Communication arts	Piano accompanying
Literature and language	Curriculum	Solo performance (instrumental)
French	Early childhood education	Solo performance (keyboard)
Comparative literature	Indian education	Solo performance (voice)
Language and culture	Mathematics	Theory and Composition
Literature	Multicultural education	Composition
Geography	Reading	Theory
Spatial analysis of land use	Science	Master of Natural Science
German ²	Social studies	Natural Science
Comparative literature	Higher and Adult Education	Botany
Language and culture	Adult education ²	Chemistry
Literature	Higher education	Communication disorders
History	Learning and Instructional Technology ¹	Geology
Asian history	School Library Science ^{1,2}	Mathematics
British history	Secondary Education ¹	Microbiology
European history	Indian education	Physics
Latin American history	Subject matter fields	Zoology
Public history	Special Education ¹	Master of Public Administration
U.S. history	Gifted	Public Administration
U.S./Western history	Mildly handicapped	Public information management
Humanities	Multicultural exceptional	Public management
Learning and Instructional Technology ¹	Severely/multiply handicapped	Public policy analysis and evaluation
Mathematics	Master of Environmental Planning	Urban management and planning
Music History and Literature	Environmental Planning	
Philosophy	Urban planning	
Political Science		
American politics		
Comparative politics		
International relations		
Political theory		

¹ Major offered toward more than one degree at the same level.

² Not accepting applications.

³ Students apply to this degree program through the College of Law, not the Graduate College.

Graduate Degrees, Majors, and Concentrations Offered (continued)

Master of Science

Aerospace Engineering
 Agribusiness
 Agribusiness management and marketing
 Food quality assurance
 Bioengineering
 Biological Sciences
 Botany
 Building Design
 Computer aided design
 Energy performance of buildings
 Facilities development and management
 Solar architecture
 Chemical Engineering¹
 Biomedical and clinical engineering
 Chemical process engineering
 Chemical reactor engineering
 Energy and materials conversion
 Environmental control
 Solid state processing
 Transport phenomena
 Chemistry
 Analytical chemistry
 Biochemistry
 Geochemistry
 Inorganic chemistry
 Organic chemistry
 Physical chemistry
 Solid state chemistry
 Civil Engineering¹
 Environmental/sanitary
 Geotechnical/soil mechanics
 Structures
 Transportation
 Water resources/hydraulics
 Communication Disorders
 Computer Science
 Construction
 Construction science
 Facilities
 Management
 Decision and Information Systems
 Economics
 Electrical Engineering¹
 Engineering Science¹
 Environmental Resources in Agriculture
 Exercise Science/Physical Education
 Family Resources and Human Development
 Family studies
 General family resources and human development
 Geology
 Industrial Engineering¹
 Computer aided processes
 Computer integrated manufacturing
 Human factors
 Information systems

Operations research
 Organization control
 Quality control reliability
 Justice Studies
 Mechanical Engineering¹
 Microbiology
 Molecular and Cellular Biology
 Nursing
 Adult health nursing
 Community health nursing
 Community mental health psychiatric nursing
 Nursing administration
 Parent child nursing
 Physics
 Option I
 Option II
 Recreation
 Outdoor recreation
 Recreation administration
 Social psychological aspects of leisure
 Tourism and commercial recreation
 Statistics
 Zoology

Master of Science in Design

Industrial Design
 Interior Design

Master of Science in Engineering

Aerospace Engineering¹
 Chemical Engineering¹
 Biomedical and clinical engineering
 Chemical process engineering
 Chemical reactor engineering
 Energy and materials conversion
 Environmental control
 Solid state processing
 Transport phenomena
 Civil Engineering¹
 Environmental/sanitary
 Geotechnical/soil mechanics
 Structures
 Transportation
 Water resources/hydraulics
 Electrical Engineering¹
 Engineering Science¹
 Industrial Engineering¹
 Computer aided processes
 Computer integrated manufacturing
 Human factors
 Information systems
 Operations research
 Organization control
 Quality control/reliability
 Mechanical Engineering¹

Master of Social Work

Master of Taxation

Master of Teaching English as a Second Language

Master of Technology

Technology
 Aeronautical engineering technology
 Aeronautical management technology
 Electronics engineering technology
 Graphic communications technology
 Industrial management and supervision
 Manufacturing engineering technology
 Mechanical engineering technology
 Welding engineering technology

Education Specialist

Educational Administration and Supervision^{*}

Doctor of Education

Counselor Education²
 Educational Administration and Supervision¹
 Elementary Education
 Bilingual education
 Child development
 Communication arts
 Curriculum
 Early childhood education
 Indian education
 Mathematics
 Multicultural education
 Reading
 Science
 Social Studies
 Higher and Adult Education
 Adult education³
 Higher education
 Learning and Instructional Technology
 Secondary Education
 Art education
 Business education
 Curriculum and instruction
 Mathematics education
 Music education
 Physical education
 Science education

Doctor of Musical Arts

Choral Music
 General Music
 Instrumental Music
 Solo Performance

Doctor of Philosophy

Aerospace Engineering
 Anthropology
 Archaeology
 Physical anthropology
 Social cultural anthropology
 Bioengineering
 Botany

¹ Major offered toward more than one degree at the same level.

² Not accepting applications.

³ Students apply to this degree program through the College of Law, not the Graduate College.

Graduate Degrees, Majors, and Concentrations Offered (continued)

Business Administration	Elementary Education ²	Political Science
Accountancy	Bilingual education	American politics
Decision and information systems	Child development	Comparative politics
Finance	Communication arts	International relations
Management	Curriculum	Political theory
Marketing	Early childhood education	Psychology
Purchasing and logistics management	Indian education	Clinical psychology
Chemical Engineering	Mathematics	Developmental psychology
Biomedical and clinical engineering	Multicultural education	Environmental psychology
Chemical process engineering	Reading	Experimental psychology
Chemical reactor engineering	Science	Physiological psychology
Energy and materials conversion	Social Studies	Social psychology
Environmental control	Engineering Science	Science and Engineering of Materials
Solid state processing	English	Social Work
Transport phenomena	Exercise Science	Sociology
Chemistry	Biomechanics	Spanish
Analytical chemistry	Motor/behavioral sport psychology	Special Education ²
Biochemistry	Physiology of exercise	Speech and Hearing Science
Geochemistry	Geography	Developmental neurolinguistic disorders
Inorganic chemistry	Geology	Neuroauditory processes
Organic chemistry	History	Neurogerontologic communication disorders
Physical chemistry	Asian history	Theatre
Solid state chemistry	British history	Theatre for youth
Civil Engineering	European history	Zoology
Environmental sanitary	Latin American history	Doctor of Public Administration
Geotechnical soil mechanics	U.S. history	Juris Doctor³
Structures	Industrial Engineering	
Transportation	Computer aided processes	
Water resources/hydraulics	Computer-integrated manufacturing	
Communication	Human factors	
Communicative development	Information systems	
Intercultural communication	Operations research	
Organizational communication	Organization control	
Computer Science	Quality control/reliability	
Counseling Psychology	Justice Studies	
Curriculum and Instruction	Criminal and juvenile justice	
Early childhood education	Dispute resolution	
Educational media and computers	Law, justice, and minority populations	
Elementary education	Law, policy, and evaluation	
English education	Women, law, and justice	
Exercise and wellness education	Learning and Instructional Technology ¹	
Physical education	Instructional technology	
Reading education	Learning	
Science education	Mathematics	
Special education	Mechanical Engineering	
Economics	Microbiology	
Educational Leadership and Policy Studies	Molecular and Cellular Biology	
Educational Psychology	Physics	
Lifespan developmental psychology	Track I	
Measurement, statistics and methodological studies	Track II	
School psychology		
Electrical Engineering		

¹ Major offered toward more than one degree at the same level

² Not accepting applications

³ Students apply to this degree program through the College of Law, not the Graduate College

discipline. The programs promote cooperative research and instruction among faculty who share common interests but are housed in different academic units. They allow students to pursue degrees that are intellectually coherent but that bring together diverse strengths of the university. See the "Interdisciplinary Graduate Degrees and Majors Overseen by the Graduate College" table.

Adult Development and Aging Program

An interdisciplinary, 24 semester-hour Certificate in Gerontology may be earned by graduate students who wish to study the biological, psychological, sociological, and policy-related aspects of aging and the economic, health, and social concerns of older people. Students enrolled in the certificate program may simultaneously pursue a major in an academic unit offering a graduate degree or may enter the program as nondegree graduate students. The Certificate in Gerontology provides a broad academic foundation for students who wish to apply the knowledge and skills acquired in their major to a variety of aging related pursuits. For further details of this program, see the *Graduate Catalog*.

For information on the undergraduate minor in Gerontology, see page 18, "Adult Development and Aging."

GERONTOLOGY

GRN 494 Undergraduate Special Topics. (3 F S)

498 Undergraduate Pro-Seminar. (3) S

499 Undergraduate Independent Study. (3 F S SS)

580 Graduate Practicum. (3) S

590 Graduate Reading and Conference. (3) F, S, SS

591 Graduate Seminar. (3) F S

Creative Writing (M.F.A.)

The interdisciplinary Master of Fine Arts degree program with a major in Creative Writing is administered by the Committee on Creative Writing. This studio/academic program involves the research, creative activity, and teaching interests of faculty of the Departments of English and Theatre to provide students with the opportunity to tailor a course of study to fit individual needs, talents, and goals. Students work under the direction of faculty who are practicing, published writers. For details of this program, see the *Graduate Catalog*.

Curriculum and Instruction (Ph.D.)

The interdisciplinary Doctor of Philosophy degree program with a major in Curriculum and Instruction is administered by the Interdisciplinary Committee on Curriculum and Instruction and overseen jointly by the Graduate College and the College of Education. Areas of concentration are available in early childhood education, educational media and computers, elementary education, English education, exercise and wellness education, physical education, reading education, science education, and special education. For details of this program, see the *Graduate Catalog*.

Exercise Science (Ph.D.)

The interdisciplinary Doctor of Philosophy degree program with a major in Exercise Science is administered by the Committee on Exercise Science. The degree is an individualized interdisciplinary degree that integrates graduate courses from a variety of academic units to provide a sound foundation for research leading to a dissertation in biomechanics, motor behavioral

sport psychology, or physiology of exercise. For details of this program, see the *Graduate Catalog*.

Humanities (M.A.)

The interdisciplinary Master of Arts degree program with a major in Humanities is administered by the Graduate Committee on Humanities. It offers the student whose interests transcend disciplinary boundaries the opportunity to integrate graduate courses in two or more departments as a foundation for research leading to a thesis in the humanities. Topics for the thesis require an understanding of cultural history, particularly of times when relationships between cultural values and one or more of the arts have been particularly dynamic in illuminating important questions. For details of this program, see the *Graduate Catalog*.

Justice Studies (Ph.D.)

The interdisciplinary Doctor of Philosophy degree program with a major in Justice Studies is administered by the Committee on Law and Social Sciences. The central focus of the program is the conceptualization and implementation of law and justice in society. The degree program integrates historical, legal, and philosophical approaches with social science training. Areas of interest include criminal and juvenile justice; dispute resolution; law, justice, and minority populations; law, policy, and evaluation; and women, law, and justice. For details of this program, see the *Graduate Catalog*.

Public Administration (D.P.A.)

The interdisciplinary Doctor of Public Administration degree program is administered by the Committee on Public Administration. The purpose of the degree is to prepare skilled professional

Interdisciplinary Graduate Degrees and Majors Overseen by the Graduate College

Major	Degree	Administered by
Creative Writing	M.F.A.	Committee on Creative Writing
Curriculum and Instruction	Ph.D.	Interdisciplinary Committee on Curriculum and Instruction
Exercise Science	Ph.D.	Committee on Exercise Science
Humanities	M.A.	Graduate Committee on Humanities
Justice Studies	Ph.D.	Committee on Law and Social Sciences
Public Administration	D.P.A.	Committee on Public Administration
Science and Engineering of Materials	Ph.D.	Committee on Science and Engineering of Materials
Speech and Hearing Science	Ph.D.	Committee on Speech and Hearing Science
Statistics	M.S.	Committee on Statistics

public administrators for positions in the public sector and for university teaching. Ethics, modes of decision making, policy analysis, problem-solving skills in budgeting, program evaluation, public personnel management, theoretical assumptions, and value assessments are some of the areas of study available. For details of this program, see the *Graduate Catalog*.

Science and Engineering of Materials (Ph.D.)

The interdisciplinary Doctor of Philosophy degree program with a major in Science and Engineering of Materials is administered by the Committee on Science and Engineering of Materials. Emphasis is placed on the applications of chemical thermodynamics, the mechanics of solids, quantum mechanics and transport theory for investigation of the relationships between microstructure and properties of solids, and the dependence of microstructures on processing. For details of this program, see the *Graduate Catalog*.

SCIENCE AND ENGINEERING OF MATERIALS

SEM 556 Electron Microscopy Laboratory. (3) F

Laboratory to support SEM 558. Cross listed as MSE 556. Prerequisite SEM 558 or MSE 558.

557 Electron Microscopy Laboratory. (3) S Laboratory support for SEM 559. Cross listed as MSE 557. Prerequisite SEM 559 or MSE 559.

558 Electron Microscopy I. (3) F Microanalysis of the structure and composition of materials using images of diffraction and X-ray and energy loss spectroscopy. Knowledge of elementary crystallography, reciprocal lattice, stereographic projections and complex variables is required. Cross listed as MSE 558. Prerequisite instructor approval.

559 Electron Microscopy II. (3) S Microanalysis of the structure and composition of materials using images of diffraction and X-ray and energy loss spectroscopy. Knowledge of elementary crystallography, reciprocal lattice, stereographic projections and complex variables is required. Cross listed as MSE 559. Prerequisite instructor approval.

Speech and Hearing Science

The interdisciplinary Doctor of Philosophy degree program with a major in Speech and Hearing Science is administered by the Committee on Speech and Hearing Science. The purpose of the program is to prepare scholars for careers of basic and applied research in academia or in health care delivery environments. The unifying theme of the program is the influence

of aging and changes in neurologic condition on human communication and its disorders. The program emphasizes this theme across all disciplines of speech, language, and hearing. For details of this program, see the *Graduate Catalog*.

Statistics (M.S.)

The interdisciplinary Master of Science degree program with a major in Statistics is administered by the Committee on Statistics. The program involves faculty and resources from the Department of Decision Information Systems and the Department of Mathematics. Areas of emphasis include applied statistics, mathematical statistics, statistical computing, statistical modeling, and statistical sampling and survey research. For details of this program, see the *Graduate Catalog*.

ADMISSION TO THE GRADUATE COLLEGE

Eligibility

Anyone who holds a bachelor's (or equivalent) or graduate degree from a college or university of recognized standing is eligible to apply for admission to the Graduate College. Undergraduate deficiencies may be assigned if the undergraduate degree is based on credits not accepted by ASU, such as life experience or noncredit workshops and seminars.

Graduate College Requirements

Generally, an applicant must have a GPA of 3.00 (4.00 – A scale) or the equivalent in the last two years of work leading to the bachelor's degree. A student who enters a graduate degree program is expected to have undergraduate educational experiences, including general education studies, that are similar to those required for the baccalaureate degree at ASU.

Requirements of the Academic Unit

Academic units may have admission requirements in addition to those of the Graduate College. For example, many graduate programs require scores from a national admissions test such as the Graduate Record Examination (GRE), Graduate Management Admission Test (GMAT), or the Miller Analogies Test (MAT). Some programs require the submission of a portfolio, letters of recommendation, and/or a statement of goals. Applicants should contact the

academic unit regarding specific admission and application requirements.

Submission of an Application

All applicants must submit a completed Application for Admission form. Applicants to a degree program must submit two official transcripts of all postsecondary academic work completed or in progress. Although courses from one school may appear on the transcript of another school, the Graduate Admissions Office requires separate transcripts from each school attended. Applicants should allow sufficient time in asking the schools concerned to process and mail the transcripts directly to the Graduate Admissions Office, Arizona State University, Tempe, Arizona 85287 1003 (602/965-6113). The process of providing the Graduate College with the necessary records may take two months or longer.

The submission of scores from a national admissions test is strongly recommended for all degree applicants and is required for admission to some graduate programs. The applicant must ask Educational Testing Service to send the test results directly to the Graduate Admissions Office. It should be noted that it may take up to eight weeks for test scores to be announced. Portfolios, letters of recommendation, and statements of goals should be sent directly to the academic unit.

Application Fee

Each application for entry to ASU graduate programs must be accompanied by a nonrefundable application fee. The fee is \$35.00 to apply for admission to a degree program and \$10.00 to apply for nondegree studies.

For details concerning reentry, multiple applications, and other matters relating to the application fee, see the *Graduate Catalog*.

International Applicants

Applicants who will attend the university while holding F-1 or J-1 visas must meet the regulations of the Immigration and Naturalization Services in addition to the requirements of the Graduate College and the academic units to which they apply.

Applicants from outside the United States are also required to submit additional materials and should follow the procedures described in the Graduate College brochure *Admission Information for New International Students*. International applicants should read this

brochure carefully to become familiar with all the requirements they must meet. Applicants can also consult the ASU listings in *Peterson's Graduate Education Directory* and in the *Directory of Graduate Programs* (published by the Educational Testing Service).

Among the additional materials required of international students are scores from English language examinations. All applicants whose native language is not English must submit a score from the Test of English as a Foreign Language (TOEFL). All international applicants who do not speak English as a primary language and who wish to apply for teaching assistantships must pass an examination that certifies their skill in speaking English—either the Test of Spoken English (TSE), which may be taken in the student's home country, or the SPEAK test, which is administered at ASU. Some degree programs also require TSE or SPEAK scores of all applicants whose native language is not English. For specific information about TSE requirements, contact the head of the academic unit.

As required by the U.S. Immigration and Naturalization Service, international applicants must also verify that they have the financial resources to cover their expenses during graduate study at ASU. The Graduate Admissions Office provides the Financial Guarantee form to international applicants. After obtaining a verification from a bank or sponsoring organization, international applicants must complete and return it to Graduate Admissions. The I 20 and the IAP66 (documents needed to obtain a student visa) are issued only after the completed, properly verified Financial Guarantee form has arrived. International students may enroll at ASU only if they have been admitted to a degree program and therefore may not pursue nondegree studies. They must meet all appropriate immigration standards and requirements.

Applications are processed when they are received. However, international applicants should submit all materials in December or January in order to begin study the following fall semester and in August or September in order to begin study the following spring semester. An application fee of \$35 (in U.S. funds) must accompany the formal application, which otherwise will not be evaluated. (For details concerning

multiple applications and other matters relating to the application fee, see the *Graduate Catalog*.) All F 1 or J 1 visa students must have insurance coverage against illness and accident before being permitted to register. Insurance must be maintained throughout the student's enrollment in the university and may be obtained at the time of registration.

Upon arrival on campus, students must report to the International Student Advisor in the Student Life Office.

Application Deadlines

The Graduate College does not have deadlines. Applications are processed as they are received. However, many academic units have specific and early deadlines; many units review applications once a year, usually in January or February for fall admission. Applicants are urged to contact the academic units regarding deadlines.

Application Procedures

When the Graduate Admissions Office has a complete file (the application, Domicile Affidavit, application fee, transcripts, and applicable national admissions test scores) for an applicant, one copy is forwarded to the academic unit. A second copy is kept in the Graduate College. Academic units review the file and the supporting materials (such as applicable test scores, portfolios, and letters of recommendation) and, following admission policies established by the Graduate College and the faculty of the academic unit, make a recommendation (regular admission, regular admission with deficiencies, provisional admission, or denial) to the Graduate College. All recommendations are reviewed and approved by admissions officers in the Graduate College.

If there are questions about the likelihood of a student succeeding in the designated program, the Graduate College admissions officers communicate with the academic unit, perhaps agreeing on a provisional admission or arranging for the student in question to have a special faculty advisor or an advanced graduate student assigned as a mentor. Other times they may suggest that the student take some preliminary courses as a nondegree student.

Academic units, which must indicate their willingness to admit applicants, frequently set higher standards than those established by the Graduate Col

lege. Denial decisions may be based on the limitations of departmental resources as well as on the relative qualifications of those competing for admission in a particular semester.

Notice of Admission Decisions

Only the dean of the Graduate College can make formal offers of admission. The Graduate College notifies all applicants in writing of the admission decision.

All documents received by the university in connection with an application for admission become the property of Arizona State University. If the applicant does not enroll in the university within one year, the admission documents may be destroyed.

The date (month/day/year) on the graduate dean's letter of admission is the actual date of admission. If the student is enrolled in courses on the admission date, those courses if applicable may be considered part of a program of study. Courses taken the semester before this date are nondegree hours.

Admission Classifications

Regular Admission. Applicants who fulfill all requirements for admission and are acceptable to both the academic unit and the Graduate College are granted regular admission.

Regular Admission with Deficiencies. A student whose grades and test scores are at an acceptable level but who does not have the undergraduate background expected by the academic unit and the university may be assigned deficiency courses. The letter of admission specifies the deficiencies that must be completed before the student is awarded a graduate degree. Deficiency courses are taken in addition to those normally required for a degree.

Provisional Admission. A student who does not meet minimum academic standards but has counterbalancing evidence to suggest the potential for success may be admitted on a provisional basis. Provisional admission provides an academic unit with more evidence on which to base its decision. Normally, the academic unit reviews the student's status following completion of 12 semester hours of approved graduate study. At that time, the academic unit recommends to the Graduate College a change in status to either regular admission or withdrawal from

the program. When students have completed their provisional requirements, they should check with their advisors to make sure that the change of status has been recommended. A provisional student may also be assigned deficiencies.

Nondegree Admission. A student not interested in earning a degree or not yet ready to apply to a particular degree program may enroll as a nondegree student. The application process is streamlined, does not require submission of transcripts or test scores, and can be completed during a single visit to the Graduate Admissions Office. This process may also be completed by mail. A maximum of nine hours taken while in this category at ASU may be applied toward a graduate degree if appropriate for the student's program of study.

Recognition of a Degree

Recognition of a degree is acknowledgment that the program leading to the degree is equivalent to a program offered by ASU or is an acceptable program for the proposed graduate major at ASU. A student who enters a graduate degree program at Arizona State University is expected to have undergraduate educational experiences, including general education studies, that are appropriate for the program.

Definition of a Unit of Credit

See page 41 of this catalog.

GRADUATE COLLEGE PROCEDURES

Change in Graduate Degree Program

A change from one graduate degree program to another requires a new application to the Graduate College. The usual admission procedures are followed. For details on matters relating to the application fee, see the *Graduate Catalog*.

Re-entry to the Graduate College

Any former graduate student who has not been in attendance at the university for one or more semesters must submit an application for re-entry to the Graduate Admissions Office. The application should be submitted at least one month before the beginning of the semester in which the student plans to re-enter. For details on re-entry and other matters relating to the application fee, see the *Graduate Catalog*.

Determination of Catalog Requirements

The *Graduate Catalog* is published annually. Requirements for an academic unit or college, campus, or the university as a whole, may change and are often upgraded.

In determining graduation requirements, a student may use only one edition of the Graduate Catalog.

A student graduates under the curriculum, course requirements, and regulations for graduation in effect at the time of admission to a degree program at the university. A student may choose to graduate under any subsequent catalog issued.

Some changes in policies and procedures affect all students regardless of the catalog used by the student. These policies and procedures may appear in the catalog or in other university publications.

Registration

See pages 38-39 of this catalog.

Audit Enrollment

Graduate students may register as auditors in one or more courses with the approval of the supervisory committee chair and the consent of the instructor involved. The student must be registered properly and pay the fees for the course. An audited course is counted in the student's maximum course load. It does not count for students who must take a minimum number of credits, e.g., teaching assistants or students receiving financial assistance. The mark of "X" is recorded for completion of an audited course, unless the instructor determines that the student's participation or attendance has been inadequate, in which case a "W" may be recorded.

Enrollment Verification

General guidelines on page 39 of this catalog are used only to verify enrollment for the purpose of loan deferments and eligibility. The registrar is responsible for such verifications.

Course Withdrawal

During the first four weeks of a semester, a student may withdraw with a mark of "W." From the fifth week to the end of the 10th week of a semester, a student may withdraw with a mark of "W" only from courses in which the instructor certifies the student is passing at the time of withdrawal.

Failure to withdraw officially from a course will result in a grade of "E," which is used in the computation of the GPA. The *Schedule of Classes* lists the procedures for withdrawal.

An instructor may withdraw a student from a class for disruptive classroom behavior with a mark of "W" or a grade of "E." A student may appeal an instructor-initiated withdrawal to the Standards Committee of the college in which the course is offered. The decision of the committee is final.

Course Load

The course load is determined by the supervisory committee but is not to exceed 15 semester hours of credit during each of the two semesters, six semester hours during each five-week summer session, or nine semester hours of credit during an eight-week summer session. An audited course is counted in the student's maximum load.

All graduate assistants and associates must enroll for a minimum of six semester hours during each semester (fall and spring) of their appointment. The six hours cannot include audit enrollment. A half-time (50%) graduate assistant or associate working 20 clock hours per week may not register for more than 12 hours of course work each semester; a third-time (33%) assistant or associate for more than 13 hours; and a quarter-time (25%) assistant or associate for more than 15 hours.

During the summer sessions, graduate assistants and associates employed 100% time may enroll for a maximum of three hours during a five-week session or four hours during the eight-week session; those employed 50% time may enroll for a maximum of five hours during a five-week session or seven hours during the eight-week session; and those employed 25% time may enroll for a maximum of six semester hours during a five-week session or nine hours during the eight-week session.

All graduate students doing research, working on theses or dissertations, taking comprehensive or final examinations, or using university facilities or faculty time must be registered for a minimum of one hour of credit, not audit, which appears on the program of study or which is an appropriate graduate-level course, such as a continuous enrollment course (595, 695, or 795).

Assistantships and Commercial Services

All graduate students who are hired for class course support or who hold assistantships or associateships for a specific course including teaching assistants, research assistants, and graduate assistants may not take or provide notes for that course to commercial notetaking services or students. An exception may be made by the course instructor(s) on a case by case basis as an authorized support service for a disabled student. This policy covers all commercial activities (e.g., notetaking or paid review sessions) that might be associated with a course for which the assistant or associate has assigned responsibilities.

GRADUATE COLLEGE DEGREE REQUIREMENTS

Graduate Advisement

Advising is much more than technical support; it is an integral part of graduate education. Students' programs of study are generally tailored to meet individual needs, and students should seek advice from faculty or advisors as they plan their course work, examinations, and other degree requirements.

Graduate College Advising Office.

The Graduate College provides advising service to prospective and enrolled students. Information is provided concerning Graduate College admissions, nondegree status, programs of study, and policies and procedures. Academic and professional advisement is available to nondegree students. Advisors assist nondegree or prospective students in contacting appropriate faculty and advisors. Students may call 602/965 3521 for an appointment or stop by the lobby of Wilson Hall

Grading

- A - Excellent (4.00)
- B - Good (3.00)
- C - Passing (2.00)
- D - No Graduate Credit (1.00)¹
- E - Failure (0.00)¹
- W - Withdrawal²
- I - Incomplete
- X - Audit
- Y - Satisfactory
- Course in Progress³

¹ This grade cannot be applied toward a graduate degree but is included in the calculation of a GPA.

² This grade is given whenever a student officially withdraws from a class.

³ This grade is usually given pending completion of courses such as thesis, dissertation, applied project, research, solo performance, and practicum (592, 692, 792; 593, 693, 793; 596, 696, 796; 580, 680, 780; and 599, 799). No grade for the Course in Progress appears on the transcript.

A grade of "P" (pass) in a 400 level course may not appear on a program of study. Grades of "D" and "E" cannot be used to meet the requirements for a graduate degree, although they are used to compute the GPAs. A student receiving a grade of "D" or "E" must repeat the course in a regularly scheduled (not an independent study) class if it is to be included in the program of study. However, both the "D" or "E" and the new grade are used to compute the GPAs. Grades on transfer work are not included in computing GPAs.

Graduate course work reported as an "I" (incomplete) must be completed within one calendar year. At the time the "I" grade is given, the student must complete the Request for Grade of Incomplete form. The form first serves as a record of the "I" grade and the work required to complete it. When the student has completed the work, the form then serves as a change of grade authorization.

If the work specified on the form is not completed within one calendar year, the "I" grade becomes part of the student's permanent transcript. The student is not allowed to complete the course work as specified on the "Incomplete" form. The student may, however, repeat the course after the "I" has become permanent by reregistering, paying fees, and fulfilling all course requirements. The grade for the repeated course appears on the transcript but does not replace the permanent "I."

Scholarship

To be eligible for a degree in the Graduate College, a student must achieve two GPAs of "B" (3.00) or better. The first GPA is based on all courses numbered 500 or higher that appear on the transcript. (Courses noted as deficiencies in the original letter of admission are not included.) The second GPA is based on all courses that appear on the program of study.

Academic excellence is expected of students doing graduate work. Upon recommendation from the head of the

academic unit, the dean of the Graduate College can withdraw a student who is not progressing satisfactorily.

A graduate student who does not enroll for three calendar years is considered withdrawn and must reapply for admission to a degree program.

Graduate Credit Courses

Courses at the 500, 600, and 700 levels are graduate credit courses. Courses at the 400 level apply to graduate degree requirements when appearing on an approved program of study. However, 400-level courses are not graduate courses by definition and can not be certified as such for purposes of employment or transferring to other institutions.

Reserving of Course Credit by Undergraduates. See page 38.

Transfer Credit. Transfer of credit is the acceptance of credit from another institution for inclusion in a program of study leading to a degree awarded by ASU. The number of hours transferred from other institutions may not exceed 20% of the total minimum semester hours required for a master's degree unless stated otherwise for a specific degree program.

Transfer credit taken before admission to a graduate degree program at ASU is nondegree credit. Nondegree credit taken at ASU combined with nondegree credit taken at another institution may not exceed nine hours on the master's program of study. The date (month/day/year) on the Graduate College dean's letter of admission is the actual date of admission. If the student is enrolled in courses on the admission date, those courses if applicable may be considered part of a program of study. Courses taken the semester before this date are nondegree hours. The nine hour limit does not apply to the doctoral programs.

Transfer credits must be acceptable toward graduate degrees at the institution where the courses were completed. Certain types of graduate credits cannot be transferred to ASU, including the following:

1. credits awarded by postsecondary institutions in the United States that lack candidate status or accreditation by a regional accrediting association,
2. credits awarded by postsecondary institutions for life experience;

3. credits awarded by postsecondary institutions for courses taken at noncollegiate institutions (e.g., government agencies, corporations, and industrial firms);
4. credits awarded by postsecondary institutions for noncredit courses, workshops, and seminars offered by other postsecondary institutions as part of continuing education programs; and
5. credits given for extension courses.

Acceptable academic credits earned at other institutions that are based on a different unit of credit than the ones prescribed by the Arizona Board of Regents are subject to conversion before being transferred to ASU.

Only resident graduate courses with an "A" or "B" grade may be transferred. A course with the grade of pass, credit, or satisfactory may not be transferred.

Official transcripts of any transfer credit to be used on a program of study must be sent directly to the Graduate Admissions Office from the office of the registrar at the institution where the credit was earned.

Correspondence and Extension Courses. Correspondence and extension courses cannot be used to meet the requirements for a graduate degree.

Graduate Supervisory Committees

When the program of study is filed, upon the recommendation of the head of the academic unit, the dean of the Graduate College appoints a graduate student's supervisory committee, consisting of a chair and other resident faculty members. The number of members serving on this committee depends on the degree program. Academic professionals (e.g., research scientists, research engineers), nontenure track faculty (e.g., adjunct professors, research professors), and individuals granted affiliated faculty status through established university procedures may serve as co-chairs or members or extra members of thesis and dissertation committees upon approval by the Graduate College. Individuals who are recommended by an academic unit as eligible to serve as a co chair must meet the criteria established by the academic unit and be approved by the Graduate College.

Qualified individuals outside the university, upon the recommendation of the head of the academic unit and approval of the Graduate College, may serve as members of thesis and dissertation committees; however, such individuals may not serve as chairs or co chairs. Former ASU faculty with students completing their degrees may continue to serve as co chairs pending the approval of the academic unit.

Foreign Language Requirements

A graduate degree program may require proficiency in a foreign language. If a foreign language is required, students must demonstrate at least a reading knowledge in the area of study required by the supervisory committee and consistent with the requirements for the graduate degree program. Normally, the language is selected from French, German, Russian, or Spanish, although other languages may be recommended when there is adequate justification.

Students must pass a foreign language examination specific to their particular graduate programs. The examinations are administered three times each year by the Department of Foreign Languages, which certifies language competency. Students planning to take the examination must register in the Graduate College at least one month in advance of the examination date. The chair of the student's supervisory committee is responsible for providing the Department of Foreign Languages with materials from which the examination is prepared. The chair should submit or recommend relevant books and/or journals of approximately 200 pages in length in the desired foreign language.

A student must pass the examination in no more than three attempts. Following a failure in the foreign language examination, the student must petition the Graduate College for permission to retake the examination.

Theses and Dissertations

Candidates for the Master of Arts and Master of Science degrees must submit a thesis or equivalent that demonstrates an introduction to research. All doctoral degree candidates must submit a dissertation, with the exception of the Doctor of Musical Arts in Solo Performance, which requires three recitals and a research paper. The Doctor of Philosophy dissertation should be a valuable educational experience that

demonstrates the candidate's mastery of research methods, theory, and tools of the discipline. The dissertation should demonstrate the candidate's ability to address a major intellectual problem and to propose meaningful questions and hypotheses. It should be a contribution to knowledge that is worthy of publication by an established press as a book or monograph or as one or more articles in a reputable journal.

For format, the Graduate College must review the final copy of the master's thesis, doctoral dissertation, and other final documents that are required to be placed in the library. Copies of the *Format Manual* are available in the Graduate College. The student is required to submit a complete copy of the thesis or dissertation for format review at least 10 working days before the oral defense (two weeks if there are no holidays during the time period). Doctoral students must submit a completed Survey of Earned Doctorates Awarded in the United States, conducted by the National Research Council.

Graduate students and their supervisory committee chairs jointly select a style guide or journal format representative of the field of study. The Graduate College allows some flexibility in the format of the manuscript, but Graduate College and library guidelines must be followed.

The student must submit two final copies of a thesis or dissertation to the ASU Bookstore for binding. Bound copies are placed in the Hayden Library and Archives. Doctoral candidates should also submit one copy of the title page, approval page, and abstract (which must not exceed 350 words). The student is responsible for the binding fees; in addition, doctoral students must pay to have their dissertations microfilmed by University Microfilms International (UMI). The fee covers the expense of having the document sent to UMI, where it is microfilmed and cataloged. Information on the dissertation appears in various publications, such as *Dissertation Abstracts International* and the annual supplement of the *Comprehensive Dissertation Index*.

Application for Graduation

Students should apply for graduation no later than the date specified in the *Graduate Catalog* calendar. All fees

are payable at that time. Students applying for graduation after the deadline listed in the *Graduate Catalog* calendar are required to pay a late fee. At the end of the semester in which they apply for graduation, students are officially notified of any degree requirements they have not yet completed. Students who do not complete all degree requirements by their anticipated graduation date are required to pay a refile fee.

Withdrawal from the University

See page 42 of this catalog.

A master's or doctoral degree student who does not enroll for three calendar years is considered withdrawn and must reapply for admission to a degree program.

Summer Sessions

See page 357 of this catalog.

Dates and Deadlines

The university calendar found in the current *Graduate Catalog* lists deadlines for the submission of theses and dissertations to the Graduate College, the last day to apply for graduation, the last day to hold an oral defense of a thesis or dissertation, and the last day to submit theses and dissertations to the ASU Bookstore for binding.

Student Responsibility

It is the responsibility of the graduate student to know and observe all procedures and requirements of the Graduate College as defined in the *Graduate Catalog*, the *Schedule of Classes*, and the *Format Manual*.

Students should also be informed about the requirements concerning their degree programs and any special requirements within their academic units. Students are expected, as part of their obligations, to be familiar with the *Student Code of Conduct*, which is available in the Office of Student Affairs. Violations of the *Student Code of Conduct* or instances of academic dishonesty, specifically cheating in examinations, laboratory work, written work (plagiarism), and forging or altering university records (i.e., attempting to

gain credit for work that the student has not actually performed) are subject to university discipline, whether committed by individuals or groups.

Misconduct in Scholarly Research and Creative Activities

Students are expected to maintain the highest standards of integrity and truthfulness in scholarly research and creative activities. Misconduct in scholarly research and creative activities includes, but is not limited to, fabrication, falsification or misrepresentation of data, and plagiarism. Misconduct by any student may result in suspension or expulsion from the university and other sanctions as specified by the individual colleges. Policies on misconduct are available in the Office of the Senior Vice President and Provost.

Graduate College Policies and Procedures. For more detailed information on Graduate College policies and procedures of particular interest to students, please refer to the current *Graduate Catalog*.

Policies and Procedures of the Graduate Council Appeals Board

The Appeals Board of the Graduate Council acts as the appeals body for graduate students seeking redress on academic decisions regarding their graduate program. The board is composed of five members of the Graduate Council, excluding ex officio council members who hold administrative positions in the Graduate College. The members and chair of the board are appointed by the dean of the Graduate College.

An appeal by a student previously admitted to a graduate degree program may result from an academic decision the student considers adverse. Decisions involving Graduate College policy as stated in the *Graduate Catalog* are within the jurisdiction of the Appeals Board. Decisions involving policies of the academic unit (center, department, school, or college) are not normally heard by the Graduate Council Appeals Board.

A student may seek redress by writing a letter to the dean of the Graduate College or the chair of the Appeals Board of the Graduate Council. Upon receipt of the letter, the dean or chair informs the student whether the appeal concerns a policy of the academic unit or of the Graduate College, placing it within the jurisdiction of the board.

A student may request an opportunity to appear before the Appeals Board or waive this right. The board may choose to interview faculty and administrators involved in the case and review the student's complete academic record and all documents pertaining to the case. Such reviews are primarily concerned with the observance of stated procedures and policies but may consider extenuating circumstances as related to policy.

In the event that a member of the Appeals Board has been involved in a case as a member of the student's committee or as a member of the faculty offering the graduate program, that member is replaced for the duration of the case, and the dean of the Graduate College or chair of the Appeals Board may select an alternate member from the remaining membership of the Graduate Council. A member of the Appeals Board may request to be excused from a case or may be temporarily replaced whenever there is a potential for conflict of interest. The presence of three members of the board at a meeting is considered a quorum.

Only summary notes, not verbatim transcripts, of the board's proceedings are kept. All written documentation presented in each case is retained in the board's files for a period of one year. Such files are available only to the complainant and respondent in the hearing and do not become part of the student's official university file. The decision of the Appeals Board is reported to members of the Graduate Council for their information. The decision is then communicated to the student in writing by the dean of the Graduate College, and a copy is sent to each member of the Appeals Board.

Summer Sessions

Leon W. Kemper, Ph.D.
Director

The summer sessions provide more than 2,000 fully accredited courses. The summer is an opportunity for students to begin or continue academic work on a year-round basis by choosing from this broad selection of courses. Graduate and undergraduate degree candidates and nondegree students find that summer is a convenient time to enhance or refresh their subject matter interests. Also, summer is an excellent time for baccalaureate degree holders to continue their professional development.

Summer sessions offer students the possibility of experiencing International Study Programs. These programs are directed by ASU faculty and permit students to earn graduate or undergraduate university credit while studying in a foreign country. All summer International Study Programs have been approved by the appropriate academic unit.

Summer courses are equivalent to regular semester courses in content, credit awarded, and expected standard of performance. As a general rule, summer courses are taught by members of the ASU faculty.

Every campus course (except some EPE courses) is held in an air-conditioned classroom or laboratory. A limited number of summer classes are offered at off campus locations.

Terms. There are three summer sessions, one of eight weeks and two of five weeks. The eight-week session and the first five week session run concurrently.

In addition, courses from the College of Education and a limited number of courses from other colleges are offered in two Supplemental Summer Sessions.

The dates for each Supplemental Summer Session are one week later than the regular two five week sessions. These Supplemental Sessions are offered for the convenience of students with work schedules that conflict with the regular summer sessions beginning dates.

Admission to Summer Sessions. All students must be admitted to the university before enrolling in summer courses. However, transient students those already admitted to other colleges and universities are admitted as non degree undergraduates or nondegree graduates. The submission of transcripts or test scores is not required for

this status. However, some courses may require specific prerequisites. (See appropriate college policies.)

ASU students enrolled during the spring semester preceding the summer sessions need only complete the summer sessions registration process.

ASU students not enrolled during the spring semester preceding the summer sessions must be readmitted. See "Readmission to the University," page 37.

Conditional admission before graduation from high school may be granted. See "Admission before Graduation from High School," page 29

Advisement. All students are strongly encouraged to seek academic advisement before enrolling in summer courses. See "Academic Advisement," page 36.

Summer Credit Loads. Students are permitted to earn a maximum of six semester hours of credit each five-week session or nine semester hours of credit in the eight week session. Hours of enrollment in any other institution or correspondence course are included in the maximum allowable course load during any given session.

Registration. See the current *Summer Sessions Bulletin*.

Fees and Expenses. Summer sessions students pay for the actual number of hours enrolled. See the current *Summer Sessions Bulletin* for the fee structure.

Housing. Contact Residence Life for summer housing information at 602/965 3515.

Information. The *Summer Sessions Bulletin* is available beginning in February at the Office of Summer Sessions, ASB 109, and all registrar sites. *Note:* The admissions and registration process for summer sessions begins when the *Summer Sessions Bulletin* is distributed.

The *Summer Sessions Bulletin* contains all course information, the non degree admission form and the registration form for all students.

Requests for the *Summer Sessions Bulletin* or for other information should be addressed to the Office of Summer Sessions, Arizona State University, Tempe, Arizona 85287 3003. For more information, call 602/965-6611.

International Programs

Richard S. Olson, Ph.D.
Director

Knowledge and appreciation of other nations and cultures are essential in this increasingly interdependent world, and Arizona State University is committed to helping build the international competence of the university community. This commitment is evidenced in a wide variety of student programs and faculty teaching, research, and service programs.

The Office of International Programs

Located administratively within the Office of the Senior Vice President and Provost, the Office of International Programs develops, coordinates, and administers university programs abroad. Activities include establishing interuniversity faculty exchange and research agreements, developing and administering student programs, and coordinating university relationships with governments, foundations, and other agencies involved in international affairs.

Academic Programs

ASU Programs. Arizona State University offers a select set of exchange and study abroad programs for students. In cooperation with the various ASU colleges and with universities abroad, the Office of International Programs coordinates semester and/or full-year programs in Bolivia, England, France, Germany, Israel, Italy, Japan, Mexico, Netherlands, Norway, Portugal, Spain, Wales, and Yugoslavia. Several of the programs offer intensive language tracks in which students may receive four semesters of foreign language credit in one semester. Other programs require prior command of a foreign language. Still other programs offer courses taught in English. Information about ASU study abroad and exchange offerings for students may be obtained from the Office of International Programs, MOEUR 124 (602/965-5965). For several programs, the Office of International Programs refers students to the appropriate academic coordinators in departments or centers.

Success in any international program depends upon careful advance planning. A student should confer with his or her academic advisor to determine how courses taken overseas on one of the ASU programs apply to his or her program of study. Generally, students

who participate in an official ASU program remain under the degree requirements of the catalog in force when they entered ASU. The students retain and may apply most of their financial aid to the program and receive resident credit on their ASU transcripts.

The larger ASU programs overseas may have resident directors. All students who participate in ASU programs are subject to the *Student Code of Conduct* and to the authority of the resident directors of their programs. Students are also required to sign appropriate waivers of responsibility before leaving campus on a program.

It should be noted that, because of ASU commitments to foreign universities, cancellation and refund schedules vary by program and are not related to the general ASU refund schedule. Specific information on each program is available from the Office of International Programs.

Non-ASU Programs. ASU cannot offer students official resident credit programs in all countries of potential interest, and students often choose to participate in international study programs offered by other universities or agencies not affiliated with ASU. By definition, these programs fall outside the purview and responsibility of the Office of International Programs. Students interested in these programs should contact Undergraduate Admissions for accurate information on overseas study and transfer credit requirements.

Upon request, Undergraduate Admissions informs students by letter of the accreditation status of foreign institutions. The student is responsible for consulting with his or her ASU academic advisor before leaving ASU.

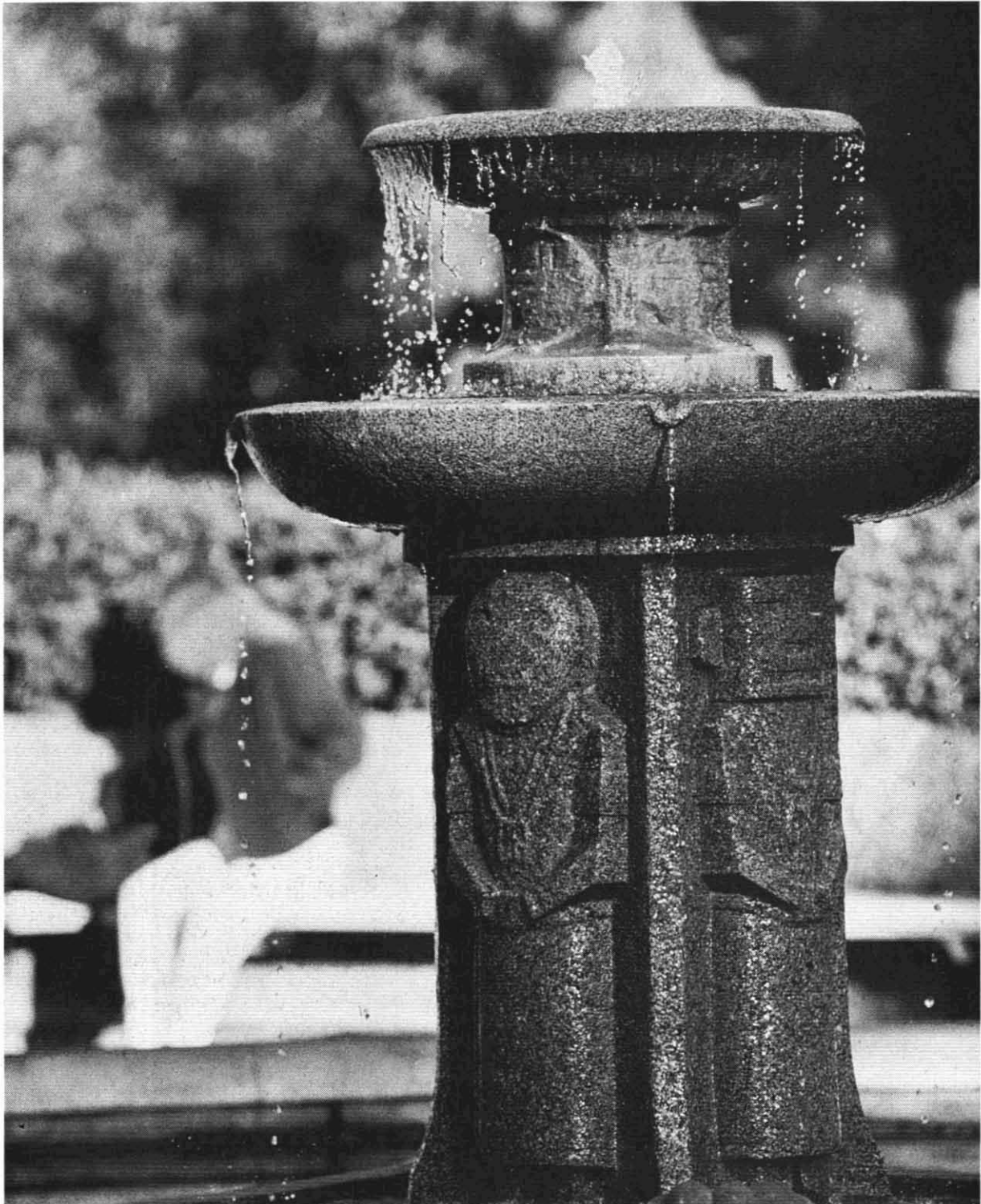
It is strongly advised that a student planning to enroll independently in a non-ASU program abroad complete the necessary readmission and catalog petition forms before leaving ASU. The student should check with the ASU registrar to assure that he or she is following ASU readmission and graduation policies. If the student wishes to follow the degree requirements of the catalog in force when he or she entered the university, the student must file the appropriate petition with the college of his or her major.

Area Studies

Special area studies programs are coordinated through the Center for Asian Studies (pages 84 and 174–175), the Center for Latin American Studies

(pages 84 and 175), the Consortium for Atlantic Studies, and the Russian and East European Studies Consortium (page 84). These groups publish jour-

nals, research reports, scholarly monographs, and books in addition to coordinating educational programs within the university and abroad.



Faculty and Academic Professionals

The faculty and academic professionals listed are involved in undergraduate and graduate instruction and research. The year of first appointment follows the name. Emeriti are included.

Aannestad, Per (1975), Associate Professor of Physics and Astronomy; B.S., University of Oslo (Norway); Ph.D., University of California, Berkeley

Abele, Deborah (1990), Faculty Associate of Planning; B.A., Vassar College

Abell, Roger K. (1989), Assistant Research Specialist, Engineering Computer Services. M.A., University of South Dakota

Aberle, James T. (1989), Assistant Professor of Engineering; B.S., M.S., Polytechnic Institute of New York; Ph.D., University of Massachusetts, Amherst

Abraham, Willard (1953), Professor Emeritus of Special Education, B.S., Illinois Institute of Technology; M.Ed., Chicago Teachers College, Ph.D., Northwestern University

Abston, Deborah (1990), Assistant Librarian, Access Services; B.S., M.S.L.S., Wayne State University

Acevedo, Roberto M. (1964), Professor Emeritus of Spanish; B.A., University of California, Berkeley, M.A., Ph.D., University of Arizona

Acharya, Raghunath (1976), Associate Professor of Physics and Astronomy; B.Sc., M.Sc., University of Delhi (India); Ph.D., University of Rochester

Acker, Barbara (1991), Assistant Professor of Theatre; B.F.A., University of Texas, Austin; M.A., Case Western Reserve University; Ph.D., Wayne State University

Acker, William J. (1970), Professor Emeritus of Geography; B.S., Purdue University, M.S., University of Kansas; M.A., Ph.D., Syracuse University

Adams, Donna (1983), Assistant Professor of Nursing; B.S.N., University of Missouri, Columbia, M.S.N., Arizona State University; D.N.Sc., University of San Diego

Adams, Karen L. (1984), Associate Professor of English; B.A., M.A., Ph.D., University of Michigan

Adams, Lori (1987), Faculty Associate of Theatre; B.A.E., Wayne State College, M.F.A., University of Nebraska, Lincoln

Adelson, Roger D. (1974), Associate Professor of History; B.A., George Washington University; B.Litt., University of Oxford (England); M.A., Ph.D., Washington University

Aguilar, John L. (1976), Associate Professor of Anthropology; B.A., University of California, Los Angeles, M.A., California State University, Los Angeles, Ph.D., University of California, San Diego

Ahn, Seung C. (1990), Assistant Professor of Economics; B.A., Sogang University; M.A., Ph.D., Michigan State University

Aiken, Jane H. (1985), Professor of Law; B.A., Hollins College; J.D., New York University, LL.M., Georgetown University

Aiken, Leona S. (1985), Professor of Psychology; B.S., Virginia Commonwealth University; M.S., Ph.D., Purdue University

Akers, Lex A. (1980), Professor of Engineering; Director, Center for Solid State Electronics Research; B.S.E.E., M.S.E.E., Ph.D., Texas Tech University

Akins, William H. (1975), Professor of Theatre; B.A., Duke University; M.A., Ph.D., University of Denver

Alarcon, Justo (1968), Professor of Foreign Languages; B.A., M.A., Seráfica (Spain), M.A., Laval University (Canada), Arizona State University, Ph.D., University of Arizona

Alarcon, Ricardo O. (1989), Assistant Professor of Physics and Astronomy, B.S., M.S., University of Chile (Chile); Ph.D., Ohio University

Alberts, Janet K. (1989), Assistant Professor of Communication; B.S.Ed., M.A., Abilene Christian University; Ph.D., University of Texas, Austin

- Alcock, John** (1972), Regents' Professor of Zoology, B.A., Amherst College; Ph.D., Harvard University
- Alcorn, Marianne S.** (1981), Law Librarian, Reference, B.A., University of Washington; M.L.S., University of Southern California
- Aldrich, Frank T.** (1969), Associate Professor of Geography; B.A., University of Texas, Austin; M.S., Ph.D., Oregon State University
- Aldridge, Gordon** (1978), Professor Emeritus of Social Work; B.A., M.A., M.S.W., University of Toronto, Canada; Ph.D., University of Michigan
- Alexander, Robert J.** (1975), Professor of German; B.A., Macalester College, M.A., Ph.D., University of Wisconsin, Madison
- Alisky, Marvin** (1957), Professor Emeritus of Political Science; B.A., M.A., Ph.D., University of Texas, Austin
- Allee, David R.** (1991), Assistant Professor of Electrical Engineering, M.S.E.E., Ph.D., Stanford University
- Allen, Craig M.** (1991), Assistant Professor of Journalism and Telecommunication, B.A., Linfield College, M.S., University of Oregon; Ph.D., Ohio University
- Allen, James** (1989), Assistant Professor of Chemistry, B.S., Saint Joseph's University, M.S., Ph.D., University of Illinois
- Allen, Stephen G.** (1988), Adjunct Assistant Professor of Botany, B.S., M.S., Montana State University; Ph.D., University of Arizona
- Allen, Theodore Jr.** (1959), Professor Emeritus of Engineering; B.S.M.E., M.S.M.E., Texas A&M University
- Allison, Maria T.** (1984), Professor of Leisure Studies, Chair, Department of Leisure Studies; B.S., M.S., University of New Mexico, Ph.D., University of Illinois
- Alozie, Nicholas O.** (1991), Assistant Professor of Public Affairs, B.A., M.P.A., Texas Southern University; M.A., Ph.D., University of Texas, Dallas
- Alquist, Lewis R.** (1984), Associate Professor of Art; B.F.A., Florida Atlantic University; M.F.A., Cranbrook Academy of Art
- Altheide, David L.** (1973), Regents' Professor of Justice Studies; B.A., Central Washington State College, M.A., University of Washington; Ph.D., University of California, San Diego
- Alvarado, Ronald H.** (1974), Professor of Zoology, B.A., University of California, Riverside; M.S., Ph.D., Washington State University
- Alvarez, Robert R. Jr.** (1989), Associate Professor of Anthropology, B.A., Northern Arizona University, M.A., San Diego State University; M.A., Ph.D., Stanford University
- Amel, Eric** (1988), Assistant Professor of Finance, B.A., Oberlin College; M.A., Ph.D., Washington University
- Ames, James G.** (1985), Senior Research Associate, Computer Integrated Manufacturing Systems Research Center; B.S., San Diego State University
- Anderson, Bruce A.** (1966), Professor of Mathematics; B.A., M.S., Ph.D., University of Iowa
- Anderson, Douglas A.** (1979), Professor of Journalism and Telecommunication; Director, Walter Cronkite School of Journalism and Telecommunication, B.A., Hastings College; M.S., Kearney State College; Ph.D., Southern Illinois University, Carbondale
- Anderson, Gary** (1975), Associate Professor of Reading and Library Science; B.S., M.Ed., Edinboro State College, Ph.D., University of Pittsburgh, Pittsburgh
- Anderson, James R.** (1984), Associate Research Scientist, Chemistry; B.A., Williams College, Ph.D., California Institute of Technology
- Anderson, John C.** (1987), Assistant Professor of Accountancy; B.B.A., M.S., University of Missouri, Kansas City; Ph.D., University of Tennessee
- Anderson, Karen** (1987), Faculty Associate of Nursing, B.S., M.S., Arizona State University
- Anderson, Marcia L.** (1986), Associate Librarian, Head, Acquisitions Department, A.B., University of Michigan, M.S., Wayne State University
- Anderson, Mary R.** (1974), Associate Professor of Engineering, B.A., Hope College; M.S., Ph.D., University of Iowa
- Anderson, Melvin S.** (1967), Professor Emeritus of Finance; B.S., M.S., Oklahoma State University, Ed.D., University of Arkansas
- Andrade, Edna W.** (1986), Adjunct Professor of Art; B.F.A., Pennsylvania Academy of the Fine Arts and University of Pennsylvania
- Andress, Barbara L.** (1972), Professor Emeritus of Music; B.A., M.A., Arizona State University
- Angell, C. Austen** (1989), Professor of Chemistry; B.S., M.S., Melbourne University (Australia); Ph.D., University of London (England)
- Angulo, Julio** (1981), Assistant Professor of Social Work; B.A., University of Houston; M.S.W., University of California, Los Angeles; Ph.D., Kansas State University
- Appleton, Nicholas R.** (1972), Professor of Educational Policy Studies, Director, Division of Educational Leadership and Policy Studies, B.A., San Francisco State University; M.A., California State University, Northridge; Ed.D., University of Massachusetts, Amherst
- Applewhite, Steven** (1985), Assistant Professor of Social Work; B.A., University of Texas, Austin; M.S.W., Ph.D., University of Michigan
- Aranda, Luis** (1975), Associate Professor of Business Law; B.M., M.Ed., University of Arizona; J.D., Arizona State University
- Arciniega, G. Miguel** (1979), Associate Professor of Counselor Education, B.S., M.A., New Mexico State University; Ph.D., University of Arizona
- Arias, M. Beatriz** (1989), Associate Professor of Multicultural Education; Director, Center for Bilingual and Bicultural Education; B.A., M.A., Occidental College; Ph.D., Stanford University
- Armbruster, Dieter** (1989), Associate Professor of Mathematics; Ph.D., University of Tübingen (West Germany)
- Armendt, Brad** (1989), Assistant Professor of Philosophy; B.A., M.S., William Marsh Rice University; Ph.D., University of Illinois
- Armstrong, Robert L.** (1967), Professor Emeritus of Secondary Education; B.A., State Teachers College of Iowa, M.S., University of Iowa, Ed.D., University of Arizona
- Arner, Douglas G.** (1959), Professor Emeritus of Philosophy; B.S., Creighton University, M.A., Ph.D., University of Michigan
- Arnold, William E.** (1973), Professor of Communication; B.S., M.A., Northern Illinois University, Ph.D., Pennsylvania State University
- Aronson, Jerome M.** (1966), Professor of Botany, Acting Chair, Department of Botany; B.A., Ph.D., University of California, Berkeley
- Arreola, Daniel** (1990), Associate Professor of Geography; B.A., University of California, Los Angeles, M.A., California State University, Hayward; Ph.D., University of California, Los Angeles
- Arterian-Furnish, Hannah** (1979), Professor of Law, B.A., Elmira College, J.D., University of Iowa

- Ashcroft, Edward A.** (1988), Professor of Computer Science and Engineering, B.A., Cantab (England); Ph.D., Imperial College of London (England)
- Ashe, Robert W.** (1955), Professor Emeritus of Education, A.B., M.A., Arizona State University, Ed.D., University of Southern California
- Ashford, Jose** (1984), Associate Professor of Social Work; B.A., Loyola University, New Orleans; M.S.W., Ohio State University, Ph.D., Bowling Green State University
- Ashley, Richard** (1981), Associate Professor of Political Science; B.A., University of California, Santa Barbara, M.A., Ph.D., Massachusetts Institute of Technology
- Askin, Walter M.** (1986), Adjunct Professor of Art; B.A., M.A., University of California, Berkeley
- Atsumi, Takayori P.** (1968), Professor of Music; B.F.A., Kunitachi Music College (Japan); M.M., New England Conservatory of Music
- Au, Chih-Chun** (1970), Law Librarian, Head, Technical Services; B.A., National Taiwan University (Taiwan); L.L.B., University of Chicago
- Autore, Donald D.** (1959), Professor Emeritus of Technology, B.S.E., University of Michigan, M.S.E., Arizona State University
- Avery, James P.** (1960), Professor Emeritus of Engineering, B.S.M.E., M.S.M.E., University of Michigan, Ph.D., Purdue University
- Ax, Leland S.** (1959), Professor Emeritus of Engineering, B.S.E., B.S.R.E., Tri State College; M.S., Kansas State College
- Axelrod, Morris** (1972), Professor Emeritus of Sociology, B.A., Ph.D., University of Michigan
- Axford, Roger W.** (1975), Professor Emeritus of Secondary Education; B.A., Nebraska Wesleyan University; M.A., Ph.D., University of Chicago
- Ayres, James E.** (1982), Adjunct Instructor of Anthropology, B.A., Fresno State University; M.A., University of Arizona
- Baaj, M. Hadi** (1990), Assistant Professor of Civil Engineering, B.S., American University of Beirut (Lebanon); M.S., Ph.D., University of Texas, Austin
- Bachus, Sue E.** (1988), Faculty Research Associate of Physics; B.S., M.A., University of Texas, Austin
- Backhaus, Ralph A.** (1977), Professor of Botany; B.S., Rutgers, The State University; M.S., Ph.D., University of California, Davis
- Backus, Charles E.** (1968), Professor of Engineering, Director, Center for Research in Engineering and Applied Sciences; Interim Dean, College of Engineering and Applied Sciences; B.S.M.E., Ohio University, M.S., Ph.D., University of Arizona
- Bacon, Sid P.** (1988), Associate Professor of Speech and Hearing Science, B.G.S., M.A., University of Kansas, Ph.D., University of Minnesota, Twin Cities
- Badger, W. W.** (1986), Professor of Construction, Chair, Department of Construction; B.S.M.E., Auburn University; M.S.C.E., Oklahoma State University; Ph.D., Iowa State University
- Baer, Steven M.** (1988), Assistant Professor of Mathematics; B.S., M.S., Ph.D., University of Illinois
- Bagwell, Marilyn** (1972), Associate Professor of Nursing, B.S.N., University of California, Los Angeles; M.A., Arizona State University, Ph.D., Texas Woman's University
- Bahr, Donald M.** (1967), Professor of Anthropology; A.B., M.A., Ph.D., Harvard University
- Bailey, Donald** (1989), Professor of Music; B.M.E., M.A., Eastern New Mexico University; D.A., University of Northern Colorado
- Bailey, James E.** (1974), Professor of Engineering; B.S.I.E., M.S.I.E., Ph.D., Wayne State University
- Baker, Dale R.** (1989), Associate Professor of Secondary Education, B.A., University of Oklahoma; M.A.T., Trenton State College, Ed.D., Rutgers, The State University
- Baker, Georgianne R.** (1971), Associate Professor of Family Resources and Human Development; B.S., Marv Grove College; M.S., Ohio State University, Ph.D., Michigan State University
- Baker, Marc A.** (1988), Adjunct Assistant Professor of Botany, B.A., San Jose State University; M.A., Humboldt State University; Ph.D., Arizona State University
- Balanis, Constantine A.** (1983), Professor of Engineering; Director, Telecommunications Research Center, Regents' Professor of Electrical Engineering, B.S.E.E., Virginia Polytechnic Institute and State University; M.S.E., University of Virginia; Ph.D., Ohio State University
- Balasubramanian, Krishnan** (1983), Professor of Chemistry; M.Sc., Birla Institute of Technology Science (India); M.A., Ph.D., Johns Hopkins University
- Balcazar, Hector** (1989), Assistant Professor of Family Resources and Human Development; B.S., Iberoamericana University (Mexico); M.S., Ph.D., Cornell University
- Baldini, Pier Raimondo** (1978), Professor of Italian; B.A., San Francisco State University; M.A., University of British Columbia (Canada), Ph.D., University of California, Los Angeles
- Bales, W. Scott** (1989), Faculty Associate of Law, B.A., Michigan State University, M.A., J.D., Harvard University
- Balling, Robert C.** (1987), Associate Professor of Geography; Director, Climatology Laboratory; A.B., Wittenberg University, M.A., Bowling Green State University; Ph.D., University of Oklahoma
- Ballon-Aguirre, Enrique** (1992), Associate Professor of Foreign Languages; Bachiller en Letras, Bachiller en Derecho, University of Arequipa (Peru), Doctor en Literatura, The National University of San Marcos (Peru), Doctorat en Etudes Iberiques, University of Paris III (France)
- Bantz, Charles R.** (1986), Professor of Communication; Chair, Department of Communication; B.S., M.A., University of Minnesota, Twin Cities, Ph.D., Ohio State University
- Bao, Qingcheng** (1988), Associate Research Specialist, Chemistry; B.S., Tsinghua University (China), M.S., Semiconductor Institute, C.A.S. (China); Ph.D., Chinese University of Science and Technology (China)
- Barcelo, Helene** (1990), Assistant Professor of Mathematics, M.S., University of Quebec (Canada), Ph.D., University of California, San Diego
- Barchilon, Marian G.** (1989), Assistant Professor of Manufacturing and Industrial Technology; B.S., State University of New York, Binghamton, New York; M.S., Northeastern University, Boston
- Bardewyck, Loretta A.** (1957), Professor Emeritus of Nursing; Dean Emeritus, College of Nursing; P.H.N., B.S., University of Minnesota, Twin Cities; M.S., Cornell University
- Bardrick, Richard A.** (1956), Professor Emeritus of Psychology; A.B., Ph.D., University of California, Los Angeles
- Barker, David** (1983), Associate Professor of Theatre, B.S.E., Duquesne University; M.F.A., Rutgers, The State University
- Barkley, Margaret V.** (1963), Professor Emeritus of Family Resources and Human Development, B.S., Millikin University; M.S., Ed.D., University of Illinois
- Barkson, Joseph A.** (1958), Professor Emeritus of Engineering; B.S.E.E., University of Michigan; M.S., Ph.D., University of Illinois

- Barlow, Richard B.** (1964), Professor Emeritus of History, B.A., M.A., Ph.D., University of Pennsylvania
- Barnard, John P.** (1991), Assistant Learning Resources Specialist, University Media Systems, B.S., State University of New York; M.Ed., Arizona State University
- Barnhill, Robert** (1986), Professor of Computer Science and Engineering; Interim Vice President for Research; B.A., University of Kansas; M.A., Ph.D., University of Wisconsin, Madison
- Barona, Andres** (1986), Associate Professor of Education; Interim Director, Division of Psychology in Education; Program Coordinator, School Psychology, B.S., M.Ed., Texas A&M University, Ph.D., University of Texas, Austin
- Barone, Thomas** (1990), Associate Professor of Curriculum and Instruction; B.A., Loyola University, New Orleans; M.A., University of New Orleans, Ed.D., Stanford University
- Barrera, Manuel** (1977), Professor of Psychology; Director, Clinical Psychology Center, B.S., University of Wisconsin, Eau Claire, M.A., Ph.D., University of Oregon
- Barrett, Thomas W.** (1950), Professor Emeritus of Agribusiness and Environmental Resources; B.S., Brigham Young University, M.S., Ph.D., Cornell University
- Barroll-Aschaffenburg, Rayna** (1980), Associate Professor of Music, B.M., University of Texas, D.M.A., University of Maryland, College Park
- Bartels, Robert D.** (1981), Professor of Law; B.A., University of Michigan; J.D., Stanford University
- Barton, C. Michael** (1987), Associate Museum Professional, Anthropology; Collections Administrator; B.A., University of Kansas, M.A., Ph.D., University of Arizona
- Bartz, Donna R.** (1968), Professor of Theatre; B.F.A., M.A., University of Colorado
- Bashford, Howard H.** (1991), Associate Professor of Construction; B.S., M.S., University of Wyoming, Ph.D., Brigham Young University
- Bassford, Gerald** (1969), Associate Professor of Management, B.S., M.S., University of Wyoming; D.B.A., Indiana University
- Bataille, Gretchen M.** (1988), Professor of English, Associate Dean, Administration and Personnel, College of Liberal Arts and Sciences; B.S., M.A., California Polytechnic State University; D.A., Drake University
- Batalden, Stephen K.** (1976), Associate Professor of History, B.A., Augsburg College, M.A., Ph.D., University of Minnesota
- Batchelor, Harold W.** (1943), Professor Emeritus of Library Science, B.A., University of Oregon; B.S., M.S., University of Illinois
- Bates, Dawn** (1989), Assistant Professor of English, B.A., Ph.D., University of Washington
- Baty, Wayne M.** (1962), Professor Emeritus of General Business; B.S., Southwest Missouri State College, M.A., Northwestern University, Ph.D., University of Southern California
- Baxter, Martha** (1990), Faculty Associate of Manufacturing and Industrial Technology, B.S. Westminster College; M.A. Arizona State University
- Baxter, Harry R.** (1982), Professor Emeritus of Engineering, B.A., New York University; M.B.A., Fairleigh Dickinson University; M.Tech., Arizona State University
- Beakley, George C. Jr.** (1956), Professor of Engineering; Director, School of Engineering, Director, Engineering Core and Special and Interdisciplinary Programs, Associate Dean, College of Engineering and Applied Sciences, B.S.M.E., Texas Tech University; M.S.M.E., University of Texas, Ph.D., Oklahoma State University; P.E.
- Beardmore, Gary D.** (1979), Associate Research Technologist, Geology; B.A., Arizona State University
- Beaumariage, Terrence G.** (1989), Assistant Professor of Engineering; B.S., Rochester Institute of Technology, M.S., Ph.D., Oklahoma State University
- Beck, Lasca** (1984), Faculty Associate of Nursing, B.S.N., Texas Woman's University; M.Ed., East Texas State University
- Becker, R. James** (1965), Professor of Public Affairs; B.S., M.A., Bradley University; Ph.D., University of Illinois
- Beckman, James R.** (1980), Associate Professor of Engineering; B.S., M.S., University of Wisconsin, Ph.D., University of Arizona
- Bedard, Roger L.** (1990), Associate Professor of Theatre; B.A., University of Northern Iowa; M.F.A., University of Oregon; Ph.D., University of Kansas
- Bedient, Jack D.** (1963), Professor Emeritus of Mathematics, A.B., Albion College, M.B.S., Ed.D., University of Colorado
- Bedworth, David D.** (1963), Professor of Engineering; B.S.I.E., Lamar College of Technology, M.S.I.E., Ph.D., Purdue University
- Belanger, James J.** (1991), Faculty Associate of Law; B.A., Brandeis University; J.D., Arizona State University
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- Young, Dennis L.** (1975), Professor of Mathematics, B.S., St. Louis University, M.S., Ph.D., Purdue University
- Young, Hewitt H.** (1967), Professor Emeritus of Engineering; B.S.M.E., M.S.I.E., Case Institute of Technology; Ph.D., Arizona State University
- Young, Joseph E.** (1979), Associate Professor of Art, B.A., California State University at Los Angeles; M.A., University of California, Los Angeles
- Young, Otis E. Jr.** (1963), Professor Emeritus of History; A.B., A.M., Ph.D., Indiana University
- Young, Michael Cochise** (1990), Associate Dean, University Honors College; B.A., Joseph's University; M.A., Ph.D., University of Pennsylvania
- Young, Troy L.** (1971), Instructor; Head Trainer; B.S., Fort Hays State College; M.S., Indiana University, Bloomington
- Youngblood, Robert L.** (1973), Professor of Political Science, B.A., Willamette University; M.A., University of Hawaii, Manoa, Ph.D., University of Michigan
- Yuen, George U.** (1957), Professor Emeritus of Chemistry; B.S., Arizona State University, Ph.D., University of Utah
- Zacher, Robert V.** (1947), Professor Emeritus of Advertising; B.S., M.S.B.A., University of Alabama

Zaniewski, John (1986), Associate Professor of Engineering; B.S.C.E., M.S.C.E., Ph.D., University of Texas, Austin

Zaslow, Bertram (1956), Professor Emeritus of Chemistry; B.A., Cornell University; M.S., University of Minnesota, Twin Cities; Ph.D., Iowa State University

Zatz, Marjorie S. (1982), Associate Professor of Justice Studies; B.A., University of Massachusetts, Amherst; M.A., Ph.D., Indiana University, Bloomington

Zautra, Alex (1976), Professor of Psychology; Director, Clinical Program in Psychology; B.A., Antioch College; M.S., Ph.D., University of Utah

Zeng, Gualiang (1991), Assistant Professor of Electronics and Computer Technology; B.S., Chengdu Telecommunication Institute (China); M.S., University of California, San Diego; M.N.S., Ph.D., Arizona State University

Zerkle, Terry (1989), Faculty Associate of Public Affairs; A.B., M.P.A., Eastern Kentucky University

Zettler, Hugo F. (1977), Faculty Associate of Law; B.S., Arizona State University; J.D., University of Arizona

Zimiles, Herbert (1988), Professor of Early Childhood Education; B.A., New York University; Ph.D., University of Rochester

Zimmer, Carl R. (1959), Professor Emeritus of Engineering; B.S.E.E., Cornell University; M.S.E.E., Ph.D., Syracuse University

Zimmerman, Allan D. (1988), Adjunct Assistant Professor of Botany; B.S., University of Arizona; Ph.D., University of Texas, Austin

Ziurys, Lucy M. (1988), Assistant Professor of Chemistry; B.A., William Marsh Rice University; Ph.D., University of California, Berkeley

Zucker, Stanley H. (1975), Professor of Special Education; B.A., State University of New York, Stony Brook; M.S., Hofstra University; Ph.D., University of Missouri, Columbia

Zuckerman, Howard S. (1991), Professor of Health Services Administration; B.A., Hunter College; M.B.A., Xavier University; Ph.D., University of Michigan

Zwiebel, Imre (1979), Professor of Engineering; B.S., University of Michigan; M.S., Ph.D., Yale University

Zygas, K. Paul (1984), Associate Professor of Architecture; A.B., M.Arch., Harvard University; Ph.D., Cornell University

Zylla, Julie (1988), Lecturer of Family Resources and Human Development; B.S., South Dakota State University; M.S., Arizona State University



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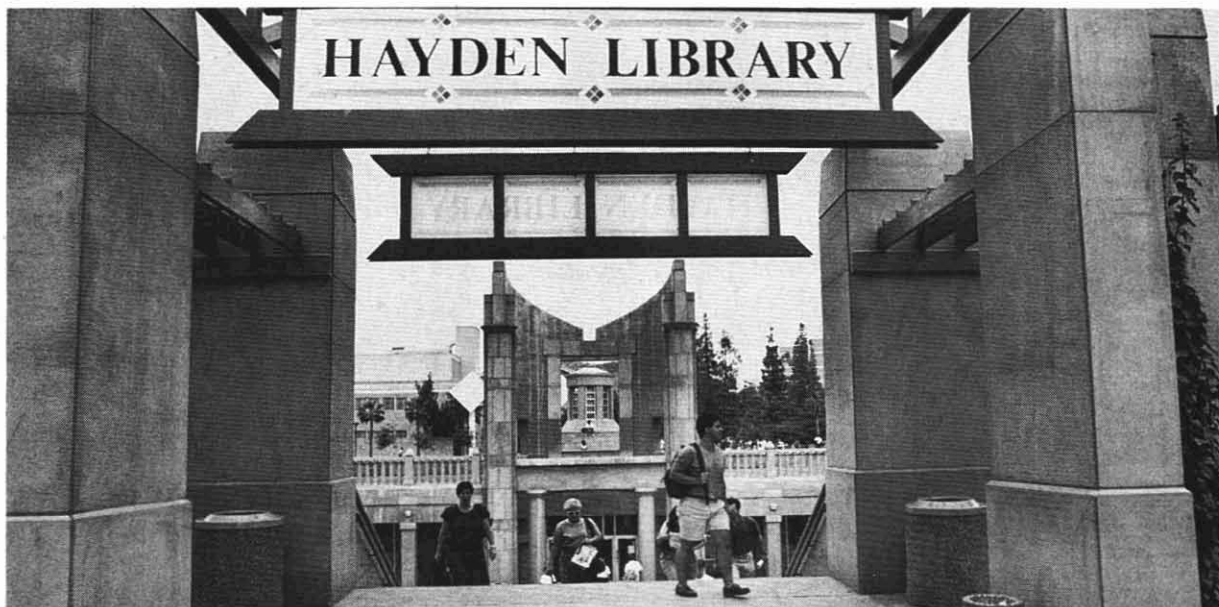
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Senior Lecturer

Garver

Lecturers

Jacquette, Ragle, Reese, Sparks

Human Services

Janet H. Shirreffs, Ph.D.

Academic Director

Professors

Knopf, Shirreffs

Associate Professors

Finn, J. Hultsman, Osburn

Assistant Professors

Gundersen, W. Hultsman

Visiting Professors

Goldman, Thomson

Senior Lecturer

Dix

Lecturers

Ferguson, Lavitt, Williams

Women's Studies

Patricia Spakes, Ph.D.

Coordinator

Professor

Spakes

Assistant Professor

Mengesha

Lecturers

Hopk ns, Mohanram

ASU West was established to serve the educational needs of residents of western Maricopa County. It offers upper division and graduate courses leading to baccalaureate and master's degrees. Academic programs and support services are designed to meet the needs of working adults and community college transfer students pursuing degrees, seeking career growth, or furthering their knowledge. As a key element in meeting these needs, ASU West is developing and maintaining a strong partnership with the community and the Maricopa Community College District.

The faculty and staff of ASU West seek to develop a unique institution that will meet ongoing educational demands through this century and into the next. They are committed to providing a broad spectrum of educational, personal, and professional opportunities to members of a diverse metropolitan population.

History

In February of 1986, members of several western Maricopa County communities, legislators, and members of the Arizona Board of Regents (ABOR) joined in the ground breaking ceremony for ASU West. The ground breaking culminated more than 10 years of intensive effort by numerous citizens' groups working for the establishment of additional educational facilities in Arizona. This grass roots enterprise started in 1972 with the formation of the West Side Citizens' Committee for Higher Education. Leaders and legislators in western Maricopa County worked with officials at ASU and the ABOR to convince the legislature of the need for additional higher education facilities beyond those at the community colleges.

The legislature began formal efforts to examine educational opportunities at the university level in western Maricopa County in 1976. "The Whiteman Report," submitted to the legislature in February 1977, noted a shortage of higher education facilities in western Maricopa County and urged that ASU begin to serve these needs by the 1980 fall semester. In response to these recommendations, Arizona State University initiated courses at the Metrocenter shopping mall in 1978 and at Alhambra Elementary School in 1980. The legislature appropriated funds in 1979-80 to

the ABOR for the purpose of planning a permanent campus site in western Maricopa County. In 1982, the legislature provided an exchange of 171.66 acres of general revenue lands for approximately 300 acres of state trust land located in Maricopa County. These 300 acres constitute the permanent site of ASU West.

ASU West's direction was set in the ABOR's first edition of the *Arizona University System Mission and Scope Statements*, published in July of 1982. This document supported "the development of a modified, upper level, primarily non residential, branch institution of Arizona State University." In support of the Whiteman findings and the board's directions, the 36th legislature enacted Senate Bill 1245. Signed on April 18, 1984, this bill amended Section 15-1601 of the Arizona Revised Statutes and directed the Arizona Board of Regents to "maintain an Arizona State University campus in western Maricopa County designated as Arizona State University West Campus." During that session, the legislature approved a separate state appropriation for the campus.

Organization

ASU West, as a campus of Arizona State University, shares a common goal of academic excellence with Arizona State University and admission and degree requirements at both campuses are identical. ASU West operates under the umbrella accreditations of Arizona State University, which is accredited by the North Central Association of Colleges and Schools. Professional programs in the various academic units are also accredited by national boards and associations.

Management is the responsibility of the provost and vice president for ASU West. The division of Academic Affairs is administered by the vice provost for academic affairs. It is composed of five academic units administered by academic directors:

Applied Sciences, Engineering and Technology
Arts and Sciences
Business
Education
Human Services

In addition, ASU West has an interunit Women's Studies program administered by a coordinator.

Degree Programs

ASU West offers the following degree or certificate programs:

Arts and Sciences

B.A. American Studies
B.A. English
B.A. History
B.A. Social and Behavioral Sciences
B.S. Social and Behavioral Sciences
B.A. Sociology
B.S. Sociology

For specific information on requirements, refer to ASU West "Arts and Sciences Programs" on page 425 and to the "College of Liberal Arts and Sciences" section in this catalog.

Business

B.S. Accountancy
B.S. Management
B.S. Marketing
M.B.A. Business Administration
Postbaccalaureate Certificate in Accountancy

For specific information on requirements, refer to ASU West "Business Programs" on page 428 and to the "College of Business" section in this catalog.

Education

B.A.E. Elementary Education with options in early childhood education, bilingual education, and English as a second language
B.A.E. Secondary Education with academic specializations in English, history, mathematics, and social studies
B.A.E. Special Education
Postbaccalaureate Teacher Certification

For specific information on requirements, refer to the "College of Education" section in this catalog.

Human Services

B.A. Communication
B.S. Communication
B.S. Justice Studies
B.S. Recreation
B.S.W. Social Work

For specific information on requirements, refer to the "College of Public Programs" and the "School of Social Work" sections in this catalog.

Women's Studies

B.A. Women's Studies
B.S. Women's Studies
Certificate in Women's Studies

For specific information on requirements, refer to the "College of Liberal Arts and Sciences" section in this catalog.

ASU West offers selected courses in the following programs:

Applied Sciences, Engineering and Technology

B.S.E. Special Studies

For specific information on requirements, refer to the "College of Engineering and Applied Sciences" section in this catalog.

Arts and Sciences

B.A. Art

B.F.A. Art

B.A. Music

B.A. Political Science

B.S. Political Science

B.A. Spanish

For specific information for degree requirements, refer to the "College of Fine Arts" and the "College of Liberal Arts and Sciences" sections in this catalog.

Education

M.Ed. Educational

Administration and Supervision

M.Ed. Elementary Education

M.Ed. Secondary Education

For specific information on requirements, refer to the "College of Education" section in this catalog.

Human Services

B.S.N. Nursing

For specific information on requirements, refer to the "College of Nursing" section in this catalog.

Admission and Advising

Students applying for admission to an ASU West degree or certificate program must complete an application and have transcripts sent directly to:

Student Information and Intake

Services

Undergraduate Admissions

ASU West

P.O. Box 37100

Phoenix, Arizona 85069-7100

For admissions requirements, refer to the "Undergraduate Admission" section, pages 27-32.

Because ASU West offers only upper-division and graduate courses, students must obtain the lower-division requirements for degrees at ASU Main or another accredited institution. The lower-division requirements are the same as those required by the appropriate ASU college.

Upon application, transfer credit is evaluated by the ASU West Undergraduate Admissions Office.

For specific questions about individual program requirements and transfer credit, call 602/543-8122, or visit or write:

Academic Advising Office

University Center Building, 220

ASU West

P.O. Box 37100

Phoenix, Arizona 85069-7100

Arts and Sciences Programs

Five new interdisciplinary baccalaureate degree programs are being developed to be offered exclusively at ASU West. The bachelor's degree programs in American Studies and Social and Behavioral Sciences were implemented in 1991-92. Three additional interdisciplinary bachelor's degree programs, including fine arts, interdisciplinary arts and sciences, and life sciences, are in the planning stages and are expected to be implemented in 1992-93.

American Studies

The Bachelor of Arts degree in American Studies allows students to take courses that look at the American experience from a variety of perspectives. Students in the program take core courses in each of three tracks: American systems, American cultures, and American lives. After completing these courses, which combine the approaches of history, literature, politics, and social thought (to name only a few), students tailor their programs to fit their individual interests or needs by selecting one of the above tracks as the primary emphasis.

The American systems track deals with the political, economic, and legal institutions in the United States. The American cultures track concentrates on issues related to philosophy, literature, art, and regional and popular cultures. The American lives track emphasizes the relationship between the American experience and issues of biography, race, class, and gender.

American Studies is an ideal program for students who may be considering a degree in history, English, or Spanish, for example, but who wish to have a broader exposure to other fields than those majors generally allow. Because most courses in American Studies emphasize critical thinking and writing, the program is also excellent

preparation for jobs or graduate training in education, business, law, and journalism or other fields involving non-fiction writing. An optional internship provides the opportunity to explore career interests before graduation.

American Studies Degree Requirements.

The American Studies major consists of a minimum of 45 semester hours (with at least 30 hours upper division) with a grade of "C" or better. The 45 semester hours are broken down as follows:

	<i>Semester Hours</i>
Department core	24
Major track	9
Select three courses from American cultures, American lives, or American systems track	
Electives	6
Exit sequence	6

AMERICAN STUDIES

AMS 310 American Systems. (3) F
First of two part survey of political, economic institutions placed in the context of a dynamic industrial capitalist society. *General studies L2*

311 American Systems. (3) S
Second of two part survey of political and economic institutions placed in the context of a dynamic industrial capitalist society. *General studies L2*

312 Studies in American Politics and Law. (3) N
Topics in American political and legal systems. May be repeated when topics vary. Topics may include social movements in the United States and women and the law.

313 Studies in American Economic Systems. (3) N
Topics in the history of American economic systems. May be repeated for credit when topics vary.

314 Military Studies. (3) N
Topics in the history of the American military. May be repeated for credit when topics vary.

315 The American Education Establishment. (3) N
Topics in the history of American education. May be repeated for credit when topics vary. Topics may include the history of public education in America.

316 American Religious Systems. (3) F, S
Topics in American religion. May be repeated for credit when topics vary. Topics may include Hispanic missions of the Southwest.

320 American Cultures. (3) F
First of two part survey of American culture broadly defined as historically transmitted patterns of meaning expressed in symbolic forms, e.g. philosophy, science, art, literature, religion. Cross-listed as HIS 303. *General studies: SB, H*

- 321 American Cultures.** (3) S
Second of two part survey of American culture, broadly defined as historically transmitted patterns of meaning expressed in symbolic forms. Includes philosophy, science, art, literature, religion. Cross-listed as HIS 304 *General studies SB H*
- 322 Studies in American Literature.** (3) F, S
Top courses in American literature. May be repeated for credit when top courses vary.
- 323 Studies in American Art and Architecture.** (3) F, S
Top courses in the visual arts and material culture. May be repeated for credit when top courses vary.
- 324 Studies in American Music.** (3) N
Top courses in American music. May be repeated for credit when top courses vary.
- 325 American Thought.** (3) N
Top courses in American systems of thought including formal philosophy, religion, and science. May be repeated for credit when topics vary.
- 326 Popular Culture.** (3) N
Top courses in American popular culture including theories of popular culture, the history and analysis of mass media including television, film, and the music industry and vernacular art and the "folk" tradition. May be repeated for credit when top courses vary.
- 327 Regional Cultures.** (3) N
Examination of the concept of regionalism and regional cultures in America with a special emphasis on the Southwest/Borderlands.
- 330 Introduction to American Lives.** (3) F '92
An overview of the theoretical bases of American social history and the topics that it generally treats.
- 331 Gender Studies.** (3) F, S
Top courses relating to issues of gender in America. May be repeated for credit when top courses vary.
- 332 Studies in Race and Ethnicity.** (3) N
Top courses relating to issues of race and ethnicity in America. May be repeated for credit when top courses vary.
- 333 Family Studies.** (3) N
Historical, sociological, and psychological explorations of the family in America. May be repeated for credit when top courses vary. Top courses may include the history of the family in the United States.
- 334 The American Class System.** (3) N
Studies in social classes and their function within American society. May be repeated for credit when top courses vary.
- 335 American Biography.** (3) N
Top courses in biographies of individuals, comparative biographies, the art of biography, and the function of autobiography. May be repeated for credit when top courses vary.
- 336 Community Studies.** (3) N
Exploration of the concept of community in America with an emphasis on documenting through photography and oral histories the lives of various communities in the Phoenix area.
- 340 Writing in American Studies.** (3) F
The first part of the two semester course taken in tandem with the two required surveys, focuses on methods of inquiry, reasoning, and arguing in American Studies. This part of the course emphasizes effective reading, reasoning, and the drafting of summaries and short arguments. *General studies L2.*
- 341 Writing in American Studies.** (3) S
The second part of the two semester course, taken in tandem with the two required surveys, focuses on methods of inquiry, reasoning, and arguing in American Studies. This part of the course focuses on research methods and sustained argumentation. *General studies L2.*
- 342 Writing about American Culture.** (3) N
This course is designed to teach students methods of writing cultural criticism. Emphasis is on the essay form.
- 343 Writing for the Professions.** (3) F, S
Advanced practice in writing and editing expository prose. Designed especially for students entering graduate professional schools.
- 344 Creative Writing.** (3) N
Emphasizes the study and practice of creative nonfiction. May be repeated for credit when topics vary.
- 345 Reporting.** (3) N
Fundamentals of news gathering, interviewing, and in depth reporting.
- 346 Editing.** (3) N
Theory and practice of editing.
- 347 Publishing.** (3) N
Operations of the publishing industry in America. May be repeated for credit when top courses vary.
- 348 Photojournalism.** (3) N
Theory and practice of photojournalism including basic techniques of taking, developing, and printing photographs for publication.
- 349 Spanish Language Grammar and Composition.** (3) F, S
Advanced courses in Spanish language writing.
- 412 Studies in American Politics and Law.** (3) N
Topics in American political and legal systems. May be repeated when top courses vary. Top courses may include social movements in the United States, and women and the law.
- 413 Studies in American Economic Systems.** (3) N
Top courses in the history of American economic systems. May be repeated for credit when top courses vary.
- 414 Military Studies.** (3) N
Top courses in the history of the American military. May be repeated for credit when top courses vary.
- 415 The American Education Establishment.** (3) N
Top courses in the history of American education. May be repeated for credit when top courses vary. Top courses may include the history of public education in America.
- 416 American Religious Systems.** (3) N
Top courses in American religion. May be repeated for credit when top courses vary. Top courses may include Hispanic missions of the Southwest.
- 419 Interdisciplinary Topics.** (3) A
Senior level seminar that examines selected issues or top courses relevant to two or more of the major systems in America. May be repeated for credit when top courses vary.
- 422 Studies in American Literature.** (3) F, S
Top courses in American literature. May be repeated for credit when top courses vary. Topics may include twentieth century American comic fiction, literature of the American South, literature of American wars, Hispanic chronicles of the Southwest, literature of la Chicana, and American rhetoric. *General studies L2.*
- 423 Studies in American Art and Architecture.** (3) A
Top courses in the visual arts and material culture. May be repeated for credit when top courses vary.
- 424 Studies in American Music.** (3) N
Top courses in American music. May be repeated for credit when top courses vary.
- 425 American Thought.** (3) N
Top courses in American systems of thought including formal philosophy, religion, and science. May be repeated for credit when top courses vary.
- 426 Popular Culture.** (3) N
Top courses in American popular culture including theories of popular culture, the history and analysis of mass media including television, film, and the music industry and vernacular art and the "folk" tradition. May be repeated for credit when top courses vary.
- 427 Regional Cultures.** (3) N
Examination of the concept of regionalism and regional cultures in America with a special emphasis on the Southwest/Borderlands. *General studies L2.*
- 429 Interdisciplinary Topics.** (3) F, S
Senior level seminar that examines issues relevant to two or more American cultures' fields. May be repeated for credit when top courses vary. Proposed topics include Southwest/borderland Hispanic folklore, Southwestern corridos, American art and the city, and the West of the imagination.
- 431 Gender Studies.** (3) N
Top courses relating to issues of gender in America. May be repeated for credit when top courses vary.
- 432 Studies in Race and Ethnicity.** (3) N
Top courses relating to issues of race and ethnicity in America. May be repeated for credit when top courses vary.
- 433 Family Studies.** (3) N
Historical, sociological, and psychological explorations of the family in America. May be repeated for credit when top courses vary. Proposed top courses include history of the family in the United States.
- 434 The American Class System.** (3) N
Studies in social classes and their function within American society. May be repeated for credit when top courses vary.
- 435 American Biography.** (3) N
Top courses in biographies of individuals, comparative biographies, the art of biography, and the function of autobiography. May be repeated for credit when top courses vary.
- 436 Community Studies.** (3) N
Exploration of the concept of community in America with an emphasis on documenting through photography and oral histories the lives of various communities in the Phoenix area.
- 439 Interdisciplinary Topics.** (3) N
Senior level seminar exploring specialized top courses relevant to two or more of the fields within American Lives. May be repeated for credit when top courses vary. *General studies L2.*
- 444 Creative Writing.** (3) N
Emphasizes the study and practice of creative nonfiction. May be repeated for credit when top courses vary.
- 446 Editing.** (3) N
Theory and practice of editing.

447 Publishing. (3 N)
Operations of the publishing industry in America. May be repeated for credit when topics vary.

494 Special Topics. (3 F)
Senior level seminar exploring issues or topics from the perspective of each of the three tracks in American Studies. Topics may include American environment, exploration of America, modernism and modernity and the 1920s: age of experiment. *General studies L2*

498 Pro-Seminar. (3 S)
Senior level seminar for American Studies majors

Omnibus Courses: See page 40 for omnibus courses that may be offered

Social and Behavioral Sciences

The objectives of the interdisciplinary program in the Social and Behavioral Sciences are as follows:

1. to nurture intellectual curiosity and tolerance for human diversity;
2. to develop critical thinking about the complex nature of human experience;
3. to foster understanding of important intellectual issues and social problems; and
4. to prepare students to assume active and creative roles in their work and community.

Instruction in the program brings the multiple perspectives of anthropology, political science, psychology, and sociology to bear on human and social issues. The program is comparative (cross cultural and cross national) in focus, and emphasizes theory, methodology, and empirical research. It offers students three interdisciplinary tracks: human change across the lifespan; culture, politics and society; and social change and social policy. The degrees conferred through the program are the Bachelor of Arts and Bachelor of Science. The program provides students with the background and skills necessary to continue their studies in graduate degree programs in social science disciplines.

Social and Behavioral Sciences Degree Requirements. The Social and Behavioral Sciences major consists of 45 semester hours of required course work.

	<i>Semester Hours</i>
Bachelor of Arts	
Required interdisciplinary semester hours in theory and methodology	2
Major concentration semester hours in one of three tracks	27

Required	12
Electives	15
Senior thesis research project (two semesters)	6
Bachelor of Science	
Required interdisciplinary semester hours in theory and methodology	18
Major concentration semester hours in one of three tracks	21
Required	9
Electives	12
Senior thesis research project (two semesters)	6

SOCIAL AND BEHAVIORAL SCIENCES

SBS 300 Interdisciplinary Approaches to Social and Behavioral Sciences. (3 F, S)
The interdisciplinary approach to the study of social life

301 Cultural Diversity. (3 F, S)
Socially structured differences in history and cross-cultural perspective.

302 Qualitative Methods. (3 F, S)
Basic methodological issues in the systematic application of qualitative analysis of human social life. Surveys range of qualitative methods used by social and behavioral scientists

303 Quantitative Methods. (3 F, S)
Concepts underlying design and implementation of quantitative research methods

304 Social Statistics. (3 F, S)
Statistical techniques of the social and behavioral sciences. Prerequisite: SBS 303 or instructor approval

305 Comparative and Cross-Cultural Analysis. (3 A)
Methodological issues in the comparative analysis in the social and behavioral sciences

310 Politics of Community Organizations. (3 A)
Social and historical development of community organizations

311 Political Socialization. (3 A)
Process by which men and women of diverse cultural, ethnic and racial backgrounds learn about politics from childhood through adulthood

312 Adolescent and Young Adulthood Development. (3 A)
Developmental processes in adolescence through young adulthood

313 Alternative Families. (3 A)
Innovative and experimental forms of families and households in the United States and their impact on society

314 Social Relationships Management. (3 A)
Methods and techniques in constructing and managing social relationships in multiple settings and situations and factors that inhibit the development of relationships

315 Psychology of Gender. (3 A)
Gender differences from a social-psychological perspective.

316 Child and Family Intervention Theories. (3 A)
Concepts theories and implementation of intervention programs which serve children and adults and which are effective in producing change

317 Work and Family. (3 A)
Relationships among work, household organization, and kinship in industrialized societies

330 Culture, Community, and Identity. (3 A)
Development of self-perception through "cultural traditions" that identify members of social units based on ethnicity and nation states

331 Ethnicity and Culture in the United States. (3 A)
The problems, barriers and stereotypes affecting major U.S. ethnic groups

332 Women, Men, and War. (3 A)
Relationship between gender and warfare from historical and cross-cultural perspectives

333 Anthropology of Gender. (3 A)
The engendering of social relations from an anthropological perspective

334 Symbolic Anthropology. (3 A)
Classical and contemporary anthropological accounts of symbols and meanings across a variety of cultures.

335 Culture and Politics in Postcolonial Countries. (3 A)
Developmental tensions between indigenous and Western cultures in postcolonial states.

336 Comparative Political Economy. (3 A)
Problems and prospects of various political economic systems around the world during the final years of the 20th century

340 Popular Culture. (3 A)
Study of the social and behavioral approaches to popular culture. Various media and cultural forms (literature, film, theater and music) are examined

341 Film and Society. (3 A)
Social scientific approach to film as an art form and as mass communication

350 Social Change and Public Policy. (3 A)
Social change as a deterrent or stimulus to the policy process

351 Psychology of Social Issues. (3 A)
Social psychological approach to social issues and social change

352 Social Movements and Social Change. (3 A)
The processes by which groups mobilize and collectively pursue social goals such as equality, justice, peace and salvation

353 Social Change and Social Life. (3 A)
Economic, social, political and behavioral forces involved in change and continuity in contemporary and historical societies

404 Social Statistics II: Multivariate Analysis. (3 A)
Analysis of variance, multiple regression, dummy variable regression, path analysis and related topics. Computer application to problem solving. Prerequisites: SBS 303 and 304 or instructor approval

410 Infant Development. (3 A)
The study of the developing individual from concept on through the first two years after birth

411 Social Development. (3 A)
Processes, dynamics, and age-related changes in social development from infancy through early adolescence. Prerequisite: one course from Lifespan Concentration or instructor approval

435 Regional Cultures. (3 A)
The cultures and institutions of one part of a nation (e.g., Brazil, Japan) are examined within the regional context (e.g., Latin America, the Pacific Rim)

450 Transformation of Work and the Workplace. (3) A

Historic and comparative changes in the structure and meaning of men's and women's work in agrarian, industrial and post industrial service economies

451 Social Inequality. (3) A

Examines the ways age, class, ethnicity, gender, and race affect social inequality

452 Program Evaluation. (3) A

Techniques and procedures used to evaluate policy and programs in both public and private domains

453 Urban Political Change. (3) A

Socioeconomic and political factors driving change in cities in the United States.

454 Gender and Work. (3) A

Looks at the differences in the ways men and women have participated in the labor process culturally assumptions about gender embedded in the allocation of jobs and in workplace organization

Omnibus Courses: See page 40 for omnibus courses that may be offered

Business Programs

The Postbaccalaureate Certificate in Accountancy is the only ASU West business program unique to ASU West and not available through the main campus during 1992-93).

Postbaccalaureate Certificate in Accountancy

The Postbaccalaureate Certificate in Accountancy is designed for students already possessing an undergraduate degree. The undergraduate degree may be in any major, business related or not.

The certificate program is particularly useful for persons seeking a career change to accounting or the upgrading of existing accounting skills. The program involves undergraduate course work in accounting and related fields that prepares a student to sit for the Certified Public Accountant (CPA) examination or other professional accounting certification such as the Certified Management Accountant (CMA) or Certified Internal Auditor (CIA).

Admission. To be admitted to the Postbaccalaureate Certificate in Accountancy an individual must

1. possess a four year baccalaureate degree from an accredited college or university;
2. be admitted to Arizona State University as a non degree-seeking graduate student,
3. have completed the prerequisite business core (described below) with a minimum GPA of 2.50 and a grade of "C" or better in each course; and

4. attain an acceptable score on the Accounting Program Admissions Test (APAT).

Prerequisite Business Core

	<i>Semester Hours</i>
Elementary accounting (financial and managerial)	6
Economics (macro and micro)	6
Finite mathematics	3
Probability and statistics	3
Management information systems	3

Note: The Accounting Program Admissions Test (APAT) is a nationally standardized test of elementary accounting. It is designed to verify that a student has a strong and up-to-date foundation in basic accounting upon which to build the professional level program of study.

The APAT Exam is administered by appointment at the Testing Center on the campus of Glendale Community College. Call 602/435-3133 for an appointment and fee information. The test requires approximately two hours. Official notification of results takes about two weeks.

Course Requirements

Required Upper-Division Accounting Core

	<i>Semester Hours</i>
ACC 321 Intermediate Accounting	3
ACC 322 Intermediate Accounting	3
ACC 331 Cost Accounting	3
ACC 347 Accounting Information Systems	3
ACC 351 Income Tax Accounting	3
ACC 481 Auditing Theory and Practice	3
Total	18

Group A Electives (Select two.)

ACC 452 Advanced Taxation	3
ACC 483 Advanced Accounting	3
ACC 498 Advanced Cost Accounting	3
Total	6

Group B Electives (Select two.)

BLW 305 Legal Environment of Business	3
BLW 306 Business Law	3
BLW 307 Business Law	3
FIN 300 Fundamentals of Finance	3
MGT 301 Management and Organization Behavior	3
MKT 300 Principles of Marketing	3
Total	6
Required upper division hours	30

Students admitted to the Postbaccalaureate Certificate in Accountancy program are permitted to enroll in

courses other than those listed above only with the written permission of the ASU West Accounting Program Coordinator.

At least 21 of the upper-division credits for the certificate and at least 18 of the upper division credits in accounting must be taken in residence at Arizona State University West. Candidates must achieve a grade of "C" or better in each course presented for the Postbaccalaureate Certificate.

Successful completion of the prerequisite core, the required accounting core, and careful selection of electives should satisfy the educational requirements of the Arizona State Board of Accountancy for taking the CPA Examination in Arizona.

For more information on admission, call the Academic Advising Center at ASU West at 602/543-8122 or the Coordinator of the Accounting Program at 602/543-6275.

Faculty

The faculty at ASU West are outstanding scholars and teachers chosen for their expertise.

To contact academic unit offices or faculty, call or visit the appropriate office listed below or write:

ASU West
P.O. Box 37100
4701 W. Thunderbird Rd.
Phoenix, Arizona 85069-7100

Applied Sciences, Engineering and Technology
FAB N101 (602/543-6100)

Arts and Sciences
FAB N200L3 (602/543-6000)

Business
FAB N101 (602/543-6200)

Education
FAB N200L1 (602/543-6300)

Human Services
FAB S270-1 (602/543-6600)

Women's Studies
FAB S115A (602-543-3300)

For a complete list of ASU West faculty and academic professionals, see pages 431-434.

Facilities

The permanent campus of ASU West is located between 43rd and 51st Avenues on West Thunderbird Road in Phoenix. Immediately west of the cam

pus is the city of Glendale. The core campus was completed in March 1991 and includes the following facilities: the Fletcher Library, the Sands Classroom Building, a Classroom Laboratory/Computer Building, a Faculty and Administration Building, and the University Center Building.

Fletcher Library. Opened in March of 1988, Fletcher Library was the first building constructed and occupied on the new campus. With a seating capacity of 900 and space for an eventual 300,000 volumes, the 95,000 square foot facility, valued at \$10.5 million, is a state-of-the-art information access center designed to take full advantage of electronic technology. The Computer Access Center is located in the lower level of the library.

Sands Classroom Building. Completed in January 1989, the Sands Classroom Building houses 44 classrooms and seminar rooms. With the largest classroom seating fewer than 100 students and the average classroom seating 35, the building provides an intimate atmosphere in which to exchange ideas.

Kiva Lecture Hall. West of the Sands Classroom Building courtyard stands the Kiva Lecture Hall with a seating capacity of 200. In addition to providing classroom space, the Kiva serves as an auditorium for a variety of programs, faculty lectures, and public forums.

Classroom Laboratory/Computer Building. Completed in January 1991, this building contains the following: laboratories for science, engineering, and the behavioral sciences; art, dance, and music studios; regular and computer classrooms; and an astronomy platform located on the roof.

Faculty and Administration Building. Completed in March 1991, the Faculty and Administration Building houses the faculty and administration for each of the five academic units. Offices of the following administrators are located in this building: the provost and the vice provosts for academic affairs, administrative affairs, planning and budget, and university relations. Other offices also located in the building are alumni relations, business services, community relations, develop-

ment, facilities planning and development, facilities management, human resources, information resources and technology, institutional planning and research, marketing, information services, and public relations.

University Center Building. Completed in March 1991, the University Center Building houses admissions, registration services, academic advising, financial assistance, minority student services, veterans services, disability support services, student employment, adult development services, and student life offices. Other facilities in this building include food service, a bookstore, cashier and fee payment services, student lounges, an art gallery, child care facilities, meeting rooms, and a large, divisible, multi-purpose room.

ASU West continues to hold some classes at other locations including a number of different public schools in the area and at:

The American Graduate School of International Management
59th Ave. and Greenway Rd.
Glendale, Arizona 85306

Future Facilities

In addition to the current set of buildings, four new facilities are planned for construction during the next five years: an addition to the Classroom Laboratory/Computer Building, a Fine Arts Facility, a Faculty Office Building, and a University Recreation Center. Beyond 1996, additional building projects are projected: a research building, an addition to Fletcher Library, an addition to Sands Classroom Building, an addition to the University Center Building, and an addition to the Fine Arts Facility. While construction of these new facilities is dependent on available funding, all of these buildings will be required to meet the needs of the campus through the year 2000.

Student Affairs

The mission of Student Affairs at ASU West is to ensure that the college experience is positive and productive for students by offering programs and services that augment and support academic programs. The focus of Student Affairs is on the quality of nonresidential campus life for all students and, in

particular, working adults, community college transfer students, ethnic and racial minorities, commuters, and the disabled. The offices of Student Affairs are located at the University Center Building and currently offer programs for:

- Academic advisement
- Admissions information and services
- Adult development services
- Disability support services
- Financial aid
- Minority student services
- Registration services
- Student employment
- Veterans services

As ASU West continues to grow, Student Affairs will offer additional programs and services.

For assistance in determining eligibility, in admission and registration, or for advisement and other services, call 602/543 8122, or visit or write:

Student Affairs
ASU West
P.O. Box 37100
4701 W. Thunderbird Rd.
Phoenix, Arizona 85069 7100

Library Services

Fletcher Library utilizes a range of electronic systems, from compact discs to telecommunication networks, to provide both access to resources and delivery of materials. The library collection includes 150,000 volumes, 400,000 microforms, and more than 2,500 serial subscriptions. Additionally, students have access to the 2.6 million-volume collection at the main campus, which is provided through the ASU online catalog and a rapid document delivery system.

The library is open seven days a week. Library staff members are always on duty to provide instruction in using the compact disc systems, the online catalog, and other library resources. Group instructional sessions are conducted in conjunction with classes at the request of faculty, and individual consultations by appointment are also available. To meet with a librarian, call 602/543-8505. For library hours, call 602/543 8500. To reach the information desk, call 602/543 8501.

For more library information, call 602/543-8501, or visit or write:

ASU West Library
 P.O. Box 37100
 4701 W. Thunderbird Rd.
 Phoenix, Arizona 85069-7100

Computing Facilities and Services

Information Resources and Technology at ASU West offers a full range of computing facilities for use by students, faculty, and staff through a combination of local microcomputer facilities and a pervasive high-speed communications network that provides access to mainframe computer facilities located in Tempe and to national and interna-

tional computer networks. The Computer Access Center, located on the lower level of Fletcher Library, contains networked IBM-compatible, Macintosh, and Apple microcomputers, and high-quality peripherals such as laser printers and scanners. A full range of software is provided on the network, which is connected to the overall ASU communications network. A high-speed printer provides local availability of mainframe output. Information and help for computer users, computer accounts services, and manuals for equipment and software are available at the center.

ASU West also has four "electronic classrooms," which facilitate the use of

computers and audiovisual equipment during instruction. They are located in the Classroom Laboratory/Computer Center. The equipment and software in them are available to individuals when the rooms are not in use by classes.

For more information on technology facilities and services available at ASU West, call 602/543-7025, or visit or write:

Information Resources and Technology
 ASU West
 P.O. Box 37100
 4701 W. Thunderbird Rd.
 Phoenix, Arizona 85069-7100

General Studies Courses Offered Only by ASU West

The following general studies courses are offered only by ASU West. See pages 45-65 for a description of the general studies requirement and a list of general studies courses offered by ASU Main. Refer to the current *Schedule of Classes* to determine which of these courses are also available at ASU West.

Arts and Sciences

	L1	L2	N1	N2	N3	HU	SB	SI	S2	C	G	H
AMS 310 American Systems. (3) F		L2										
311 American Systems. (3) S		L2										
320 American Cultures. (3) F (Cross-listed as HIS 303.)							SB					H
321 American Cultures. (3) S (Cross-listed as HIS 304.)							SB					H
340 Writing in American Studies. (3) F		L2										
341 Writing in American Studies. (3) S		L2										
422 Studies in American Literature. (3) F, S		L2										
427 Regional Cultures. (3) N		L2										
439 Interdisciplinary Topics. (3) N		L2										
494 Special Topics. (3) F		L2										



ASU West Administrative and Academic Personnel

ASU West Administrative and Academic Organization

Provost and Vice President for
ASU West

Assistant Vice Provost and Director of
Educational Development Christine C. Hall

Assistant to the Provost Mary Hayden-John

Interim Vice Provost for Academic
Affairs Marilyn K. Dantico

Interim Assistant Vice Provost for
Academic Affairs Bruce A. Baldwin

Assistant to the Vice Provost Julia R. Ramsden

Academic Director, Applied Sciences,
Engineering and Technology

Interim Academic Director, Arts
and Sciences Emily F. Cutrer

Interim Academic Director, Business Roger W. Hutt

Academic Director, Education Evelyn J. Sowell

Academic Director, Human Services Janet H. Shirreffs

Director, Student Affairs Harry P. Muir

Associate Director Spencer Johnson

Assistant Director, Financial Aid Frank Granillo

Assistant Director, Minority Services Juan Acosta

Director, ASU West Library Helen L. Gater

Coordinator, Women's Studies Patricia Spakes

Vice Provost for Administrative Affairs Gebeyehu Ejigu

Director, Business Services Steffany K. Knirsch

Assistant Director, University
Center Building Russell S. Flaherty

Interim Director, Facilities
Development and
Management Richard W. Ewbank

Assistant Director, Facilities
Management Gerald R. Willow

Director, Human Resources Jacqueline F. Weatherby

Director, Information Resources
and Technology Connie McNeill

Interim Director, Public Safety Charles A. Erickson

Vice Provost for Planning and Budget Barry R. Bruns

Director, Planning and Institutional
Research Sheila L. Ainlay

Vice Provost for University Relations Judy C. Knudson

Director, Development Barbara Ridge

Director, Public Relations Judith L. Redman

ASU West Faculty and Academic Professionals

Achilles, Elayne R. (1986), Assistant Professor of Education;
B.M Ed., Temple University, M.M , Ed D , Arizona State University

Anders, Gary C. (1989), Professor of Economics; B.S., West
Texas State University, M A , Ph D., University of Notre Dame

Anderson, Laurel A. (1989), Associate Professor of Marketing;
B.S., University of Minnesota; M N., University of Washington,
Ph.D , Arizona State University

Avalos, Manuel (1990), Assistant Professor of Political Science;
B.A., M.A., University of Arizona, Ph D , University of New Mexico

Baldwin, Bruce A. (1989), Professor of Accountancy; Interim Assistant Vice Provost for Academic Affairs, B A , M B A , Michigan State University, Ph.D., Arizona State University

- Bellizzi, Joseph A.** (1988), Professor of Marketing; Coordinator, Marketing Program; B.S., M.A., Ph.D., University of Nebraska, Lincoln
- Bettis, Carr** (1991), Instructor of Accountancy; B.B.A., University of Guam
- Bowen, David E.** (1991), Associate Professor of Management, M.B.A., Ph.D., Michigan State University
- Bredbenner, Candice D.** (1990), Assistant Professor of American History, B.A., Russell Sage College, M.A., Ph.D., University of Virginia
- Breuer, Lee** (1991), Senior Lecturer of Performing Arts; B.A., University of California, Los Angeles
- Broadus, Dorothy C.** (1990), Assistant Professor of English; B.A., Eastern Kentucky University; M.Ed., Ph.D., University of Louisville
- Buss, Ray R.** (1990), Associate Professor of Educational Psychology; Area Coordinator, Educational Psychology, Leadership, and Services; B.S., M.S., Ph.D., University of Wisconsin, Madison
- Cardelle-Elawar, Maria** (1987), Assistant Professor of Educational Psychology; B.A., Ministry of Education (Venezuela); M.S., University of Southern California; M.S., Ph.D., Stanford University
- Cardenas, Lupe** (1986), Associate Professor of Spanish, B.A., M.A., Ph.D., Arizona State University
- Carey, Jane M.** (1988), Associate Professor of Management Information Systems, B.S., M.B.A., Eastern Illinois University; Ph.D., University of Mississippi
- Castañeda, Maria B.** (1989), Assistant Professor of Management, B.S., National University of Mexico (Mexico), M.S., Ph.D., University of Wisconsin, Madison
- Cerveris, Michael E.** (1990), Professor of Music; Coordinator, Fine Arts; B.S., The Juillard School; M.A., Catholic University, D.M.A., West Virginia University
- Chisolm, Inés M.** (1991), Assistant Professor of Education in Curriculum and Instruction, B.A., M.Ed., University of Puerto Rico, Ph.D., University of Florida, Gainesville
- Cleland, Jo Ann V.** (1991), Visiting Clinical Assistant Professor of Education; B.A., St. Olaf College, M.A., Ed.D., Northern Arizona University
- Coburn, William W.** (1989), Assistant Professor of Science Education, B.A., University of California, San Diego; M.A., San Diego State University; Ph.D., University of Colorado
- Cook, Susan J.** (1988), Assistant Professor of Educational Administration; Coordinator, Field Placement for Education; B.A., M.A., Arizona State University; Ed.D., Northern Arizona University
- Corrigan, John** (1992), Associate Professor of Religion and American Studies, B.A., University of Dayton, M.A., Miami University, Ph.D., University of Chicago
- Craig, Timothy P.** (1990), Assistant Professor of Zoology; B.S., Kansas State University; M.S., Ph.D., Northern Arizona University
- Cruze, Gary L.** (1990), Senior Lecturer of Business; Director, Extended Education/Institute for Business Development, B.S., M.B.A., Northern Arizona University, Ed.D., Arizona State University
- Cutrer, Emily F.** (1990), Associate Professor of American Studies, Interim Academic Director, Arts and Sciences; B.A., M.A., Ph.D., University of Texas, Austin
- Cutrer, Thomas W.** (1990), Visiting Assistant Professor of History, B.A., M.A., Louisiana State University; Ph.D., University of Texas, Austin
- Dantico, Marilyn K.** (1981), Associate Professor of Political Science; Interim Vice Provost for Academic Affairs; B.A., M.A., University of Illinois; Ph.D., Florida State University
- Dasgupta, Chanda Ghose** (1991), Visiting Assistant Professor of Marketing; B.Tech, M.Tech, Indian Institute of Technology (India); M.S., State University of New York, Stony Brook; Ph.D., Georgia Institute of Technology
- De La Cruz, Yolanda** (1991), Assistant Professor of Education in Curriculum and Instruction, B.A., M.A., California State University, Northridge; Ed.D., University of California, Berkeley
- Dix, Clarence L.** (1979), Senior Lecturer of Social Work; B.S., Buena Vista College, M.S., University of Chicago
- Duncan, William A.** (1991), Associate Professor of Accountancy; B.S., Portland State University; Ph.D., University of Texas, Austin
- Duvall, David** (1990), Associate Professor of Zoology, A.B., University of California, Berkeley, M.A., San Jose State University, Ph.D., University of Colorado
- Erfani, Julie A.** (1989), Assistant Professor of Political Science, B.A., Knox College, M.A., Ph.D., University of Minnesota
- Farrelly, Deg** (1991), Assistant Librarian, Collection Development and Bibliographic Services; B.A., Illinois State University; M.L.S., Rutgers, The State University
- Fawson, Parker C.** (1991), Assistant Professor of Education in Curriculum and Instruction, B.A., Weber State College; M.Ed., Ed.D., Brigham Young University
- Ferguson, Janice** (1989), Lecturer of Communication; Interim Coordinator, Communication; B.A., Michigan State University; M.A., Siena Heights College; Ph.D., Michigan State University
- Finn, Jerry** (1990), Associate Professor of Social Work; Interim Coordinator, Social Work, B.A., University of California, Los Angeles, M.S.W., University of Hawaii, Honolulu; Ph.D., University of Wisconsin, Madison
- Firat, A. Fuat** (1990), Professor of Marketing, Licencie en Economie, Istanbul University (Turkey), Ph.D., Northwestern University
- Gallegos, Bee** (1984), Assistant Librarian, Research and Information Access Services; B.S., University of North Alabama; M.L.S., Vanderbilt University
- Garver, George G.** (1987), Senior Lecturer of Educational Administration, B.A., University of Northern Iowa; M.A., University of Michigan; Ed.D., Michigan State University
- Gater, Helen L.** (1970), Associate Librarian; Director, ASU West Library, B.A., Fort Hays State University; M.A., University of Denver
- Geshwind, Diane** (1990), Senior Lecturer of Business, Director, Business Services/Institute for Business Development, B.S., M.B.A., Arizona State University
- Gilkeson, John S.** (1991), Visiting Assistant Professor of History, A.B., Amherst College, M.A., University of Oklahoma, Ph.D., Brown University
- Goldman, Alan** (1989), Visiting Associate Professor of Communication; B.Ed., University of Miami, M.A., San Francisco State University; Ph.D., University of Colorado
- González, Edward L. F.** (1991), Assistant Librarian, Research and Information Access Services; B.A., University of San Diego; M.L.S., San Jose State University
- Graef, David W.** (1988), Senior Lecturer of Management; B.S., University of Nebraska, M.S., University of Colorado, Ph.D., Arizona State University
- Greenhut, John G.** (1989), Associate Professor of Finance and Economics, B.A., Ph.D., Texas A&M University

- Gundersen, Dennis F.** (1986), Assistant Professor of Communication; B.A., Bowling Green State University, M.A., Arizona State University; Ph.D., University of Texas, Austin
- Gutierrez, Sara E.** (1990), Assistant Professor of Social Psychology; B.S., M.A., Ph.D., Arizona State University
- Haas, Nancy S.** (1986), Assistant Professor of Instructional Design, Interim Area Coordinator, Curriculum and Instruction, B.A., M.Ed., Ph.D., Arizona State University
- Haladyna, Thomas M.** (1986), Professor of Educational Research and Measurement; B.S., Illinois State University; M.A., San Jose State University, Ph.D., Arizona State University
- Hall, Christine C.** (1989), Assistant Professor of Psychology; Assistant Vice Provost and Director, Educational Development; B.A., California State University, Long Beach; M.A., Ph.D., University of California, Los Angeles
- Hammond, Carol Burroughs** (1987), Associate Librarian; Head, Research and Information Access Services; B.A., Colorado State University; M.S.L.S., University of Illinois, M.A., Gonzaga University
- Harken, Henry R. Jr.** (1986), Associate Librarian, Electronic Information Specialist, B.A., Hofstra University, M.S.L.S., Long Island University
- Harmon, W. Ken** (1990), Associate Professor of Accountancy; B.S., M.A., D.B.A., University of Tennessee, Knoxville
- Harris, Kathleen C.** (1990), Associate Professor of Special Education; B.A., M.Ed., Rutgers, The State University; Ph.D., Temple University
- Hattenhauer, Darryl** (1988), Assistant Professor of American Literature, B.A., M.A., California State University; Ph.D., University of Minnesota
- Hess, Robert** (1990), Assistant Professor of Computer Education; B.A., M.Ed., University of Georgia; Ph.D., University of South Carolina
- Hopkins, Patricia** (1990), Lecturer of Women's Studies; B.S., M.A., Memphis State University; Ph.D., University of Kentucky
- Hultsman, John T.** (1990), Associate Professor of Leisure Studies; B.G.S., University of Kansas, M.S., University of Missouri; Re.D., Indiana University, Bloomington
- Hultsman, Wendy Z.** (1990), Assistant Professor of Leisure Studies; B.S.E., State University of New York, Cortland; M.S., Indiana University, Bloomington; Ph.D., Pennsylvania State University
- Hutt, Roger W.** (1975), Associate Professor of Management; Interim Academic Director, Business, B.S., M.B.A., Ohio State University; Ph.D., Michigan State University
- Isbell, Dennis** (1991), Assistant Librarian, Research and Information Access Services; B.S., M.A., Northern Arizona University; M.L.S., University of Arizona
- Jacquette, Barbara L.** (1990), Lecturer of Curriculum and Instruction; B.S., Cornell University; M.A., Adelphi University; Ph.D., Arizona State University
- Kahn, Douglas** (1991), Associate Professor of Fine Arts; B.A., Evergreen State College; M.F.A., California Institute of the Arts; M.A., Wesleyan University
- Kammerlocher, Lisa** (1988), Assistant Librarian, Research and Information Access Services; B.S., M.L.S., University of Oklahoma
- Kelley, Michael F.** (1990), Assistant Professor of Early Childhood Education, B.S., M.S., Arizona State University, Ed.D., University of Georgia
- Knopf, Richard C.** (1986), Professor of Leisure Studies, Coordinator, Leisure Studies, B.S., M.S., Ph.D., University of Michigan
- Kolber, Denise** (1986), Visiting Assistant Librarian, Research and Information Access Services; B.A., Montclair State College; M.L.S., Rutgers, The State University
- Kuhn, Laura D.** (1991), Instructor of Fine Arts, B.A., Dominican College, M.A., University of California, Los Angeles
- Lattin, Vernon E.** (1989), Professor of English; B.B.A., M.A., University of New Mexico; Ph.D., University of Colorado
- Lavitt, Melissa** (1991), Lecturer of Social Work, B.A., University of Chicago, M.S.W., D.S.W., Tulane University
- Lentz, Daniel** (1991), Associate Professor of Music; B.A., St. Vincent College; M.A., Ohio University
- Levy, Emanuel** (1990), Professor of Sociology; Coordinator, Social and Behavioral Sciences, B.A., M.A., Tel Aviv University (Israel); M.Ph., Ph.D., Columbia University
- Lo, Jane-Jane** (1991), Assistant Professor of Education in Curriculum and Instruction; B.S., The National Taiwan University (Taiwan); M.S., Hsing Hua University (Taiwan)
- Luna, Joseph Donald** (1990), Assistant Professor of Theater, B.S., Memphis State University; M.F.A., University of Arizona
- Malekzadeh, Ali R.** (1987), Associate Professor of Management, B.S., M.B.A., University of Denver; Ph.D., University of Utah
- Malian, Ida M.** (1990), Associate Professor of Special Education; B.A., Oakland University; M.A., Ph.D., University of Michigan
- Martin, Karl** (1991), Visiting Assistant Professor of Religion, B.A., Point Loma College; M.A., Ph.D., University of Minnesota, Twin Cities
- McGovern, Thomas V.** (1990), Professor of Psychology; Coordinator, Interdisciplinary Arts and Sciences; A.B., Fordham University; M.A., Ph.D., Southern Illinois University, Carbondale
- McGraw, Louette** (1989), Assistant Professor of Educational Psychology; B.S., Eastern Montana College; M.A., Washington State University, Ph.D., Stanford University
- McKee, Anne E.** (1991), Assistant Librarian, Collection Development and Bibliographic Services; B.A., Western Kentucky University; M.L.S., Indiana University, Bloomington
- McWilliams, Thomas P.** (1990), Associate Professor of Production and Quantitative Business Analysis; B.S., Gonzaga University, M.S., Ph.D., Stanford University
- McWilliams, Victoria B.** (1990), Assistant Professor of Finance, B.S.B.A., M.B.A., University of Denver, Ph.D., University of Oregon
- Mengesha, Astair Gebre Mariam** (1991), Assistant Professor of Women's Studies; B.A., Purdue University; M.A., Michigan State University; Ph.D., Iowa State University
- Miller, Paul A.** (1988), Assistant Professor of Psychology; B.S., St. Vincent College, M.S., North Carolina State University, Raleigh; M.A., Ph.D., University of Texas, Austin
- Millson-Martula, Christopher** (1991), Associate Librarian; Assistant Director, Administrative Services; B.A., Tufts University; M.S., Columbia University, M.A., Trinity College
- Mitchell, Eleanor** (1990), Assistant Librarian, Research and Information Access Services; B.A., Skidmore College, M.L.I.S., State University of New York, Albany
- Mizzi, Philip J.** (1988), Assistant Professor of Economics and Quantitative Analysis; B.A., Rockford College; Ph.D., Texas A&M University
- Mohanram, Radika** (1991), Lecturer of Women's Studies, B.A., M.A., University of Madras (India); M.A., University of Arizona

Moore, David W. (1989), Associate Professor of Reading; B.A., M.Ed., University of Arizona; Ph.D., University of Georgia

Moore, Sharon A. (1989), Associate Professor of Elementary Reading; B.S.Ed., M.S.Ed., Ohio University; Ph.D., University of Georgia

Mueller, Carol M. (1988), Associate Professor of Sociology; B.A., University of California, Berkeley; M.A., Rutgers, The State University; Ph.D., Cornell University

Muller, Barbara (1991), Senior Lecturer of Accountancy; B.S., M.B.A., Arizona State University

Muñiz-Swicegood, Miriam (1991), Assistant Professor of Education; B.A., M.Ed., Sam Houston State University; Ph.D., Texas A&M University

Myers, Marilyn (1987), Associate Librarian; Head, Collection Development and Bibliographic Services; B.A., Kansas State University; M.S., University of Illinois; M.A., Kansas State University

Nahavandi, Afsaneh (1987), Assistant Professor of Management; B.A., University of Denver; M.A., Ph.D., University of Utah

Náñez, José E. Sr. (1988), Assistant Professor of Psychology; B.A., M.A., California State University, Chico; Ph.D., University of Minnesota, Twin Cities

Nevin, Ann (1991), Associate Professor of Education in Curriculum and Instruction; B.A., Westminster College; M.Ed., University of Vermont; Ph.D., University of Minnesota, Twin Cities

Novak, Gayle J. (1986), Assistant Professor of Studio Art; B.F.A., M.F.A., Arizona State University

Osburn, Jerry R. (1991), Associate Professor of Justice Studies; Interim Coordinator, Justice Studies; B.A., M.A., California State University, Bakersfield; Ph.D., University of Oregon

Park, Young-Ae (1991), Lecturer of Fine Arts; B.A., University of California, Irvine; M.A., University of California, Los Angeles

Poston, Kay M. (1990), Assistant Professor of Accountancy; B.A., M.B.A., D.B.A., University of Tennessee, Knoxville



Pyne, Stephen J. (1986), Professor of History; B.A., Stanford University; M.A., Ph.D., University of Texas, Austin

Ragle, Gael L. (1988), Lecturer of Educational Psychology; B.S.Ed., M.A.Ed., Northern Arizona University; Ed.D., Arizona State University

Resse, Ruth (1988), Lecturer of Educational Psychology; B.S., University of Wisconsin, Madison; M.S., Ph.D., University of Wisconsin, Milwaukee

Ridley, Dale Scott (1990), Assistant Professor of Educational Psychology; B.S., New Mexico State University; M.A., Ph.D., University of Texas, Austin

Sabatini, Arthur J. (1991), Instructor of Fine Arts; B.A., M.A., Ohio University

Shirreffs, Janet H. (1977), Professor of Health Science; Academic Director, Human Services; B.S., Ithaca College; M.S., Syracuse University; Ph.D., Texas Woman's University

Siehl, Caren (1991), Associate Professor of Management; B.A., University of California, Los Angeles; Ph.D., Stanford University

Sowell, Evelyn J. (1990), Professor of Education; Academic Director, Education; B.A., Howard Payne College; M.Ed., Wichita State University; Ed.D., Northern Illinois University

Spakes, Patricia (1990), Professor of Women's Studies; Coordinator, Women's Studies; B.A., Winthrop College; M.S.W., University of South Carolina; Ph.D., University of Wisconsin, Madison

Sparks, Patricia (1990), Lecturer of Curriculum and Instruction; Field Placement Liaison; B.S., M.A., E.D., Ball State University

St. Clair, Charles (1991), Lecturer of Theatre; B.F.A., Fairmont Center for Creative and Performing Arts

Stryker, Linda L. (1987), Associate Professor of Astronomy; B.A., Whittier College; B.A., M.S., San Diego State University; M.A., California State University, Fullerton; Ph.D., Yale University

Sullivan, Brian K. (1989), Assistant Professor of Zoology; B.A., University of California, Berkeley; Ph.D., Arizona State University

Svoboda, William S. (1969), Professor of Education; B.S., M.S., Ed.D., University of Kansas

Thomson, Ernie (1990), Visiting Assistant Professor of Justice Studies; B.A., M.A., University of Texas, El Paso; Ph.D., University of California, Santa Barbara

Van Fleet, David D. (1989), Professor of Management Strategy Policy; Coordinator, Master of Business Administration/Management Programs; B.S., Ph.D., University of Tennessee, Knoxville

Vaughan, Suzanne (1987), Assistant Professor of Sociology; B.A., Roanoke College; M.A., University of New Mexico; Ph.D., Ohio State University

Weston, Kathleen M. (1990), Assistant Professor of Anthropology; A.B., A.M., University of Chicago; A.M., Ph.D., Stanford University

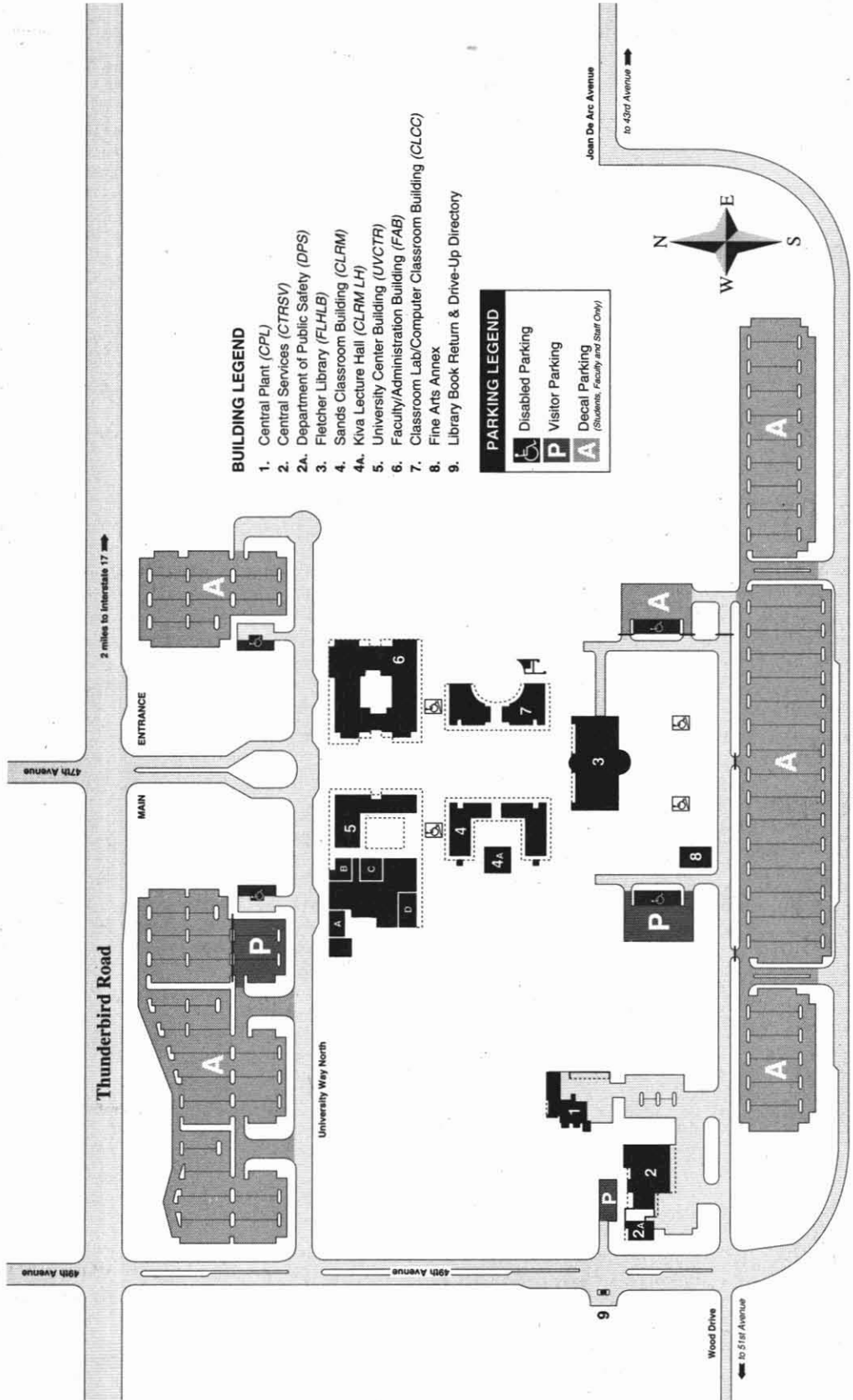
Wetzel, Keith (1991), Assistant Professor of Education; B.A., Greenville College; M.A., Goddard College; M.A., Ph.D., University of Oregon

Williams, Dudley A. (1986), Lecturer of Communication; B.A., University of Maryland, College Park; M.A., University of Hawaii, Manoa; Ph.D., Ohio University

Wilson, Daniel (1986), Associate Professor of Engineering; B.S., Drexel University; M.S.E., Ph.D., Arizona State University

Wilson, Denward J. (1989), Lecturer of Philosophy; B.A., Arizona State University

Zambo, Ronald W. (1991), Assistant Professor of Education in Curriculum and Instruction; B.S., Indiana University, Bloomington; M.A., Ph.D., University of South Florida



BUILDING LEGEND

1. Central Plant (CPL)
2. Central Services (CTRSV)
- 2A. Department of Public Safety (DPS)
3. Fletcher Library (FLHLB)
4. Sands Classroom Building (CLRM)
- 4A. Kiva Lecture Hall (CLRM/LH)
5. University Center Building (UVCTR)
6. Faculty/Administration Building (FAB)
7. Classroom Lab/Computer Classroom Building (CLCC)
8. Fine Arts Annex
9. Library Book Return & Drive-Up Directory

PARKING LEGEND

- Disabled Parking
- Visitor Parking
- Decal Parking (Students, Faculty and Staff Only)

ASU West Administrative and Academic Directory

Academic Advisement Center	UVCTR N220	543-8122
Academic Units (Administrative and Faculty Offices)		
Applied Sciences, Engineering and Technology	FAB 101	543-6100
Arts and Sciences	FAB N200L3	543-6000
American Studies, Fine Arts, Interdisciplinary Arts and Sciences, Life Sciences, Social and Behavioral Sciences		
Business	FAB N101	543-6200
Accounting, Management and MBA, Marketing		
Education	FAB N200L1	543-6300
Curriculum and Instruction, Educational Psychology, Leadership and Services		
Human Services	FAB S270	543-6600
Communication, Justice Studies, Leisure Studies, Nursing, Social Work		
Women's Studies	FAB S115A	543-3300
Admissions (Student Intake and Information Services)	UVCTR 120	543-8125
Adult Development Center	UVCTR 320	543-8124
Admission Services	FAB S360	543-5300
ASU West General Information		543-5500
Bookstore	UVCTR N140	543-6800
Business Services	UVCTR 101	543-6709
Cashier (Student Fee Payment, Student Aid Disbursement)		
Computer Access Center	FLHLB	
Lower Level		543-8277
Disability Resource Center	UVCTR 130	543-8145
TDD (Telecommunication Device for Deaf)		543-4327
Educational Development	FAB S308	543-7050
Financial Aid	UVCTR 221	543-8178
Fletcher Library	FLHLB	543-8501
Circulation		543-8520
Hours		543-8500
Information Desk		543-8501
Renewals		543-RENU
Minority Student Services	UVCTR 201	543-8148
Provost/Vice President for ASU West	FAB N303	543-7000
Registration Services	UVCTR 105	543-8300
Residency Classification	UVCTR 120	543-8125
Student Activities		
Coordinator	UVCTR 202	543-8200
Student Affairs, Director	UVCTR 301	543-8152
Student Employment	UVCTR 221	543-8178
Student Records	UVCTR 120	543-8123
Veterans Services	UVCTR 120	543-8167
Vice Provost for Academic Affairs	FAB N301	543-4500

APPENDIX

UNIVERSITY POLICY FOR STUDENT APPEAL PROCEDURES ON GRADES

Informal: The steps outlined below, beginning with step A, must be followed by any student seeking to appeal a grade. Student grade appeals must be processed in the regular semester immediately following the issuance of the grade in dispute (by commencement for fall or spring), regardless of whether the student is enrolled at the university. It is university policy that students filing grievances and those who are witnesses will be protected from retaliation. Students who believe they are victims of retaliation should immediately contact the dean of the college in which the course is offered.

A. The aggrieved student must first undergo the informal procedure of conferring with the instructor, stating the evidence (if any) and reasons for questioning that the grade received was not given in good faith. The instructor is obliged to review the matter, explain the grading procedure utilized, and show how the grade in question was determined. If the instructor is a graduate assistant and this interview does not resolve the difficulty, the student may then go to the faculty member in charge of the course (regular faculty member or director of the course sequence) with the problem.

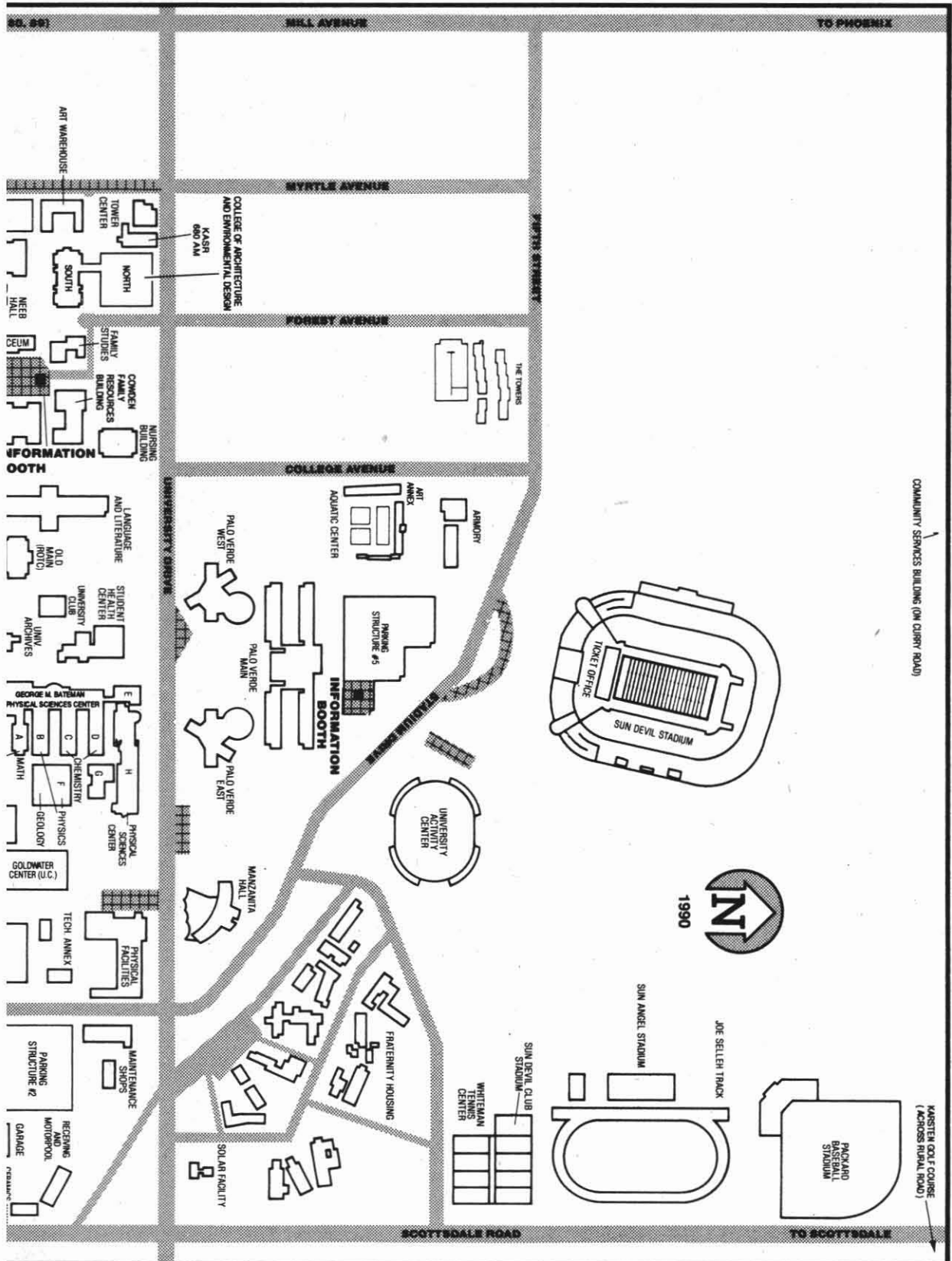
B. If the grading dispute is not resolved in step A, the student may appeal to the department chair or other appropriate chair of the area within the department (if any). The department chair may confer with the instructor to handle the problem. Step B applies only in departmentalized colleges.

C. If these discussions are not adequate to settle the matter to the complainant's satisfaction, the student may then confer with the dean of the college concerned (or the dean designate), who will review the case. If unresolved, the dean or designate may refer the case to the college academic grievance hearing committee to review the case formally. In most instances, however, the grievance procedure will not go beyond this level.

Formal: The following procedure takes place after steps A, B, and C (or A and C) have been completed.

D. Each college has on file in the office of the dean (and in each department of the college) the procedures and composition of the undergraduate or graduate academic grievance hearing committee for student grievances. Each college committee shall operate under grievance procedures as stated which satisfy due process requirements. The committee shall always meet with the student and the instructor in an attempt to resolve the differences. At the conclusion of the hearing, the committee shall send its recommendations to the dean.

E. Final action in each case will be taken by the dean after full consideration of the committee's recommendation. Grade changes (if any are recommended) may be made by the instructor (or the dean of the college in the absence of the faculty member). The dean shall have authority to take action as is deemed necessary by the case and shall so inform the student, instructor, department chair (if any) and the registrar of action taken.



Building Abbreviations

ADM	Administration Building	LIB	Charles T. Hayden Library
AED	College of Architecture and Environmental Design/North	LL (Wings A–C)	Language and Literature Building
AG	Agriculture Building	LS (Wings A–C)	Life Sciences Center
ANTH (Wings A C)	Anthropology Building	LYC	Lyceum Theatre
AQUAT (Wings A and B)	Aquatics Center	MAIN	Old Main
ARCH	College of Architecture and Environmental Design/South	MCENT	Matthews Center
ARCV	University Archives	MCL	McClintock Hall
ART	Art Building	MHALL	Matthews Hall
ARWH	Art Warehouse	MOEUR	Moeur Administration
ASB	Academic Services Building	MTASU	ASU West Montebello*
ASUDC	Downtown Center	MTCHL	Mitchell School (Tempe)
BA	Business Administration Building	MU	Memorial Union
BAC	Business Administration C Wing	MUR	Murdock Lecture Hall
BKSTR	ASU Bookstore	MUSIC	Music Building
BLPZA	Bell Plaza Professional Building South	NEEB	L.S. Neeb Hall
CERA (Wings A and B)	Ceramics Annex	NOBLE	Noble Science Center
CFS	Center for Family Studies	NUR	Nursing Building
CLCC	Classroom Laboratory/Computer Building*	PBS	Packard Baseball Stadium
CHAPL	Danforth Chapel	PEBE	Physical Education Building East
CLRM	Sands Classroom Building*	PEBW	Physical Education Building West
CMPIN	Campus Inn	PPS	Physical Plant and Shops
CMSC1	Community Services Center Building	PS (Wings A H)	George M. Bateman Physical Sciences Center
COB (Wings A and B)	Classroom Office Building	PSY	Psychology Building
CP	Central Plant	PURCH	Purchasing and General Stores
CRNSN	Cornerstone Mall	RITT (Wings A and B)	Ritter Building
EC (Wings A–G)	Engineering Center	RURLS	Rural School (Tempe)
ED	Farmer Education	SDF	Solar Demonstration Facility
EDB	Payne Education Hall	SHS (Wings A and B)	Student Health Service
EDC	Education Lecture Hall	SRC	Student Recreation Complex
ENGRC	Engineering Research Center	SS	Social Sciences Building
FAA	Fine Arts Annex	SSV	Student Services Building
FAB	Faculty and Administration Building*	STAD	Sun Devil Stadium
FAC	Fine Arts Center	STAUF (Wings A and B)	Stauffer Hall
FIELD	University Field Lab	TC	Technology Center
FLHLB	Fletcher Library*	TCB	Aeronautics Building
FSL	Forestry Services Lab	TCC	Technology Center Annex
GGMA	Grady Gammage Memorial Auditorium	TCM	Technology Modulars
GHALL	Dixie Gammage Hall	THWH	Theatre Warehouse
HEC (Wings A and B)	Cowden Family Resources Building	TOWER (Wings A and B)	University Tower Center
HECX	Home Economics Annex	TRACK	Joe Selleh Track
IRISH	Irish Hall	UAC	University Activity Center
LAW	Armstrong Hall	UVCTR	University Center Building*
		WH	Warehouse
		WHALL	West Hall
		WILSN	Wilson Administration
		WTC	Whiteman Tennis Center

* Located at ASU West.

Directory Colleges and Academic Units

**Architecture and Environmental Design,
College of..... ARCH 134 965-3216**
 Architecture, School of AED 162 965-3536
 Design, School of AED 158 965-4135
 Planning, Department of AED 154 965-7167

Business, College of BA 140 965-4227
 Accountancy, School of BA 267 965-3631
 Business Administration,
 Department of BA 318 965-3231
 Decision and Information Systems,
 Department of BAC 554 965-6350
 Economics, Department of BAC 659 965-3531
 Finance, Department of BAC 519 965-3131
 Health Administration and Policy,
 School of BA 252 965-7778
 Management, Department of BA 323 965-3431
 Marketing, Department of BAC 462 965-3621

Education, College of EDB 104 965-3306
 Curriculum and Instruction,
 Division of ED 409 965-1644
 Educational Leadership and Policy Studies,
 Division of ED 108 965-6357
 Psychology in Education,
 Division of EDB 301 965-3384

**Engineering and Applied Sciences,
College of..... ECG 100 965-3421**
 Aeronautical Technology,
 Department of TC 100 965-7775
 Agribusiness and Environmental Resources,
 School of AG 281 965-3585
 Chemical Bio and Materials Engineering,
 Department of ECG 202 965-3313
 Civil Engineering,
 Department of ECG 136 965-3589
 Computer Science and Engineering,
 Department of ECG 252 965-3190
 Construction, Department of COB 268 965-3615
 Construction and Technology,
 School of TC 201A 965-3874
 Electrical Engineering
 Department of ECG 127 965-3424
 Electronics and Computer Technology,
 Department of TC 301 965-3137
 Engineering, School of ECG 104 965-1726
 Industrial and Management Systems Engineering,
 Department of ECG 303 965-3185
 Manufacturing and Industrial Technology,
 Department of TC 201F 965-3781
 Mechanical and Aerospace Engineering,
 Department of ECG 346 965-3291

**Extended Education,
College of..... CRNM C207 965-9696**
 American Language and
 Culture Program IRISH 3D 965-2376
 Arizona Prevention
 Resource Center CRNM C207 965-9666

Center for Lifelong Learning	BLPZA	972 7398 965-5600	Women's Studies Program	SS 104	965-235
Distance Learning Technology ..	RITT A129	965-6738	Zoology, Department of	LS C226	965-357
Division of Conferences and Institutes	CRNM C203	965-5757	Nursing, College of	NUR 322	965-324
Division of Instructional Programs	CRNM C207	965-9797	Public Programs, College of	WILSN 234	965-103
Downtown Center	ASUDC	965 3046	Communication, Department of	STAUF A412	965-509
Independent Study by Correspondence	ED 404	965-6563 1-800-533-4806	Journalism and Telecommunication, Walter Cronkite School of	STAUF A231	965-501
Office of Marketing and Communication	CRNM C207	965-9494	Justice Studies, School of	WILSN 331	965-768
Office of Planning and Development	CRNM C207	965-9777	Leisure Studies, Department of	GHALL 204	965-729
Fine Arts, College of	GHALL 132	965-6536	Public Affairs, School of	WILSN 208	965-392
Art, School of	ART 102	965-3468	Social Work, School of	WHALL 137	965-330
Dance, Department of	PEBE 107B	965-5029	University Honors College	MCL 112	965-235
Music, School of	MUS C 183	965-3371	Other		
Theatre Department of	GHALL 232	965-5359	Admissions, Graduate	WILSN 101	965-611
Graduate College	WILSN Lobby	965-3521	Admissions, Law	LAW 101	965-789
Admissions	WILSN 101	965-6113	Admissions, Undergraduate	SSV C111	965-778
Advising Office	WILSN Lobby	965-3521	Advising (see University Academic Advising Center below) ASU West (see page 436)		
Law, College of	LAW 101	965-6181	Bookstore	BKSTR	965-792
Liberal Arts and Sciences, College of	SS 111	965-6506	Career Services	SSV C359	965-235
Aerospace Studies, Department of	MAIN 340	965-3181	Drop Add and Withdrawal Information	SSV B114	965-312
Anthropology, Department of	ANTH A124	965-6213	Graduation Office, Graduate Division	SSV B113	965-698
Botany, Department of	LS C210	965-3414	Graduation Office, Undergraduate Division	SSV B113	965-325
Chemistry and Biochemistry, Department of	PS D102	965-3461	International Admissions	SSV C111	965-268
English Department of	LL B504	965-3168	International Programs	MOEUR 124	965-596
Exercise Science and Physical Education, Department of	PEBW M212	965-3875	International Student Programs	SSV B225	965-745
Family Resources and Human Development, Department of	HEC 106	965-6978	Memorial Union Information Desk	MU First Level	965-572
Foreign Languages, Department of	LL B404	965-6281	Off-Campus Academic Services	ED 404	965-656
Geography, Department of	COB 338	965-7533	On-Campus Student Employment	SSV C222	965-518
Geology, Department of	PS F686	965-5081	Operator, University		965-9011
History, Department of	SS 204	965-5778	Orientation, New Student, Undergraduate	SSV A278	965-267
Interdisciplinary Humanities Program	LL C352	965-6747	Outgoing Transcripts	SSV B113	965-785
Mathematics, Department of	PS A216	965-7195	Readmission, Undergraduate	SSV B114	965-744
Microbiology, Department of	LS 378	965-1457	Recreational Sports and Student Activities	SRC Lobby	965-890
Military Science, Department of	MAIN 240	965-3318	Registrar	SSV B114	965-3124
Philosophy, Department of	PS A524	965-3394	Residence Life	SSV A131	965-3515
Physics and Astronomy Department of	PS F470	965-3561	Student Financial Assistance	SSV C219	965-3355
Political Science, Department of	SS 410	965-6551	Student Health	SHS	965-334
Psychology, Department of	PSY 237	965-3326	Student ID	EDB 42	965-3124
Religious Studies, Department of	LL B605	965-7145	Summer Sessions, Office of	ASB 109	965-6611
Sociology, Department of	SS 321	965-3546	University Academic Advising Center	MCENT 110	965-4464
Speech and Hearing Science, Department of	LL A145	965-2373	University Libraries (information)	LIB	965-6164
			(hours)		965-3415

Academic Definitions

Academic Renewal. An undergraduate who has been readmitted to the university after an absence of at least five years and who has satisfactorily completed a minimum of 12 approved, additional semester hours in residence at ASU, may, upon petition to the dean of the college, have the former record treated in the same manner as transfer credits. See page 38.

ACT. All new freshman applicants *must* take either the American College Test (ACT) or Scholastic Aptitude Test (SAT) on a national test date in their junior or senior years of high school. See page 28.

Advanced Placement. Students who have taken an advanced placement course of the College Entrance Examination Board (CEEB) in their secondary school *and* who have taken an Advanced Placement Examination of CEEB may receive credit. See page 32.

ALCP. The American Language and Culture Program (ALCP) features an intensive, noncredit course of study designed for adult international students who desire to become proficient in English as a second language. See pages 32 and 343.

ASASU. The Associated Students of Arizona State University (ASASU) is the student government for the university, the official representative of the student body in matters of university governance and the largest student programming organization on campus, with 18 different departments. See page 71.

ASU Main. ASU Main is the principal campus of ASU, located in Tempe. See page 15.

ASU West. ASU West is the Phoenix based satellite campus of ASU, established in 1984 by the Arizona Legislature to serve the educational needs of residents in western Maricopa County. See pages 422–436.

Audit Enrollment. A student who audits a course attends regularly scheduled class sessions but earns no credit. See page 41.

Buckley Amendment. See *Family Educational Rights and Privacy Act* in this section.

CLEP. As part of the College-Level Examination Program (CLEP), students who have taken a College Level Examination of the College Entrance Examination Board may receive university credit. See pages 32, 33, 35, 36.

Comprehensive Exam. A comprehensive examination is intended to permit a student to establish academic credit in a field in which the student has gained experience or competence equivalent to an established university course. See page 33.

Concentration. A concentration is a selection of courses within a major or among one or more majors.

Cooperative Education. Cooperative Education is any educational program that requires alternating classroom and work experience in government or industry. The work experience exists for its educational value. See page 39.

Corequisite. A requirement to be met, such as taking a certain course, *while* taking a course is a corequisite. See *prerequisite* in this section.

Course Loads. A minimum full-time course load for an undergraduate student is 12 semester hours. The maximum course load for which a student may register is 18 semester hours (with the exception of a 19-hour maximum for students enrolled in the College of Engineering and Applied Sciences or the College of Architecture and Environmental Design). See page 38.

Course Prefix. The course prefix is the three-letter designation assigned by each instruction unit. The Course Prefix Index, on pages 462–463, provides a comprehensive list. Also see *cross-listing* below.

Credit Enrollment. One semester hour represents one 50-minute class exercise per week per semester. A minimum of 126 semester hours is required for graduation with a baccalaureate degree. To obtain credit, a student must be properly registered and pay fees for the course. See page 41.

Cross-listing. One course may have more than one course prefix and may be offered by more than one department. Some instruction units require students to enroll in a course under a certain prefix in order to receive credit properly. Course descriptions in the *General Catalog* indicate courses that are cross-listed.

Cum Laude. An undergraduate student with a cumulative GPA of 3.40–3.59 graduates *cum laude*. See page 67. Also see *magna cum laude* and *summa cum laude*.

Drop Add. A student who has registered for courses for a semester or summer session may drop or add courses through the first week of classes or the first two days of a summer session. See page 42.

Emphasis. An area of emphasis is a selection of courses within a major or among one or more majors.

Family Educational Rights and Privacy Act. The Family Educational Rights and Privacy Act of 1974, or Buckley Amendment, sets forth the requirements governing the protection of the privacy of the educational records of students who are or have been in attendance at Arizona State University. See page 45.

Freshman. A student who has earned 24 or fewer hours is a freshman.

General Studies Requirements. The general studies program consists of five core areas and three awareness areas. The core areas are literacy and critical inquiry, numeracy, humanities and fine arts, social and behavioral sciences, and natural sciences. The awareness areas are cultural diversity in the United States, global awareness, and historical awareness. All undergraduate students must successfully complete a minimum of 35 semester hours of approved general studies courses. See pages 45–65.

GPA. The grade point average (GPA) is obtained by dividing the total number of grade points earned by the number of semester hours graded. Grade point averages are rounded to the nearest hundredth of a grade point. See page 42.

Grade Points. For the purpose of computing the GPA, grade points are assigned to each of the grades for each semester hour as follows: "A," four points; "B," three points; "C," two points; "D," one point; and "E," zero points.

Graduate Catalog. The *Graduate Catalog* describes the procedures and requirements for enrollment in the Graduate College. See pages 346–356 of the *General Catalog* for information on the Graduate College. See pages 347–349 specifically for a complete list of graduate degrees, majors, and concentrations.

Graduate-Level Courses. Courses numbered 500–799 are designed for graduate students. However, an upper-division undergraduate student may enroll in graduate courses with the approval of his or her advisor, the course instructor, the department chair, and the dean of the college or school in which the course is offered. See page 40.

Incomplete. A mark of "I" (incomplete) is given by the instructor only when a student who is otherwise doing acceptable work is unable to complete a course because of illness or other conditions beyond the student's control. See page 41.

Independent Study. The course number 499 has been reserved for independent study courses in each of the instructional departments or divisions of the colleges at the undergraduate level. Independent study courses are honor courses and may be taken only by outstanding senior students who have completed at least one semester in residence. See page 40.

Junior. A student who has earned 56–86 hours is a junior.

LIA 100. See *University Adjustment and Survival* in this section.

Lower-Division Courses. Courses numbered 100–299 are designed primarily for freshmen and sophomores. See page 39.

Magna Cum Laude. A student with a cumulative GPA of 3.60–3.79 graduates *magna cum laude*. See page 67. Also see *cum laude* and *summa cum laude* in this section.

Major. A major is a specialized group of courses contained within the program of study. Refer to college and school sections for specific descriptions and requirements.

Minor. A minor is a specialized group of courses contained within the program of study available from some instruction units. Refer to college and school sections for specific descriptions and requirements.

Omnibus Course. An omnibus course is offered on a one-time or tutorial basis when the course content is new or periodically changes. See page 40.

Option. An option is a selection of courses within a major or among one or more majors.

Pass/Fail Enrollment. A mark of "P" (pass) or "E" (fail) may be assigned for this grading option. This grading method may be used at the option of individual colleges and schools within the university. See page 41.

Prerequisite. A requirement to be met, such as completing a certain course, *before* registering for a course is a prerequisite. See *corequisite* in this section.

Probation. A student's college assumes responsibility for enforcing academic standards and may place any student on probation who has failed to maintain good standing. A student on academic probation is required to observe any rules or limitations the college may impose as a condition for retention. See page 44.

Proficiency Examination. A proficiency examination is given to: (a) waive a course requirement; (b) validate certain transfer credits in professional programs; or (c) determine a student's ability in a field where competence is an important consideration. See page 33.

Program of Study. A student must file an Undergraduate Program of Study for graduation within the semester he or she earns his or her 87th hour. See page 66. The complete array of courses included in the study leading to a degree make up a student's program of study.

Registration Fee. All students who register for classes at ASU are assessed this charge. See *tuition* in this section.

Restricted Complete Withdrawal. From the fifth week to the transaction deadline for a semester and from the seventh day to the transaction deadline for a summer session, students may withdraw from all courses but will receive a mark of "W" only from courses in which the instructor certifies that they are passing at the time of the withdrawal. See page 42.

Restricted Course Withdrawal. From the fifth week to the end of the 10th week of a semester and from the seventh day to the end of the third week of a summer session, students may withdraw with a mark of "W" only from courses in which the instructor certifies that they are passing at the time of withdrawal. See page 42.

SAT. All new freshman applicants *must* take either the American College Test (ACT) or Scholastic Aptitude Test (SAT) on a national test date in their junior or senior years of high school. See page 28.

Senior. A student who has earned 87 or more hours of credit is a senior.

Sophomore. A student who has earned 25–55 hours of credit is a sophomore.

Special Topics. Courses numbered 294, 394, and 494 cover topics of immediate or special interest to a faculty member and students. See page 40.

Summa Cum Laude. A student with a cumulative GPA of 3.80–4.00 graduates *summa cum laude*. See page 67. Also see *cum laude* and *magna cum laude* in this section.

TOEFL. All applicants to ASU whose native language is not English and who have not attended a high school in the United States for their junior and senior years where English is the language of instruction or graduated from a U.S. college or university where English is the language of instruction are required to take the Test of English as a Foreign Language (TOEFL) in place of the ACT or SAT. See pages 28, 32, and 343. Also see *ALCP* in this section.

Transcript. The transcript has information about classes taken and grades earned. The Office of the Registrar releases official transcripts only upon written request of the student for a fee of \$1.00 per copy for enrolled students or \$5.00 per copy for nonenrolled students. Additional copies ordered at the same time are \$1.00 each. Unofficial transcripts may be obtained free of charge in person at the Office of the Registrar, any registrar site, or by mail if a signed release is enclosed. See page 43. Also see *Family Educational Rights and Privacy Act* in this section.

Tuition. This term refers to the additional charges assessed only to nonresidents, as established in Arizona Board of Regents' Policy 4-102. See *registration fee* in this section.

University Adjustment and Survival. This course (LIA 100), offered by the College of Liberal Arts and Sciences, is an analysis of student motivation and goals. The course is designed to reinforce language facility and study skills. Students are oriented to university resources and procedures. See pages 27 and 85.

Unrestricted Withdrawal. During the first four weeks of a semester or the first six days of a summer session, a student may withdraw from any course with a mark of "W." See page 42.

Upper-Division Courses. Courses numbered 300-499 are designed primarily for juniors, seniors, and other advanced students. See page 40.

WICHE. Through the Western Interstate Commission for Higher Education (WICHE), qualified Arizona residents may attend professional schools of dentistry, veterinary medicine, occupational therapy, optometry, and osteopathy in other western states at essentially the same expense to the students as to residents of the state in which the school is located. See page 67.



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